

JMA Architecture Studios  
Attention: Mr. Robert Messina  
Subject: Las Vegas City Hall  
May 17, 2010  
Page 4 of 6

8. Provide circuit breaker handle ties for multi-wire circuits to system furniture per NEC 605.7 and NEC 210.4(B).
9. Provide panel LBBB with subfeed lugs.
10. Provide panel LTVA with 400A main circuit breaker and isolated ground bus.
11. Provide panels LTVB, XLBA and XLTV with isolated ground bus. Why is every panel furnished with insulated ground connector?
12. Circuit breakers for heat trace shall be GFP type in panel LBBBS.

Div 262511- Busway and Busway Plug-Ins- Reviewed

Div 262726- Wiring Devices- Reviewed

1. Architect shall indicate finish.
2. Incandescent dimmer shall be furnished with on/off switch.
3. Submit for 30 amp, 120 volt maintenance receptacles and clock type receptacles.

Div 262813- Fuses- Reviewed

Div 262816- Enclosed Switches and Breakers- Furnish as Corrected

1. Coordinate fusible disconnects for elevators with revised electrical drawings and elevator shop drawings. Provide auxiliary contacts required.
2. Confirm 50A/3P and 125A/3P circuit breakers are furnished with shunt trip function.

Div 262913- Enclosed Controllers- Furnish as Corrected

1. Furnish starters with (2) NO and (2) NC contacts.
2. Coordinate NEMA 3R enclosure requirements with the electrical drawings.
3. Confirm solid state overloads are furnished with single phase protection.

Div 263213- Packaged Engine Generator Systems- Revise and Resubmit

1. 9KW jacket heaters require circuit revisions to the drawings.
2. Generators shall be furnished with upturn radiator exhaust scoops.
3. Provide shop drawing of generator yard layout. Provide minimum of 42" clear on the sides of the generators.

Div 263353- Static Uninterruptible Power Supply- Furnish as Corrected

1. Furnish with network monitoring via Ethernet cable connection.

Div 263500- Generator Paralleling Switchgear- Reviewed

Div 263600- Transfer Switches- Revise and Resubmit

1. Provide information for remote status panel.
2. Provide equipment room layouts.

*- Item D in BOM  
section 5 in sub*

*we will provide 2A for fine  
comm. switchgear  
ATS*

*Run/Stop/Aud  
for gen*

*891-857*

CASH1058  
J54-536

JA 00004376

JMA Architecture Studios  
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3. Indicate automatic transfer features as indicated in specifications.

Div 264113- Lightning Protection- Reviewed

1. Submit manufacturers generated drawings (project specific) with plan view and elevations per specifications.

Div 264313- Transient Voltage Suppression- Revise and Resubmit

1. Provide information specific for each unit indicated on single line diagrams. Indicate quantities and locations.
2. Submit for 120/208V unit.

Div 265100- Interior Lighting- Furnish as Corrected

1. All T8 florescent ballasts shall be rated and labeled NEMA-PREMIUM.
2. All T8 fluorescent lamps shall be Super T8 32 watt with 3100 initial lumens.
3. Fixture E- refer to restroom lighting plan for row information.
4. Fixture J- furnish with rocker switch and 120V ballasts.
5. Exit sign letters are green.
6. LPDC exit sign shall be for 120V or 277V operation.
7. Fixture LB1- lamp distribution shall be narrow flood.
8. Fixture LB2- lamp distribution shall be narrow flood.
9. Submit for fixture LC1 and LC2. Missing cutsheets from binders.
10. Architect to specify finish for LD1.
11. Fixtures on the specialty fixture schedule shall be reviewed by the lighting consultant for compliance with their specifications.
12. Fixtures LC1 and LC2 are 277V.
13. Fixtures AR1, PF1, PF2 are 120V.
14. Fixtures JM1, JM2, RF1, WF1, WF2, FD2, PM1, PM2, PM3 and SZ3 are 277V.
15. Fixture PP1 is 100W lamp.

Div 265600- Exterior Lighting- Furnish as Corrected

1. Architect to specify finish for fixture CC.
2. Exit signs are green.
3. XS-Pole shall be 48" high- finish by architect.
4. Fixtures on the specialty fixture schedule shall be reviewed by the lighting consultant for compliance with their specifications.
5. Fixtures BC1, BM1, BM3, GM1, SC1, SC2, SF8, WC3 are 277V.
6. Fixtures FD3, GM2, SZ7A and WC2 shall be for 120V operation.
7. Fixtures SC1 and SC2 are submitted as 120V operation. Electrical drawings indicate 277V. Is 277V available for fixtures?
8. Submit for obstruction light control relay and photocell- FAA approved.

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Div 260000- Sustainability Public Interface- Review and Resubmit

1. Provide product cut-sheets.
2. Provide shop drawings.
3. Indicate user interfaces for Total Electricity Use, Total Water Use, Hot Water Use, Natural Gas, Lighting Distribution, HVAC, LEED Checklist and Benchmark Comparisons. Refer to specifications section 260000-2.02.

Div 271100- Communications Equipment- Reviewed

Div 271300- Communications Backbone Cabling- Reviewed

Div 271500- Communications Horizontal Cabling- Reviewed

Emergency Services Radio Amplification System- Reviewed

1. Submit shop drawings.

City of Las Vegas Intersection Lights- Not Reviewed

1. Civil engineer shall review.

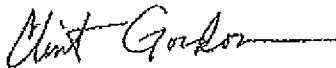
General

1. Submit samples as indicated in the specifications.
2. Submit for shunt trip stations.
3. Submit for power poles.
4. Submit for plug strips.
5. Submit for recessed table top connectivity box.
6. Submit for manual 3 phase contactor switches.
7. Submit for chiller room and boiler room breakglass stations.
8. Submit for lights in elevator pits.

If you should have any questions or concerns, please do not hesitate to call.

Very truly yours,

JBA CONSULTING ENGINEERS



Clint Gordon  
Senior Project Manager- Electrical Engineering

CRG/kw

EX-2009-PRD-0015620-0200-08.035272.0214 - CITY OF LAS VEGAS CITY HALL Documents\Submittals\JBA Electrical\Submittal Book.cdw

CASH1060  
J54-538  
JA 00004378



## BILL OF MATERIALS

### DESCRIPTION

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(2) CATERPILLAR MODEL C32 1000KW 277/480V 3 PHASE DIESEL GENERATOR SET:  
NON UL2200  
WEATHER ENCLOSURE  
CRITICAL MUFFLER & FLEX  
UL2085 BASE FUEL TANK 800 GALLONS  
VIBRATION ISOLATORS  
EMCP 3.3 DIGITAL ENGINE-GENERATOR CONTROL PANEL  
REMOTE ANNUNCIATOR NFPA 99/110  
LOCAL PC MONITORING  
ENGINE-MOUNTED RADIATOR  
1600 A CIRCUIT BREAKER  
24VDC STARTING BATTERIES  
HD STATING MOTOR  
BATTERY CHARGER  
JACKET WATER HEATER  
TWO (2) YEAR WARRANTY STANDBY INSTALLATION  
OWNER TRAINING  
OPERATION AND MAINTENANCE MANUALS PER SPECS  
LOAD BANK TEST AT SITE PER SPECS  
FACTORY TESTING - STANDARD NFPA110

**LAS VEGAS CITY HALL  
CATERPILLAR GENERATOR SET  
INSTALLATION SUMMARY**

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**SYSTEM DATA**

|                            |              |
|----------------------------|--------------|
| MODEL                      | C32          |
| ENGINE DISPLACEMENT        | 32.10 LITERS |
| GENERATOR RATING           | 1000 kW      |
| VOLTAGE (V)                | 277/480V     |
| PHASE                      | 3            |
| FUEL SYSTEM                | #2 DIESEL    |
| FULL LOAD FUEL CONSUMPTION | 74.3 GAL/HR  |
| BATTERY                    | 24 VOLT      |

**GENERATOR SET DIMENSIONS**

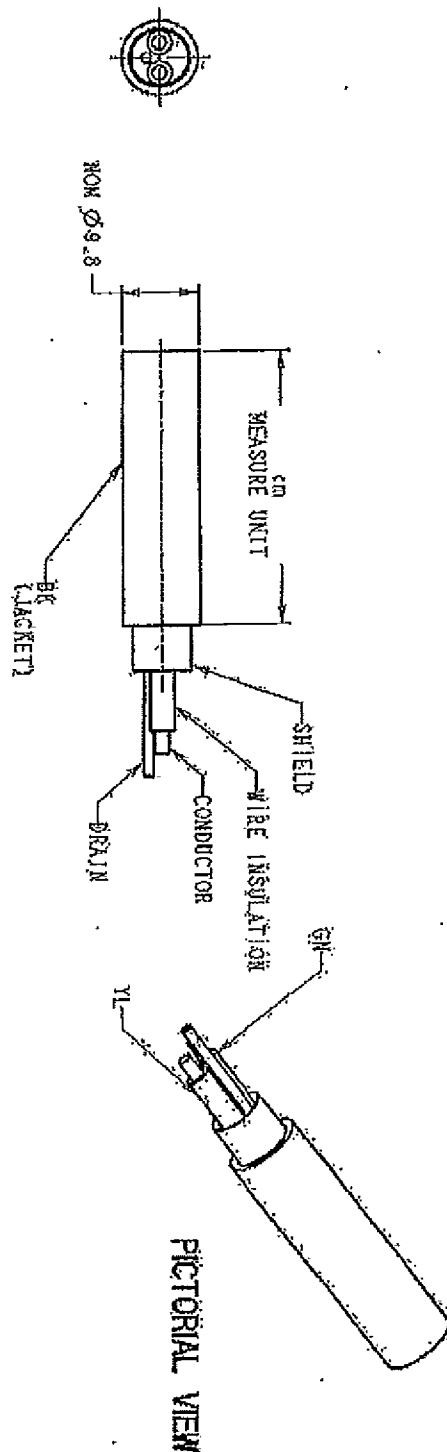
|        |            |
|--------|------------|
| LENGTH | 270 INCHES |
| WIDTH  | 100 INCHES |
| HEIGHT | 183 INCHES |

**SYSTEM WEIGHTS**

|            |            |
|------------|------------|
| DRY WEIGHT | 32,000 LBS |
|------------|------------|

# Remote Ammuniotor Wire (data)

METRIC 153-2707



CABLE.....2 CONDUCTOR, HYDRAULIC AND SHIELD  
 CONDUCTOR.....0.75-0.85mm<sup>2</sup> (COPPER 16 OR 19 STRAND)  
 WIRE INSULATION.....POLYETHYLENE OR CELLULAR XLPE  
 JACKET.....MODIFIED POLYOLEFIN OR THERMOPLASTIC RUBBER  
 DRAIN.....COPPER 16 OR 19 STRAND OF 75-0.85mm<sup>2</sup>  
 (TINNED COPPER UNDER SHIELD)  
 SHIELD.....ALUMINUM POLYESTER FOIL  
 MINIMUM BEND RADIUS.....35  
 OPERATING TEMP RANGE.....-40°C TO +125°C  
 IMPEDANCE.....120±12 OHMS @ 1 MHz

51939 wire



CALIFORNIA DYNAMICS CORPORATION

5572 ALHAMBRA AVE.  
LOS ANGELES, CA. 90032-3106

CALL US - TO SET THINGS RIGHT

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PH (323) 223 - 3882

email: caldyn@earthlink.net

# TYPE RJ STEEL SPRING ISOLATOR/RESTRAINT DUCTILE IRON

FILE 285

3/22/02

| EARTHQUAKE RESTRAINT RATING |      |      |      |      |
|-----------------------------|------|------|------|------|
| Type                        | Up   | End  | Side |      |
|                             |      |      | Low  | High |
| RJB                         | 1600 | 1600 | 1280 | 1600 |
| RJC                         | 3366 | 3333 | 1312 | 2840 |
| RJE                         | 4810 | 6000 | 4000 | 4400 |

SIDE HIGH RATING applies for machine with strong moment resisting attachments.  
SIDE LOW RATING applies for machine with weak moment resisting attachments.

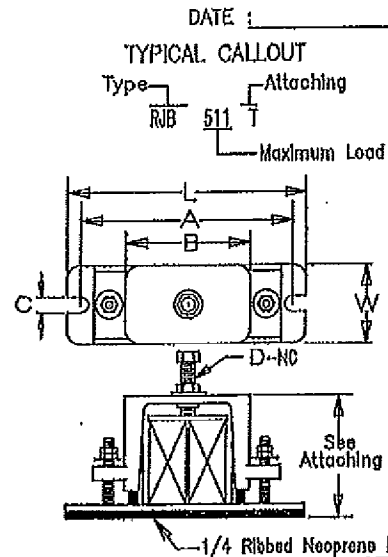
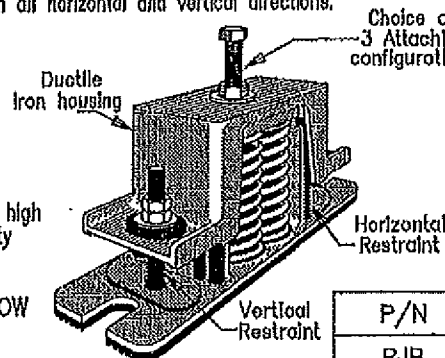
Restraint ratings determined by independent laboratory test.

## EARTHQUAKE RESTRAINTS

Equipment motion is limited in all horizontal and vertical directions.

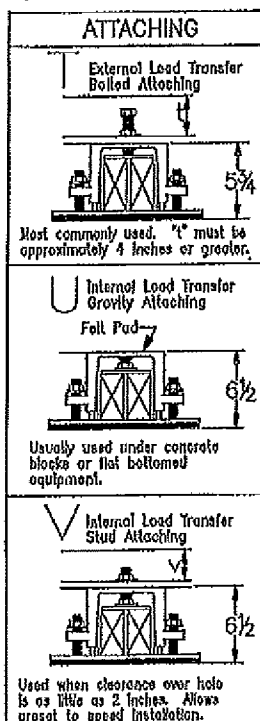
### PROTECTION FOR -

- Earthquakes
- Windloads
- Marine installations (see \*)
- Mobile installations (see \*)
- Equipment weight change due to drainage
- Unstable installations due to high equipment center of gravity



FREE HEIGHT-SEE BELOW  
Typical Operating 5 1/2 to 8  
Height min. 5, max. 6 1/2.

| P/N | A  | B     | C    | D   | L  | W     |
|-----|----|-------|------|-----|----|-------|
| RJB | 8  | 3 3/4 | 9/16 | 1/2 | 9  | 2 3/8 |
| RJC | 12 | 7     | 5/8  | 5/8 | 13 | 2 3/8 |
| RJE | 12 | 7     | 1/16 | 5/8 | 13 | 4 5/8 |



\* Not for use in marine or mobile applications.  
Contact factory for assistance.

| 1 SPRING |                        |                           |                             | 2 SPRINGS |                        |                           | 4 SPRINGS                   |      |                        |                           |                             |
|----------|------------------------|---------------------------|-----------------------------|-----------|------------------------|---------------------------|-----------------------------|------|------------------------|---------------------------|-----------------------------|
| TYPE     | MAXIMUM LOAD<br>(Lbs.) | Max.<br>Defl.<br>(Inches) | Spring<br>Rate<br>(Lbs./in) | TYPE      | MAXIMUM LOAD<br>(Lbs.) | Max.<br>Defl.<br>(Inches) | Spring<br>Rate<br>(Lbs./in) | TYPE | MAXIMUM LOAD<br>(Lbs.) | Max.<br>Defl.<br>(Inches) | Spring<br>Rate<br>(Lbs./in) |
| RJB      | 21                     | 1.13                      | 18                          | RJC       | 42                     | 1.13                      | 36                          | RJE  | 84                     | 1.13                      | 72                          |
| RJB      | 55                     | 1.13                      | 49                          | RJC       | 110                    | 1.13                      | 98                          | RJE  | 220                    | 1.13                      | 196                         |
| RJB      | 79                     | 1.13                      | 70                          | RJC       | 158                    | 1.13                      | 140                         | RJE  | 316                    | 1.13                      | 280                         |
| RJB      | 106                    | 1.13                      | 94                          | RJC       | 212                    | 1.13                      | 188                         | RJE  | 424                    | 1.13                      | 376                         |
| RJB      | 120                    | 2.30                      | 52                          | RJC       | 240                    | 2.30                      | 104                         | RJE  | 480                    | 2.30                      | 208                         |
| RJB      | 155                    | 2.20                      | 70                          | RJC       | 310                    | 2.20                      | 140                         | RJE  | 620                    | 2.20                      | 282                         |
| RJB      | 187                    | 1.13                      | 165                         | RJC       | 374                    | 1.13                      | 330                         | RJE  | 748                    | 1.13                      | 662                         |
| RJB      | 244                    | 1.13                      | 216                         | RJC       | 488                    | 1.13                      | 432                         | RJE  | 976                    | 1.13                      | 864                         |
| RJB      | 318                    | 1.13                      | 281                         | RJC       | 636                    | 1.13                      | 562                         | RJE  | 1272                   | 1.13                      | 1124                        |
| RJB      | 395                    | 1.80                      | 220                         | RJC       | 790                    | 1.80                      | 440                         | RJE  | 1580                   | 1.80                      | 880                         |
| RJB      | 511                    | 1.50                      | 341                         | RJC       | 1022                   | 1.50                      | 682                         | RJE  | 2044                   | 1.50                      | 1364                        |
| RJB      | 715                    | 1.30                      | 550                         | RJC       | 1430                   | 1.30                      | 1100                        | RJE  | 2860                   | 1.30                      | 2200                        |
| *RJB     | 1080                   | 1.00                      | 1080                        | *RJC      | 2120                   | 1.00                      | 1120                        | *RJE | 4240                   | 1.00                      | 4240                        |
| *RJB     | 1520                   | .78                       | 1950                        | *RJC      | 3040                   | .78                       | 3900                        | *RJE | 6080                   | .78                       | 7800                        |
| *RJB     | 1960                   | .78                       | 2515                        | *RJC      | 3920                   | .78                       | 5030                        | *RJE | 7840                   | .78                       | 10060                       |

CASH1004  
J54-542

JA 00004382

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 PH (323) 223 - 3882  
 email: caldyn@earthlink.net

**TYPE RJ**  
**STEEL SPRING**  
**ISOLATOR/RESTRAINT**  
**DUCTILE IRON**

FILE 285

3/22/02

| EARTHQUAKE RESTRAINT RATING |      |      |      |      |                                                                                                                                                               |
|-----------------------------|------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                        | Up   | End  | Side |      |                                                                                                                                                               |
|                             |      |      | Low  | High |                                                                                                                                                               |
| RJB                         | 1600 | 1600 | 1280 | 1600 | SIDE HIGH RATING applies for machine with strong moment resisting attachments.<br>SIDE LOW RATING applies for machine with weak moment resisting attachments. |
| RJC                         | 3368 | 3333 | 1312 | 2840 |                                                                                                                                                               |
| RJE                         | 4810 | 6000 | 4000 | 4400 |                                                                                                                                                               |

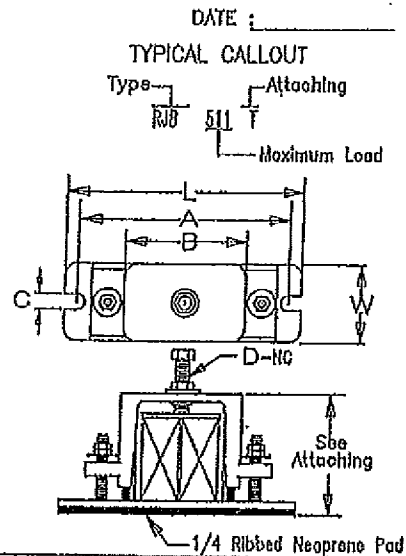
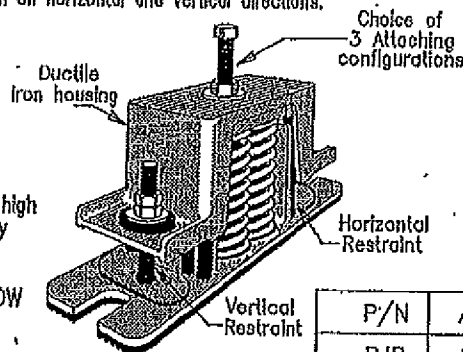
Restraint ratings determined by independent laboratory test.

**EARTHQUAKE RESTRAINTS**

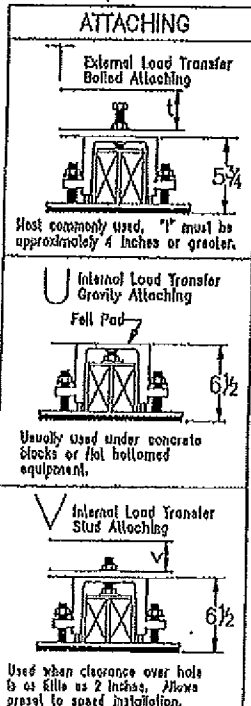
Equipment motion is limited in all horizontal and vertical directions.

**PROTECTION FOR --**

- Earthquakes
- Windloads
- Marine installations (see \*)
- Mobile installations (see \*)
- Equipment weight change due to drainage
- Unstable installations due to high equipment center of gravity



**FREE HEIGHT--SEE BELOW**  
 Typical Operating 5 1/2 to 6  
 Height min. 5, max. 6 1/2.



\* Not for use in marine or mobile applications.  
 Contact factory for assistance.

| P/N | A  | B     | C      | D   | L  | W     |
|-----|----|-------|--------|-----|----|-------|
| RJB | 8  | 3 3/4 | 9/8    | 1/2 | 9  | 2 3/8 |
| RJC | 12 | 7     | 5/8    | 5/8 | 13 | 2 3/8 |
| RJE | 12 | 7     | 1 1/16 | 5/8 | 13 | 4 5/8 |

| 1 SPRING            |      |            |             | 2 SPRINGS           |      |            |             | 4 SPRINGS           |      |            |             |
|---------------------|------|------------|-------------|---------------------|------|------------|-------------|---------------------|------|------------|-------------|
| TYPE                |      | Max. Defl. | Spring Rate | TYPE                |      | Max. Defl. | Spring Rate | TYPE                |      | Max. Defl. | Spring Rate |
| MAXIMUM LOAD (Lbs.) |      | (Inches)   | (Lbs./In)   | MAXIMUM LOAD (Lbs.) |      | (Inches)   | (Lbs./In)   | MAXIMUM LOAD (Lbs.) |      | (Inches)   | (Lbs./In)   |
| RJB                 | 21   | 1.13       | 18          | RJC                 | 42   | 1.13       | 36          | RJE                 | 84   | 1.13       | 72          |
| RJB                 | 55   | 1.13       | 49          | RJC                 | 110  | 1.13       | 98          | RJE                 | 220  | 1.13       | 198         |
| RJB                 | 79   | 1.13       | 70          | RJC                 | 158  | 1.13       | 140         | RJE                 | 316  | 1.13       | 280         |
| RJB                 | 106  | 1.13       | 94          | RJC                 | 212  | 1.13       | 188         | RJE                 | 424  | 1.13       | 376         |
| RJB                 | 120  | 2.30       | 52          | RJC                 | 240  | 2.30       | 104         | RJE                 | 480  | 2.30       | 208         |
| RJB                 | 155  | 2.20       | 70          | RJC                 | 310  | 2.20       | 140         | RJE                 | 620  | 2.20       | 282         |
| RJB                 | 187  | 1.13       | 165         | RJC                 | 374  | 1.13       | 330         | RJE                 | 748  | 1.13       | 662         |
| RJB                 | 244  | 1.13       | 216         | RJC                 | 488  | 1.13       | 432         | RJE                 | 976  | 1.13       | 864         |
| RJB                 | 318  | 1.13       | 281         | RJC                 | 636  | 1.13       | 562         | RJE                 | 1272 | 1.13       | 1124        |
| RJB                 | 395  | 1.80       | 220         | RJC                 | 790  | 1.80       | 440         | RJE                 | 1580 | 1.80       | 880         |
| RJB                 | 511  | 1.50       | 341         | RJC                 | 1022 | 1.50       | 682         | RJE                 | 2044 | 1.50       | 1364        |
| RJB                 | 715  | 1.30       | 550         | RJC                 | 1430 | 1.30       | 1100        | RJE                 | 2860 | 1.30       | 2200        |
| *RJB                | 1060 | 1.00       | 1060        | *RJC                | 2120 | 1.00       | 1120        | *RJE                | 4240 | 1.00       | 4240        |
| *RJB                | 1520 | .78        | 1950        | *RJC                | 3040 | .78        | 3900        | *RJE                | 6080 | .78        | 7800        |
| *RJB                | 1960 | .78        | 2515        | *RJC                | 3920 | .78        | 5030        | *RJE                | 7840 | .78        | 10060       |

CASH1065  
 J54-543

JA 00004383

**LAS VEGAS CITY HALL  
CATERPILLAR GENERATOR SET  
INSTALLATION SUMMARY**

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**SYSTEM DATA**

|                            |              |
|----------------------------|--------------|
| MODEL                      | C32          |
| ENGINE DISPLACEMENT        | 32.10 LITERS |
| GENERATOR RATING           | 1000 kW      |
| VOLTAGE (V)                | 277/480V     |
| PHASE                      | 3            |
| FUEL SYSTEM                | #2 DIESEL    |
| FULL LOAD FUEL CONSUMPTION | 74.3 GAL/HR  |
| BATTERY                    | 24 VOLT      |

**GENERATOR SET DIMENSIONS**

|        |             |
|--------|-------------|
| LENGTH | 223+ INCHES |
| WIDTH  | 96 INCHES   |
| HEIGHT | 183 INCHES  |

**SYSTEM WEIGHTS**

|            |            |
|------------|------------|
| DRY WEIGHT | 32,000 LBS |
|------------|------------|

**LAS VEGAS CITY HALL  
CATERPILLAR GENERATOR SET  
INSTALLATION SUMMARY**

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**POWER REQUIREMENTS**

| <u>EQUIPMENT</u>    | <u>INPUT VOLTAGE</u>     | <u>LOAD</u> |
|---------------------|--------------------------|-------------|
| BATTERY CHARGER     | 120VAC SINGLE PHASE      | 720 WATTS   |
| JACKET WATER HEATER | 240/208 VAC SINGLE PHASE | 9,000 WATTS |

BOTH ARE FED WITH SINGLE 120/208 OR 120/240 SINGLE PHASE CIRCUIT

**CONTROL WIRING – CONTROL VOLTAGE: 24VDC**

| <u>WIRING RUN/ALL STRANDED WIRE</u>                         | <u>NUMBERS OF WIRES</u>                                                                                                                                                                                                         |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATS TO ENGINE CONTROL PANEL (TYPICAL)<br>SUPPLIED BY OTHERS | 3<br>PAIR EACH ATS --<br>STRANDED                                                                                                                                                                                               |
| GENERATOR TERMINAL STRIP TO REMOTE<br>ANNUNCIATOR           | #14 STRANDED (6)<br>WIRING FOR REMOTE<br>ANNUNCIATOR CANNOT<br>EXCEED 800FT<br>SEE DRAWING FOR<br>WIRING TYPE DETAIL<br>SOURCE FOR # J1939 WIRE IS<br>JCH WIRE & CABLE -- JEFF<br>SHELTON 702-639-4120<br>Part # 22-1B-23-00037 |

# LAS VEGAS CITY HALL CATERPILLAR GENERATOR SET INSTALLATION SUMMARY

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## GENERATOR INSTALLATION CONSIDERATIONS

### ACCESS

CASHMAN SERVICE DEPT MUST BE ALLOWED ADEQUATE ACCESS TO THE JOB SITE FOR START UP AND TESTING OF EQUIPMENT DURING NORMAL BUSINESS HOURS.

### CONNECTIONS

DUE TO VIBRATIONS, ALL CONNECTIONS TO THE GENERATOR SET SHOULD BE FLEXIBLE. FUEL AND ELECTRICAL CONNECTIONS MUST BE FLEXIBLE.

### CONTROL WIRING

ALL CONTROL WIRING MUST BE RUN IN SEPARATE CONDUITS FROM ANY POWER WIRING TO PREVENT INDUCED VOLTAGES.

PULL 25% ADDITIONAL WIRE FOR SPARES

REFER TO PREVIOUS SHEET FOR SPECIFIC INFORMATION

### ELECTRICAL AND FUEL STUB UP

ALL STUB UP INFORMATION CAN BE FOUND IN THE *GENERATOR SET INSTALLATION - STUB UP DRAWING* IN SECTION 10.

### FOUNDATION RECOMMENDATIONS

FOUNDATION DEPTH SHOULD BE CALCULATED USING THE WET WEIGHT PROVIDED ON THE PREVIOUS SHEET (REFER TO *GENERATOR SET INSTALLATION* IN SECTION 10).

FOUNDATION SHOULD EXTEND A MINIMUM OF 12 INCHES BEYOND THE GENERATOR SET BASE RAILS

### VIBRATION ISOLATOR PADS

VIBRATION ISOLATORS ARE INSTALLED UNDER THE GENERATOR SET RAILS. GENERATOR NEEDS TO BE BOLTED TO THE FLOOR.

### POWER REQUIREMENTS

COOLANT HEATER AND BATTERY CHARGER REQUIRE NORMAL POWER INPUT. REFER TO PREVIOUS SHEET FOR DETAILS ON VOLTAGES AND LOAD REQUIREMENTS.

### VENTILATION

THE GENERATOR SET SHOULD BE LOCATED SO THAT CLEAN, COOL AIR IS AVAILABLE TO THE AIR INTAKE. RADIATOR EXHAUST AIR SHOULD BE FREE OF FLOW RESTRICTIONS. WE RECOMMEND A MINIMUM OF 4 FT CLEARANCE ON ALL SIDES EXCEPT HOT AIR DISCHARGE (RADIATOR) END REQUIRES A MINIMUM OF 10 FEET.

### UNLOADING CONSIDERATION

WHEN OFF LOADING EQUIPMENT WITH CRANES, SPREADER BARS SHOULD BE USED TO AVOID DAMAGING THE EQUIPMENT. REFER TO THE DRY WEIGHT PROVIDED FOR OFFLOADING.

**LAS VEGAS CITY HALL  
CATERPILLAR GENERATOR SET  
INSTALLATION SUMMARY**

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**SHOULD YOU HAVE ANY QUESTIONS REGARDING THIS SUBMITTAL OR  
INSTALLATION PROCEDURES, PLEASE CONTACT:**

**KEITH LOZEAU  
SALES MANAGER  
CASHMAN EQUIPMENT CO  
3300 ST. ROSE PKWY  
HENDERSON, NV 89052  
PHONE: (702) 639-5018  
FAX: (702) 639-5090**

**KIM SYMONS  
SALES REP  
CASHMAN EQUIPMENT CO  
3300 ST. ROSE PKWY  
HENDERSON, NV 89052  
PHONE: (702) 639-5012  
FAX: (702) 639-5090**

**ROB MAYER  
PROJECT MANAGER  
3300 ST. ROSE PKWY  
HENDERSON, NV 89052  
N LAS VEGAS, NV 89031  
PHONE: (702) 639-5010  
FAX: (702) 639-5090**

## **DIVISION OF RESPONSIBILITIES**

### **CONTRACTOR'S RESPONSIBILITIES**

The following work must be completed by the Contractor prior to startup of the unit per drawings and instructions included in the Engineering Submittal:

#### **COOLING**

Install and pipe cooling system

#### **EXHAUST**

Install and mount exhaust system

#### **FOUNDATION**

Off-load and set equipment on a foundation designed and constructed according to load requirements and soil conditions. Vibration isolators should be adjusted prior to piping/wiring interconnection.

#### **WIRING**

Supply and terminate all interconnecting 24 VDC control wiring. Wire AC power to jacket water heater and battery charger. Wire VAC lines between generator and ATS.

#### **FUEL**

Provide and adequate supply of good quality fuel.

### **CASHMAN EQUIPMENT COMPANY'S RESPONSIBILITIES**

In addition to supply of equipment and delivery to the jobsite, Cashman Equipment Company will provide the following:

#### **ENGINEERING**

Engineering of all equipment provided in Cashman's Scope of Supply including design information and submittal drawings. Project engineering support and coordination, as required. Provide Operation and Maintenance Manuals, spare parts list and test reports, if required.

#### **START UP**

Provide the services of a technician to startup and test the generator set, as required. Startup activities include: check and install engine coolant and lubricating oil as necessary, install battery electrolyte, check that all auxiliary equipment is properly installed, check that all wiring has been terminated by contractor, start unit and check all control functions, check automatic operation and load test, if required.



## ENGINE DIVISION ENGINE DATA SHEET

BDS

70.2

DATE

4-85

SUBJECT: GENERATOR SET PROTOTYPE TESTING

This document serves to certify the prototype testing that Caterpillar performs on its generator sets. The Caterpillar reputation for quality is well founded -- that's by design. Tens of thousands of Caterpillar Generator Sets are in use worldwide. Quality design, manufacture, and testing of performance-matched components makes them dependable power sources.

Caterpillar does extensive testing of its generator sets to ensure quality and long-lasting reliability for power requirements throughout the world. Prototype testing is an integral part of generator set evaluation and is performed on the engine; generator; and finally, the entire generator set. Prototype test data is used as the basis for performance guidelines for production generator sets, as well as the basis for the information in the Technical Information File (TIF) published by Caterpillar. Prototype testing will be outlined in three sections: Engine Prototype Testing, Generator Prototype Testing, and Generator Set Prototype Testing.

### Engine Prototype Testing

Caterpillar's commitment to a reliable quality product starts with the design and development of engine systems in the Caterpillar Technical Center at Mossville, Illinois, U.S.A. The most modern instrumentation and lab testing procedures are employed to evaluate engine and component performance. Instrument labs throughout the Technical Center are used to determine the performance of new engine designs and modifications. New and modified engine designs are tested for performance and durability in thousands of hours of simulated operation in Caterpillar research test cells. The major test work performed on an engine under development in the prototype stages includes but is not limited to:

- Engine Performance
  - Partial Loads
  - Full Load
  - Lug
- Oil Consumption
- Fuel Consumption
- Exhaust Emissions
- Noise Levels
- Stability -- Cold Weather and Hot Weather
- Piston, Ring, and Liner Wear for Life Projections
- Piston Structure Test
- Lube System Evaluation
- Cooling System Performance and Heat Rejection
- Valve Train Overspeed Qualification
- Deep Thermal Cycle Endurance
- Cycle Endurance in the Lab
- Field Endurance

LEKQ6200

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CASH1071  
J54-549  
JA 00004389

There are many more tests which include engine component testing such as:

- Governors
- Injectors
- Bearings
- Turbos
- Valves
- Lifters
- Water Pumps
- Oil Pumps
- Fuel Lines

Engine prototype testing is an integral part of the development of all Caterpillar Engines and is performed before any power generation test is attempted. This test is to assist in quality control of the final product and provide a record of the test results for future reference. Whenever the output requirement of the generator set engine is increased beyond that of the original basic dynamometer test, or when major components are changed, Caterpillar Generator Set Engines are submitted for test to verify performance to Caterpillar standards.

#### Generator Prototype Testing

Generator concept is designed and approved before any manufacture of test generators. Sufficient design data for analysis includes, but is not limited to, layout drawings, computer design sheets, torsional and linear vibration analysis data requirements, and mechanical assembly details. Caterpillar designs structural and electrical generator characteristics to match specific Caterpillar Engine performance. Generator design meets or exceeds the quality standards commensurate with the quality expected of machines operating in prime power applications for similar output range. Generators are designed and tested in such a manner to achieve factory works approval by all recognized marine agencies, including the American Bureau of Shipping, Lloyd's Register of Shipping, Bureau Veritas, and Det norske Veritas. Verification of design and assurance of compliance with design quality standards is performed by a test development program performed on prototype generators manufactured to the concept design approved by Caterpillar. For verification of design and assurance of compliance to Caterpillar standards, the performance test work includes but is not limited to the following tests:

- Standard Production Tests
- Temperature Rise Heat Runs at Both 50 and 60 Hz and at Continuous and Standby Ratings
- Motor Starting at 50 and 60 Hz at 1.0 and 0.8 Power Factor
- Wave Form Harmonic Analysis
- Wave Form Pictures
- Saturation Curves
  - No Load
  - Short Circuit
  - Rated Load
- Direct Axis Synchronous Reactance
- Negative Sequence Reactance
- Zero Sequence Reactance
- Direct Axis Transient Reactance
- Voltage Dip and Rise (Application and Rejection)
- Voltage Wave Form Deviation

- Voltage Unbalance
- Part Load Readings
- Motorized for no Load Losses
- Exciter Open and Short Circuit Saturation Curve
- Efficiency/Loss Test
- Verification of Compliance
  - Overload Capability
  - Short Circuit Capability
  - 150% Overspeed Capability
- EMI Test
- Telephone Influencer Factor and Telephone Harmonic Factor

These tests are to be conducted in accordance with MIL Std-705B and additional test procedures approved by Caterpillar. Applicable standards include MG1-22 NEMA, CSA Std, C22.2-100, C50 (A.N.S.I.), IEC Pub. 34-1, BS 4999, and BS 5000.

#### Generator Set Prototype Testing

Caterpillar performs electrical tests and mechanical tests on prototype generator sets to assure that the engine-generator combination will perform adequately and reliably. Electric AC power generator tests incorporate a group of 15 tests in the procedure to evaluate the engine-generator combination. Although the entire series of tests may not be required in each situation, the proper selection of tests will provide an adequate evaluation. The following 15 tests provide a comprehensive evaluation of Caterpillar AC power generator sets.

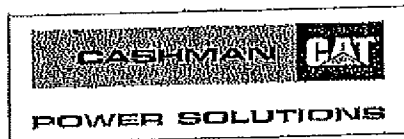
- Waveform Analysis
- Voltage Adjustment
- Voltage Frequency Curve
- Voltage Drift
- Voltage Spike Check
- Voltage Sensing Loss
- Diode Stress
- Short Circuit Tests
- Harmonic Analysis
- Heat Runs
- Motor Starting
- Transient Response
- Excitation Requirements
- Saturation Curves
- Voltage Overshoot During Start

In addition to the rigorous electrical tests performed on Caterpillar Generator Sets, complete system testing and evaluation is performed on prototype generator sets. Prototype generator sets are subjected to extensive testing and endurance runs, including teardown after testing and complete inspection for stress or worn parts for signs of fatigue. Prototype generator sets must pass this stringent testing before production models are released for sale. Complete system testing for generator sets includes but is not limited to:

- Mounting Evaluation
- Wiring Compatibility
- Control Panel Functions
- Linear Vibration

- Torsional Analysis
- Radiator and Cooling Performance
- Fuel Consumption
- Oil Consumption
- Noise Levels
- Governor Response
- Heat Rejection Data
- Full Load Performance Checks
- Safety Shutdowns
  - High Water Temperature
  - Overspeed
  - Low Oil Pressure
  - Overcranking
- Auto Start and Shutdown Capabilities

In conclusion, Caterpillars generator sets undergo extensive prototype testing procedures. However, the Caterpillar commitment to quality does not stop at prototype testing. Production testing is just as important, if not more important, than Caterpillar's extensive prototype testing. Caterpillar sets the industry standard for production generator set testing. All engines are 100% dynamometer tested, all generators are fully loaded with motor drive, and all generator sets are assembled and tested again at partial and full loads with full electrical and mechanical tests to ensure the customer receives a quality product.



### POWER SYSTEM PRESTART CHECKLIST

JOB NAME: \_\_\_\_\_ CONTRACTOR: \_\_\_\_\_  
SITE ADDRESS: \_\_\_\_\_  
DIRECTIONS: \_\_\_\_\_  
CONTACT AT SITE: \_\_\_\_\_

CONTRACTOR IS RESPONSIBLE TO NOTIFY ALL PARTIES PRIOR TO WITNESS TESTING AT SITE AS REQUIRED BY INSPECTOR, OWNER, ENGINEER, ETC.

**CHECKLIST MUST BE COMPLETED PRIOR TO SYSTEM STARTUP BEING SCHEDULED.**

- ☐ Check for shipping damage and items shipped - REPORT ANY DISCREPANCIES IMMEDIATELY. Items not received or damage not reported immediately may be considered a site security issue and not Cashman Equipment's responsibility.
- ☐ Wire per schematics included in submittal and/or shipped with equipment and Electrical Engineer's drawings. DC control wiring must be run in separate conduit from AC wiring.
- ☐ Mount on level concrete pad with anchors, rated for seismic zone 4 (if applicable) and the set weight, as recommended and approved by the Structural Engineer. Install spring vibration isolators between genset skid and concrete pad, if applicable. Ground equipment as recommended by Electrical Engineer.
- ☐ Torque all lug connections as noted on equipment. Verify utility, genset, and load cabling. Verify downstream equipment current ratings per NEC/Electrical Engineer.
- ☐ Verify engine and radiator intake and exhaust systems installed, supported, and connected per Mechanical Engineer's drawings and manufacturer's recommendations regarding airflow and backpressure. Unit requires adequate intake air for radiator airflow plus engine combustion. For indoor installations, engine exhaust systems should be insulated to reduce radiated heat in room.
- ☐ Verify cooling system components assembled per Mechanical Engineer's drawings and manufacturer's recommendations. Unless otherwise noted, Cashman will supply coolant and fill cooling system at startup.
- ☐ Verify fuel system interconnected per Mechanical Engineer's drawings and manufacturer's recommendations. Do not use copper for fuel lines. Flush all lines to remove any debris. Fill fuel tank(s) with #2 diesel fuel.
- ☐ Block heater and battery charger wired with proper voltage feed. Do not energize prior to Cashman pre-startup inspection.
- ☐ Install and anchor engine starting batteries and station batteries, if applicable, per Structural Engineer's and manufacturer's recommendations. Cashman will fill dry batteries supplied by us.

Please fax this completed checklist to (702) 639-5090 five business days prior to required startup date to ensure timely scheduling of a technician. A Cashman representative will visit the site prior to startup to ensure all items are properly addressed and recommendations will be made for any changes needed.

Completed by (print and sign name) \_\_\_\_\_

Date \_\_\_\_\_

Company \_\_\_\_\_

CASH1075  
J54-553

JA 00004393



- Failures resulting from attachments, accessory items and parts not sold or approved by Caterpillar.
- Failures resulting from abuse, neglect and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.

- Failures resulting from unauthorized repair or adjustments, and unauthorized fuel setting changes.
- Damage to parts, fixtures, attachments, and accessory items that are not part of the engine or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).

- Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Caterpillar dealer for more information.

For products operating outside of Australia, Fiji, Niue, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS WHICH IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION (CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS) IS EXCLUDED IN ITS ENTIRETY.

For electric power generation products sold for personal or family use, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Caterpillar dealer or other authorized repair facility, call (800) 447-4986. If you have questions concerning this warranty or its applications, call or write:

In USA and Canada: Caterpillar Inc., Engine Division, P. O. Box 510, Mossville, IL 61552-0510. Attention: Customer Service Manager. Telephone (800) 447-4986. Outside the USA and Canada: Contact your Caterpillar dealer.

For products operating in Australia, Fiji, Niue, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED.

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TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, IF CATERPILLAR IS THE SUPPLIER TO THE USER, CATERPILLAR'S LIABILITY SHALL BE LIMITED AT ITS OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN, AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS. CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION (CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS) IS EXCLUDED IN ITS ENTIRETY.

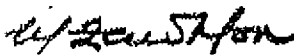
This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Caterpillar dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 140 N. E. Adams St., Peoria, IL USA 61629.

SELF340-01

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, DC 20460

2006 Model Year Certificate of Conformity

Manufacturer: CATERPILLAR INC.  
Engine Family: 6CPXL32.0ESK  
Certificate Number: CPX-NR9-06-02  
Intended Service Class: NR 9 (>560 KW)  
Fuel Type: DIESEL  
FELs: g/kW-hr NMHC+NOx: N/A NOx: N/A PM: N/A  
Effective Date: 12/6/2005  
Date Issued: DEC 07 2005

  
Merrylin Zaw-Mon, Director  
Compliance and Innovative Strategies Division  
Office of Transportation and Air Quality

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 89, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 89 and produced in the stated model year.

This certificate of conformity covers only those new nonroad compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 89 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 89.

This certificate of conformity is conditional upon compliance of said manufacturer with the averaging, banking and trading provisions of 40 CFR Part 89, Subpart C. Failure to comply with these provisions may render this certificate void ab initio.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 89.129-96 and 89.506-96 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 89. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 89.

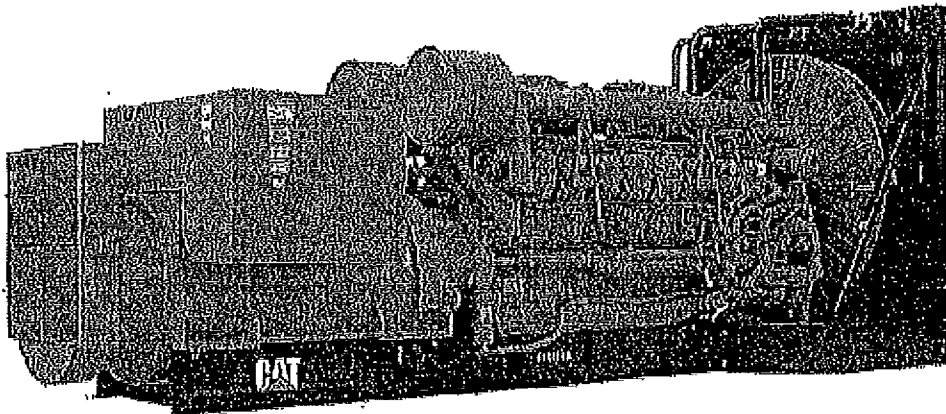
This certificate does not cover nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.



SUBMITTAL

**Las Vegas City Hall**

**CATERPILLAR POWER GENERATION  
SOLUTIONS PACKAGING**



BILL OF MATERIALS  
INSTALLATION SUMMARY  
PRE-START CHECK LIST  
WARRANTY INFORMATION

GENSET SPEC SHEET  
GENSET DATA SHEET  
ALTERNATOR DATA SHEETS

EMCP 3.2 CONTROLLER  
REMOTE ANNUNCIATOR

BATTERIES  
BATTERY CHARGER  
JACKET WATER HEATER

CIRCUIT BREAKER  
VIBRATION ISOLATORS

INSTALLATION DRAWING  
WIRING DIAGRAM

PARRALLEL SWITCH GEAR

AUTOMATIC TRANSFER SWITCH

UPS

## DIESEL GENERATOR SET

# CATERPILLAR®

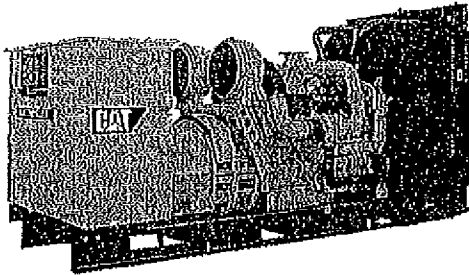


Image shown may not reflect actual package.

## STANDBY

**1000 ekW 1250 kVA  
60 Hz 1800 rpm 480 Volts**

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

## FEATURES

### FUEL/EMISSIONS STRATEGY

- EPA Tier 2

### DESIGN CRITERIA

- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

### UL 2200

- UL 2200 listed packages available. Certain restrictions may apply. Consult with your Caterpillar Dealer.

### FULL RANGE OF ATTACHMENTS

- Wide range of bolt-on system expansion attachments, factory designed and tested
- Flexible packaging options for easy and cost effective installation

### SINGLE-SOURCE SUPPLIER

- Fully prototype tested with certified torsional vibration analysis available

### WORLDWIDE PRODUCT SUPPORT

- Caterpillar® dealers provide extensive post sale support including maintenance and repair agreements
- Caterpillar dealers have over 1,600 dealer branch stores operating in 200 countries
- The Cat® S·O·S<sup>SM</sup> program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

### CAT C32 ATAAC DIESEL ENGINE

- Utilizes ACERT™ Technology
- Reliable, rugged, durable design
- Four-cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

### CAT GENERATOR

- Designed to match the performance and output characteristics of Caterpillar diesel engines
- Single point access to accessory connections
- UL 1446 recognized Class H Insulation

### CAT EMCP 3 SERIES CONTROL PANELS

- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

**CATERPILLAR®**

| System            | Standard                                                                                                                                                                                                                                                                                                              | Optional                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Inlet         | <ul style="list-style-type: none"> <li>• Single element canister type air cleaner</li> <li>• Service Indicator</li> </ul>                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Dual element air cleaners</li> <li>• Air Inlet adapters</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cooling           | <ul style="list-style-type: none"> <li>• Radiator with core (4370) or Low Power (all frontal area) all-way airflow</li> <li>• Coolant drain line with valve</li> <li>• Fan and belt controls</li> <li>• Caterpillar Extended Life Coolant</li> <li>• Coolant level sensors</li> <li>• Radiator duct (long)</li> </ul> | <ul style="list-style-type: none"> <li>• Radiator with 27°C ambient capability</li> <li>• Inlet or water heater</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Exhaust           | <ul style="list-style-type: none"> <li>• Dry exhaust manifold</li> <li>• Flanged faced outlets</li> </ul>                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Stainless steel exhaust flex fittings</li> <li>• Elbows, flanges, expanders &amp; Y adapters</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Filter            | <ul style="list-style-type: none"> <li>• Primary filter/separator with secondary filter</li> <li>• Secondary fuel filter</li> <li>• Fuel priming pump in fuel line (optional)</li> <li>• Fuel cooler</li> </ul>                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Generators        | <ul style="list-style-type: none"> <li>• Class H Insulation</li> <li>• Class F temperature (105°C prime/130°C standby)</li> <li>• Winding temperature detectors (select models)</li> <li>• Anti-condensation space heaters</li> </ul>                                                                                 | <ul style="list-style-type: none"> <li>• Oversize &amp; premium generators</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Power termination | <ul style="list-style-type: none"> <li>• Built-in (NEMA and IEC mechanical) disconnect switch and/or</li> <li>• Bottom cable entry</li> </ul>                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• On-board breakers, UL listed, 3 pole with 100% or 80% or 100% rated on/off coil trip units, manual or electrically operated (low voltage only)</li> <li>• Ground breakers, IEC compliant, 3 pole with 100% or 80% (low voltage only) trip coils or trip units, manual or electrically operated</li> <li>• Shroud cover or bottom cable entry</li> <li>• Power termination can be located on the top and/or sides and bottom. Also multiple voltages or both, 600V or 1000V (60/3)</li> <li>• Top cable entry</li> </ul> |
| Governor          | <ul style="list-style-type: none"> <li>• ADEM™ A4</li> </ul>                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• Load Share Module</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Control Panels    | <ul style="list-style-type: none"> <li>• EMCP 3.1</li> <li>• Alarm indicator panel (UIP) - four module</li> <li>• Emergency Stop Pushbutton</li> </ul>                                                                                                                                                                | <ul style="list-style-type: none"> <li>• EMCP 3.2 and EMCP 3.3</li> <li>• Right or left mount UIP</li> <li>• All 4 remote alarm horn module</li> <li>• Discrete I/O module</li> <li>• Generator temperature monitoring &amp; protection</li> <li>• Load share module</li> </ul>                                                                                                                                                                                                                                                                                  |
| Lube              | <ul style="list-style-type: none"> <li>• Lubricating oil and filter</li> <li>• Oil drain line with valves</li> <li>• Fumes disposal</li> <li>• Gear type lube oil pump</li> </ul>                                                                                                                                     | <ul style="list-style-type: none"> <li>• Deep sump oil pan</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Mounting          | <ul style="list-style-type: none"> <li>• Formed steel webbed base</li> <li>• Anti-vibration mounts (shipped loose)</li> </ul>                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Starting/Charging | <ul style="list-style-type: none"> <li>• 24 volt starting motor(s)</li> <li>• Batteries with rack and cables</li> <li>• Battery disconnect</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Battery chargers (10 Amp)</li> <li>• 45 amp charging alternator</li> <li>• Oversize batteries</li> <li>• Ether starting aid</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |
| General           | <ul style="list-style-type: none"> <li>• Right hand service</li> <li>• Paint: Caterpillar Yellow (except fairs and radiator) (interior gloss black)</li> <li>• SAE standard rotations</li> <li>• 16" wheel and 16" wheel housing (SAE No. 30)</li> </ul>                                                              | <ul style="list-style-type: none"> <li>• UL 2200</li> <li>• CSA certification</li> <li>• EUL Declaration of Incorporation</li> <li>• EEC Declaration of Conformity</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                    |

**STANDBY 1000 ekW 1250 kVA**  
60 Hz 1800 rpm 480 Volts



**SPECIFICATIONS**

**CAT GENERATOR**

SR4B Generator  
Frame size..... 892  
Excitation..... Permanent Magnet  
Pitch..... 0.7143  
Number of poles..... 4  
Number of bearings..... 2  
Number of Loads..... 12  
Insulation..... UL 1446 Recognized Class H with  
tropicalization and antilubrication  
IP rating..... Drip Proof IP22  
Alignment..... Close Coupled  
Overspeed capability - % of rated..... 150  
Wave form..... 0.003.00  
Voltage regulator. 3 Phase sensing with selectable volts/Hz  
Voltage regulation..... Less than +/- 1/2% (steady state)  
Less than +/- 1% (no load to full load)  
Telephone Influence Factor..... Less than 50  
Harmonic distortion..... Less than 6%

**CAT DIESEL ENGINE**

C32 TA, V-12, 4-stroke watercooled diesel  
Bore - mm..... 145.00 mm (5.71 in)  
Stroke - mm..... 162.00 mm (6.38 in)  
Displacement - L..... 32.10 L (1958.86 in<sup>3</sup>)  
Compression ratio..... 15:1  
Aspiration..... TA  
Fuel system..... MEUI  
Governor type..... ADEM™ A4

**CAT EMCP 3 SERIES CONTROLS**

- 12-24 Volt (nominal) DC Control
- Run/Auto/Stop control
- Display Size 24 x 96 mm
- Display Size 33 x 132 (pixels)
- Display available in any of 26 languages with text translation capability
- Temperature operating range -40C to 70C (display to -20C)
- Designed for mounting on generator set package (vibration tested to 4.3G sinusoidal and 15G shock)
- 3-phase, true RMS metering
- Generator metering accuracy (+/- 2%)
- Metering - L-L volts, L-N volts, phase Amps, Hz
- Digital Indications for RPM, operating hours, oil pressure, coolant temperature and system DC voltage
- LED Indicators for warning/shutdown alarms (low oil pressure, high coolant temperature, low coolant, over-speed, etc)
- Reset all events function
- Voltage adjust when CDVR is on J1939 data-link
- Integrates with Adem engine governor for engine monitoring, alarms and control
- Integrates with Caterpillar Digital Regulator (CDVR) for alarms and control
- Compatible with Caterpillar ET service tool for enhanced serviceability including data capturing from event log, data logging, set point programming and troubleshooting
- Field re-flashable software ensures the customers get the latest updated software
- Programmable switch inputs
- Programmable relay outputs (2A continuous DC)

**STANDBY 1000 ekW 1250 kVA**  
60 Hz 1800 rpm 480 Volts



## TECHNICAL DATA

| Open Generator Set - 1800 rpm/60 Hz/480 Volts         | DM7714                    |                |
|-------------------------------------------------------|---------------------------|----------------|
| EPA Certified Tier 2                                  |                           |                |
| Generator Set Rated Performance                       | 1250 ekW                  |                |
| Generator Set Rated Power                             | 1000 kW                   |                |
| Coolant to aftercooler                                | 49 °C                     | 120 °F         |
| Coolant to aftercooler temp max                       |                           |                |
| Fuel (Coriolis flow)                                  | 20.1 L/min                | 5.3 gal/min    |
| 100% load with 100% fuel                              | 21.0 L/min                | 5.6 gal/min    |
| 75% load with 75% fuel                                | 15.8 L/min                | 4.1 gal/min    |
| 50% load with 50% fuel                                | 10.6 L/min                | 2.8 gal/min    |
| Cooling System <sup>1</sup>                           |                           |                |
| Air flow restriction (system)                         | 0.12 kPa                  | 0.48 in. water |
| Air flow (max @ rated speed for radiator arrangement) | 4126 m <sup>3</sup> /min  | 88764 cfm      |
| Engine Coolant capacity with radiator/exp. tank       | 190.0 L                   | 50.2 gal       |
| Engine coolant capacity                               | 55.0 L                    | 14.6 gal       |
| Radiator coolant capacity                             | 135.0 L                   | 35.7 gal       |
| Exhaust System                                        |                           |                |
| Exhaust stack gas temperature                         | 818.3 °C                  | 984.9 °F       |
| Exhaust gas flow rate                                 | 237.6 m <sup>3</sup> /min | 8387.2 cfm     |
| Exhaust flange size (internal diameter)               | 203 mm                    | 8 in           |
| Exhaust system backpressure (maximum allowable)       | 10.6 kPa                  | 40.2 in. water |
| Heat rejection                                        |                           |                |
| Heat rejection to coolant (total)                     | 7.3 kW                    | 2.2 Btu/hr     |
| Heat rejection to exhaust (total)                     | 106 kW                    | 2891 Btu/hr    |
| Heat rejection to aftercooler                         | 20 kW                     | 53 Btu/hr      |
| Heat rejection to atmosphere (total)                  | 1.1 kW                    | 222 Btu/hr     |
| Heat rejection to atmosphere (generator)              | 66.0 kW                   | 178 Btu/hr     |
| Alternator <sup>2</sup>                               |                           |                |
| Motor starting capability @ 30% voltage dip           | 1990 sKVA                 |                |
| Frame                                                 | 692                       |                |
| Temperature Rise                                      | 130 °C                    | 234 °F         |
| Summary                                               |                           |                |
| Summary                                               | 153.0 L/min               | 40.0 gal/min   |
| Emissions (Normal) <sup>3</sup>                       |                           |                |
| NOx g/hp-hr                                           | 4.82 g/hp-hr              |                |
| CO g/hp-hr                                            | .18 g/hp-hr               |                |
| HC g/hp-hr                                            | .01 g/hp-hr               |                |
| PM g/hp-hr                                            | .023 g/hp-hr              |                |

SEE  
IEA  
DATA

<sup>1</sup> For ambient and altitude capabilities consult your Caterpillar dealer. Air flow restriction (system) is added to existing restriction from factory.

<sup>2</sup> UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40°C ambient per NEMA MG1-32.

<sup>3</sup> Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

**GEN SET PACKAGE PERFORMANCE DATA**  
**[SYC00585]**

MARCH 08, 2010

(SYC00585)-ENGINE (G5B00209)-GENERATOR (SXC00821)-  
GENSETFor Help Desk Phone Numbers [Click here](#)

Performance Number: DM7714

Change Level: 02

|                       |                                       |                              |
|-----------------------|---------------------------------------|------------------------------|
| Sales Model: C32 DITA | Combustion: DI                        | Aspr: TA                     |
| Engine Power:         |                                       |                              |
| 1000 W/F 1042 W/O F   | Speed: 1,800 RPM                      | After Cooler: ATAAC          |
| BKW BKW               |                                       |                              |
| 1,502 HP              |                                       |                              |
| Manifold Type: DRY    | Governor Type: ELBC                   | After Cooler Temp(F): 120    |
| Turbo Quantity: 2     | Engine App: GP                        | Turbo Arrangement:           |
| Hertz: 60             | Application Type: PACKAGE-DIE         | Engine Rating: PGS Strategy: |
| Rating Type: STANDBY  | Certification: BPA TIER-2 2006 - ---- |                              |

## General Performance Data 1

| GEN<br>W/F<br>EKW | PERCENT<br>LOAD | ENGINE<br>POWER<br>BHP | ENGINE<br>BMEP<br>PSI | FUEL<br>BSFC<br>LB/BHP-<br>HR | FUEL<br>RATE<br>GPH | INTAKE<br>MFLD<br>TEMP<br>DEG F | INTAKE<br>MFLD P<br>IN-HG | INTAKE<br>AIR<br>FLOW<br>CFM | EXH<br>MFLD<br>TEMP<br>DEG F | EXH<br>STACK<br>TEMP<br>DEG F | EXH<br>GAS<br>FLOW<br>CFM |
|-------------------|-----------------|------------------------|-----------------------|-------------------------------|---------------------|---------------------------------|---------------------------|------------------------------|------------------------------|-------------------------------|---------------------------|
| 1,000             | 100             | 1502                   | 337.36                | 0.35                          | 74.34               | 123.44                          | 69.21                     | 2,998.22                     | 1,288.76                     | 964.94                        | 8,387.24                  |
| 900               | 90              | 1358                   | 305.02                | 0.34                          | 66.44               | 110.66                          | 61.18                     | 2,789.86                     | 1,218.74                     | 923.36                        | 7,560.88                  |
| 800               | 80              | 1215                   | 272.97                | 0.35                          | 60.81               | 105.98                          | 57.6                      | 2,705.11                     | 1,177.16                     | 891.32                        | 7,158.29                  |
| 750               | 75              | 1145                   | 257.01                | 0.35                          | 58.01               | 103.64                          | 55.82                     | 2,662.73                     | 1,156.64                     | 875.84                        | 6,957                     |
| 700               | 70              | 1074                   | 241.2                 | 0.36                          | 54.66               | 100.04                          | 52.24                     | 2,560.32                     | 1,133.6                      | 860.36                        | 6,617.97                  |
| 600               | 60              | 933                    | 209.58                | 0.36                          | 47.37               | 91.22                           | 42.85                     | 2,284.86                     | 1,077.62                     | 829.76                        | 5,784.55                  |
| 500               | 50              | 793                    | 178.11                | 0.35                          | 40.13               | 82.58                           | 33.52                     | 2,012.94                     | 1,011.2                      | 799.34                        | 4,954.65                  |
| 400               | 40              | 658                    | 147.65                | 0.35                          | 33.26               | 75.56                           | 24.88                     | 1,751.61                     | 935.78                       | 759.2                         | 4,163.6                   |
| 300               | 30              | 519                    | 116.61                | 0.36                          | 26.58               | 70.34                           | 17                        | 1,504.41                     | 843.62                       | 698.54                        | 3,397.27                  |
| 250               | 25              | 449                    | 100.8                 | 0.36                          | 23.27               | 68.36                           | 13.33                     | 1,384.34                     | 790.88                       | 661.46                        | 3,019.41                  |
| 200               | 20              | 378                    | 84.85                 | 0.37                          | 20                  | 66.74                           | 9.83                      | 1,264.27                     | 733.46                       | 619.7                         | 2,648.6                   |
| 100               | 10              | 233                    | 52.36                 | 0.41                          | 13.79               | 64.22                           | 5.18                      | 1,126.54                     | 597.2                        | 502.52                        | 2,076.5                   |

## General Performance Data 2

| GEN<br>W/F<br>EKW | PERCENT<br>LOAD | ENGINE<br>POWER<br>BHP | COMPRESS<br>OUT<br>PRESS<br>IN-HG | COMPRESS<br>OUT<br>TEMP<br>DEG F |
|-------------------|-----------------|------------------------|-----------------------------------|----------------------------------|
| 1,000             | 100             | 1502                   | 74.24                             | 416.84                           |
| 900               | 90              | 1358                   | 66.01                             | 379.22                           |
| 800               | 80              | 1215                   | 62.31                             | 363.38                           |
| 750               | 75              | 1145                   | 60.47                             | 355.46                           |
| 700               | 70              | 1074                   | 56.68                             | 340.52                           |
| 600               | 60              | 933                    | 46.76                             | 301.64                           |
| 500               | 50              | 793                    | 36.93                             | 262.94                           |
| 400               | 40              | 658                    | 27.78                             | 225.68                           |
| 300               | 30              | 519                    | 19.46                             | 188.42                           |
| 250               | 25              | 449                    | 15.55                             | 169.7                            |

Performance Data

Page 2 of 8

|     |    |     |       |        |
|-----|----|-----|-------|--------|
| 200 | 20 | 378 | 11.87 | 150.98 |
| 100 | 10 | 233 | 7.11  | 125.06 |

## Engine Heat Rejection Data

| GEN<br>W/F<br>EKW | PERCENT<br>LOAD | REJ TO<br>JW<br>BTU/MN | REJ TO<br>ATMOS<br>BTU/MN | REJ TO<br>EXHAUST<br>BTU/MN | EXH<br>RCOV<br>TO 350F<br>BTU/MN | FROM<br>OIL CLR<br>BTU/MN | FROM<br>AFT CLR<br>BTU/MN | WORK<br>ENERGY<br>BTU/MN | LHV<br>ENERGY<br>BTU/MN | HHV<br>ENERGY<br>BTU/MN |
|-------------------|-----------------|------------------------|---------------------------|-----------------------------|----------------------------------|---------------------------|---------------------------|--------------------------|-------------------------|-------------------------|
| 1,000             | 100             | 21,212.5               | 12,227.0                  | 59,940.9                    | 34,520.0                         | 8,587.3                   | 14,843.0                  | 63,694.3                 | 161,396.7               | 171,917.7               |
| 900               | 90              | 19,222.0               | 10,919.0                  | 52,945.9                    | 29,799.8                         | 7,677.4                   | 12,625.1                  | 57,609.2                 | 143,880.8               | 153,264.3               |
| 800               | 80              | 17,459.1               | 10,464.1                  | 48,908.1                    | 27,070.1                         | 6,995.0                   | 11,772.1                  | 51,524.1                 | 131,540.0               | 140,070.5               |
| 750               | 75              | 16,549.1               | 10,122.8                  | 46,974.5                    | 25,818.9                         | 6,653.8                   | 11,317.1                  | 48,510.0                 | 125,398.1               | 133,530.5               |
| 700               | 70              | 15,639.2               | 10,009.1                  | 44,244.8                    | 24,056.0                         | 6,312.6                   | 10,407.2                  | 45,552.8                 | 118,118.7               | 125,796.2               |
| 600               | 60              | 13,876.2               | 9,497.3                   | 37,818.5                    | 20,075.1                         | 5,459.5                   | 8,132.4                   | 39,581.4                 | 102,252.0               | 108,905.8               |
| 500               | 50              | 12,283.9               | 8,246.1                   | 31,847.1                    | 16,492.3                         | 4,606.5                   | 6,142.0                   | 33,610.1                 | 86,442.2                | 92,129.2                |
| 400               | 40              | 10,862.2               | 7,051.9                   | 26,046.4                    | 12,966.3                         | 3,810.3                   | 4,435.9                   | 27,866.2                 | 71,599.2                | 76,262.5                |
| 300               | 30              | 9,497.3                | 6,085.1                   | 20,302.6                    | 9,383.5                          | 3,071.0                   | 3,014.1                   | 22,008.6                 | 57,154.2                | 60,850.8                |
| 250               | 25              | 8,814.8                | 5,573.2                   | 17,515.9                    | 7,677.4                          | 2,672.9                   | 2,388.5                   | 19,051.4                 | 49,988.6                | 53,287.1                |
| 200               | 20              | 8,189.3                | 5,004.5                   | 14,786.2                    | 6,028.2                          | 2,274.8                   | 1,819.8                   | 16,037.3                 | 42,993.6                | 45,780.2                |
| 100               | 10              | 6,085.1                | 4,322.1                   | 10,122.8                    | 3,014.1                          | 1,592.4                   | 1,137.4                   | 9,895.4                  | 29,629.2                | 31,562.8                |

## EMISSIONS DATA

EPA TIER-2 2006 - ----- \*\*\*\*\* B5  
Gaseous emissions data measurements are consistent with those described in  
EPA 40 CFR PART 89 SUBPART D and ISO 6178 for measuring HC, CO, PM, and NOx

Gaseous emissions values are WEIGHTED CYCLE AVERAGES and are in compliance  
with the following non-road regulations:

| LOCALITY          | AGENCY/LEVEL | MAX LIMITS - g/kW-hr       |
|-------------------|--------------|----------------------------|
| U.S. (incl Calif) | EPA/TIER-2   | CO:3.5 NOx + HC:6.4 PM:0.2 |

|                                                  |                  |
|--------------------------------------------------|------------------|
| REFERENCE EXHAUST STACK DIAMETER                 | ""               |
| WET EXHAUST MASS                                 | 13,789.9 LB/HR   |
| WET EXHAUST FLOW (964.40 F STACK TEMP)           | 8,390.77 CFM     |
| WET EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG) | 2,840.00 STD CFM |
| DRY EXHAUST FLOW RATE (32 DEG F AND 29.98 IN HG) | 2,601.63 STD CFM |
| FUEL FLOW RATE                                   | 74 GAL/HR        |

## RATED SPEED "Not to exceed data"

| GEN<br>PWR<br>BKW | PERCENT<br>LOAD | ENGINE<br>POWER<br>BHP | TOTAL<br>NOX (AS<br>NO2)<br>LB/HR | TOTAL<br>CO<br>LB/HR | TOTAL<br>HC<br>LB/HR | PART<br>MATTER<br>LB/HR | OXYGEN<br>IN<br>EXHAUST<br>PERCENT |
|-------------------|-----------------|------------------------|-----------------------------------|----------------------|----------------------|-------------------------|------------------------------------|
| 1,000             | 100             | 1502                   | 19.3300                           | 1.1800               | .0800                | .1500                   | 9.2000                             |
| 750               | 75              | 1145                   | 11.6600                           | .6400                | .1900                | .1100                   | 10.8000                            |
| 500               | 50              | 793                    | 7.2700                            | 1.2300               | .2200                | .1800                   | 11.7000                            |
| 250               | 25              | 449                    | 4.9500                            | 1.8500               | .1900                | .2400                   | 13.2000                            |
| 100               | 10              | 233                    | 3.1600                            | 2.8000               | .3400                | .2000                   | 15.3000                            |

## RATED SPEED "Nominal Data"

| GEN<br>PWR<br>BKW | PERCENT<br>LOAD | ENGINE<br>POWER<br>BHP | TOTAL<br>NOX (AS<br>NO2)<br>LB/HR | TOTAL<br>CO<br>LB/HR | TOTAL<br>HC<br>LB/HR | TOTAL<br>CO2<br>LB/HR | PART<br>MATTER<br>LB/HR | OXYGEN<br>IN<br>EXHAUST<br>PERCENT |
|-------------------|-----------------|------------------------|-----------------------------------|----------------------|----------------------|-----------------------|-------------------------|------------------------------------|
| 1,000             | 100             | 1502                   | 15.9700                           | .6300                | .0400                | 1,675.8               | .0700                   | 9.2000                             |
| 750               | 75              | 1145                   | 9.6400                            | .3400                | .1000                | 1,299.5               | .0600                   | 10.8000                            |
| 500               | 50              | 793                    | 6.0100                            | .6600                | .1200                | 890.2                 | .0900                   | 11.7000                            |
| 250               | 25              | 449                    | 4.0900                            | .9900                | .1000                | 511.4                 | .1200                   | 13.2000                            |
| 100               | 10              | 233                    | 2.6100                            | 1.5000               | .1800                | 301.2                 | .1000                   | 15.3000                            |

## Altitude Capability Data(Corrected Power Altitude Capability)

| Ambient Operating Temp. | 50 F        | 58 F        | 66 F        | 104 F       | 122 F       | NORMAL     |
|-------------------------|-------------|-------------|-------------|-------------|-------------|------------|
| Altitude                |             |             |             |             |             |            |
| 0 F                     | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 h |
| 984.25 F                | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 h |
| 1,640.42 F              | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,501.94 h |
| 3,280.84 F              | 1,501.94 hp | 1,501.94 hp | 1,501.94 hp | 1,497.92 hp | 1,450.98 hp | 1,501.94 h |
| 4,921.26 F              | 1,501.94 hp | 1,501.94 hp | 1,455.01 hp | 1,409.41 hp | 1,365.16 hp | 1,501.94 h |
| 6,561.68 F              | 1,465.73 hp | 1,414.78 hp | 1,367.84 hp | 1,324.93 hp | 1,283.36 hp | 1,428.19 h |
| 8,202.1 F               | 1,375.89 hp | 1,328.95 hp | 1,286.04 hp | 1,244.47 hp | 1,205.58 hp | 1,357.11 h |
| 9,842.52 F              | 1,292.74 hp | 1,248.49 hp | 1,206.92 hp | 1,168.03 hp | 1,131.82 hp | 1,287.38 h |
| 11,482.94 F             | 1,212.28 hp | 1,170.71 hp | 1,131.82 hp | 1,095.61 hp | 1,062.09 hp | 1,221.67 h |
| 13,123.36 F             | 1,135.84 hp | 1,096.95 hp | 1,060.75 hp | 1,027.22 hp | 995.04 hp   | 1,158.64 h |
| 14,763.78 F             | 1,064.77 hp | 1,027.22 hp | 993.7 hp    | 961.51 hp   | 932.01 hp   | 1,098.3 h  |

The powers listed above and all the Powers displayed are Corrected Powers

## Identification Reference and Notes

|                                         |            |                                        |           |
|-----------------------------------------|------------|----------------------------------------|-----------|
| Engine Arrangement:                     | 2537557    | Lube Oil Press @ Rated Spd(PSI):       | 58.6      |
| Effective Serial No:                    | SYC00001   | Piston Speed @ Rated Eng SPD (FT/Min): | 1,785.4   |
| Primary Engine Test Spec:               | OK6255     | Max Operating Altitude(FT):            | 4,921.3   |
| Performance Parm Ref:                   | TM5739     | PEEC Elect Control Module Ref          |           |
| Performance Data Ref:                   | DM7714     | PEEC Personality Cont Mod Ref          |           |
| Aux Coolant Pump Perf Ref:              |            |                                        |           |
| Cooling System Perf Ref:                |            | Turbocharger Model                     | GTA5518BS |
| Certification Ref:                      | BPA TIER 2 | Fuel Injector                          |           |
| Certification Year:                     | 2006       | Timing-Static (DEG):                   | --        |
| Compression Ratio:                      | 15.0       | Timing-Static Advance (DEG):           | --        |
| Combustion System:                      | DI         | Timing-Static (MM):                    | --        |
| Aftercooler Temperature (F):            | 120        | Unit Injector Timing (MM):             | --        |
| Crankcase Blowby Rate(CFH):             | --         | Torque Rise (percent)                  | --        |
| Fuel Rate (Rated RPM) No Load (Gal/HR): | --         | Peak Torque Speed RPM                  | --        |
| Lube Oil Press @ Low Idle Spd(PSI):     | 37.4       | Peak Torque (LB/FT):                   | --        |

Reference  
Number: DM7714

EPA TIER-2 2006----B5

Parameters  
Reference: TM6739

GEN SET - PACKAGED - DIESEL

TOLERANCES:

AMBIENT AIR CONDITIONS AND FUEL USED WILL AFFECT THESE VALUES.  
EACH OF THE VALUES MAY VARY IN ACCORDANCE WITH THE FOLLOWING  
TOLERANCES.

|                                  |     |     |
|----------------------------------|-----|-----|
| ENGINE POWER                     | +/- | 3%  |
| EXHAUST STACK TEMPERATURE        | +/- | 8%  |
| GENERATOR POWER                  | +/- | 5%  |
| INLET AIR FLOW                   | +/- | 5%  |
| INTAKE MANIFOLD PRESSURE -- GAGE | +/- | 10% |
| EXHAUST FLOW                     | +/- | 6%  |
| SPECIFIC FUEL CONSUMPTION        | +/- | 3%  |
| FUEL RATE                        | +/- | 5%  |
| HEAT REJECTION                   | +/- | 5%  |
| HEAT REJECTION EXHAUST ONLY      | +/- | 10% |

CONDITIONS:

ENGINE PERFORMANCE IS CORRECTED TO INLET AIR STANDARD CONDITIONS  
OF 99 KPA (29.31 IN HG) AND 25 DEG C (77 DEG F).

THESE VALUES CORRESPOND TO THE STANDARD ATMOSPHERIC PRESSURE AND  
TEMPERATURE IN ACCORDANCE WITH SAE J1349. ALSO INCLUDED IS A  
CORRECTION TO STANDARD FUEL GRAVITY OF 35 DEGREES API HAVING A  
LOWER HEATING VALUE OF 42,780 KJ/KG (10,390 BTU/LB) WHEN USED AT  
29 DEG C (84.2 DEG F) WHERE THE DENSITY IS 838.9 G/L (7.002  
LB/GAL).

THE CORRECTED PERFORMANCE VALUES SHOWN FOR CATERPILLAR ENGINES WILL  
APPROXIMATE THE VALUES OBTAINED WHEN THE OBSERVED PERFORMANCE  
DATA IS CORRECTED TO SAE J1349, ISO 3046-2 & 8665 & 2288 & 9249 &  
1585, EEC 60/1269 AND DIN70020 STANDARD REFERENCE CONDITIONS.

ENGINES ARE EQUIPPED WITH STANDARD ACCESSORIES; LUBE OIL, FUEL  
PUMP AND JACKET WATER PUMP. THE POWER REQUIRED TO DRIVE  
AUXILIARIES MUST BE DEDUCTED FROM THE GROSS OUTPUT TO ARRIVE AT THE  
NET POWER AVAILABLE FOR THE EXTERNAL (FLYWHEEL) LOAD. TYPICAL  
AUXILIARIES INCLUDE COOLING FANS, AIR COMPRESSORS, AND CHARGING  
ALTERNATORS.

RATINGS MUST BE REDUCED TO COMPENSATE FOR ALTITUDE AND/OR AMBIENT  
TEMPERATURE CONDITIONS ACCORDING TO THE APPLICABLE DATA SHOWN ON  
THE PERFORMANCE DATA SET.

GEN SET - PACKAGED - DIESEL

ALTITUDE:

ALTITUDE CAPABILITY - THE RECOMMENDED REDUCED POWER VALUES FOR  
SUSTAINED ENGINE OPERATION AT SPECIFIC ALTITUDE LEVELS AND AMBIENT  
TEMPERATURES.

COLUMN "N" DATA - THE FLYWHEEL POWER OUTPUT AT NORMAL AMBIENT  
TEMPERATURE.

AMBIENT TEMPERATURE - TO BE MEASURED AT THE AIR CLEANER AIR INLET  
DURING NORMAL ENGINE OPERATION.

NORMAL TEMPERATURE - THE NORMAL TEMPERATURE AT VARIOUS SPECIFIC  
ALTITUDE LEVELS IS FOUND ON TM2001.

THE GENERATOR POWER CURVE TABULAR DATA REPRESENTS THE NET  
ELECTRICAL POWER OUTPUT OF THE GENERATOR.

GENERATOR SET RATINGS  
EMERGENCY STANDBY POWER (ESP)

OUTPUT AVAILABLE WITH VARYING LOAD FOR THE DURATION OF AN EMERGENCY OUTAGE. AVERAGE POWER OUTPUT IS 70% OF THE ESP RATING. TYPICAL OPERATION IS 50 HOURS PER YEAR, WITH MAXIMUM EXPECTED USAGE OF 200 HOURS PER YEAR.

STANDBY POWER RATING

OUTPUT AVAILABLE WITH VARYING LOAD FOR THE DURATION OF AN EMERGENCY OUTAGE. AVERAGE POWER OUTPUT IS 70% OF THE STANDBY POWER RATING. TYPICAL OPERATION IS 200 HOURS PER YEAR, WITH MAXIMUM EXPECTED USAGE OF 500 HOURS PER YEAR.

PRIME POWER RATING

OUTPUT AVAILABLE WITH VARYING LOAD FOR AN UNLIMITED TIME. AVERAGE POWER OUTPUT IS 70% OF THE PRIME POWER RATING. TYPICAL PEAK DEMAND IS 100% OF PRIME RATED KW WITH 10% OVERLOAD CAPABILITY FOR EMERGENCY USE FOR A MAXIMUM OF 1 HOUR IN 12. OVERLOAD OPERATION CANNOT EXCEED 25 HOURS PER YEAR.

CONTINUOUS POWER RATING

OUTPUT AVAILABLE WITH NON-VARYING LOAD FOR AN UNLIMITED TIME. AVERAGE POWER OUTPUT IS 70-100% OF THE CONTINUOUS POWER RATING. TYPICAL PEAK DEMAND IS 100% OF CONTINUOUS RATED KW FOR 100% OF OPERATING HOURS.

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Caterpillar Confidential: Green  
Content Owner: Shane Gilles  
Web Master(s): PSG Web Based Systems Support  
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## GENERATOR DATA

MARCH 08, 2010

For Help Desk Phone Numbers [Click here](#)

## Selected Model

Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY      Connection: SERIES STAR      Application: BPG      Status: Current

Version: 39158 / 39231 / 38580 / 4017

## Spec Information

| Generator Specification    |            |                    | Generator Efficiency |        |              |
|----------------------------|------------|--------------------|----------------------|--------|--------------|
| Frame: 692                 | Type: SR4B | No. of Bearings: 2 | Per Unit Load        | kW     | Efficiency % |
| Winding Type: RANDOM WOUND |            |                    | 0.25                 | 250.0  | 92.4         |
| Flywheel: 18.0             |            |                    | 0.5                  | 500.0  | 94.8         |
| Connection: SERIES STAR    |            |                    | 0.75                 | 750.0  | 95.0         |
| Housing: 0                 |            |                    | 1.0                  | 1000.0 | 94.7         |
| Phases: 3                  |            |                    |                      |        |              |
| No. of Leads: 12           |            |                    |                      |        |              |
| Poles: 4                   |            |                    |                      |        |              |
| Wires per Lead: 4          |            |                    |                      |        |              |
| Sync Speed: 1800           |            |                    |                      |        |              |
| Generator Pitch: 0.7143    |            |                    |                      |        |              |

| Reactances                             | Per Unit | Ohms   |
|----------------------------------------|----------|--------|
| SUBTRANSIENT - DIRECT AXIS $X'_d$      | 0.1801   | 0.0332 |
| SUBTRANSIENT - QUADRATURE AXIS $X''_q$ | 0.3852   | 0.0710 |
| TRANSIENT - SATURATED $X'_d$           | 0.2669   | 0.0492 |
| SYNCHRONOUS - DIRECT AXIS $X_d$        | 3.8091   | 0.7021 |
| SYNCHRONOUS - QUADRATURE AXIS $X_q$    | 1.8842   | 0.3473 |
| NEGATIVE SEQUENCE $X_2$                | 0.2827   | 0.0521 |
| ZERO SEQUENCE $X_0$                    | 0.0722   | 0.0133 |

| Time Constants                                         | Seconds |
|--------------------------------------------------------|---------|
| OPEN CIRCUIT TRANSIENT - DIRECT AXIS $T'_{d0}$         | 3.6860  |
| SHORT CIRCUIT TRANSIENT - DIRECT AXIS $T'_d$           | 0.2584  |
| OPEN CIRCUIT SUBTRANSIENT - DIRECT AXIS $T''_{d0}$     | 0.0054  |
| SHORT CIRCUIT SUBTRANSIENT - DIRECT AXIS $T''_d$       | 0.0044  |
| OPEN CIRCUIT SUBTRANSIENT - QUADRATURE AXIS $T''_{q0}$ | 0.0096  |
| SHORT CIRCUIT SUBTRANSIENT - QUADRATURE AXIS $T''_q$   | 0.0082  |
| EXCITER TIME CONSTANT $T_e$                            | 0.2225  |
| ARMATURE SHORT CIRCUIT $T_a$                           | 0.0407  |

|                          |                                 |                              |
|--------------------------|---------------------------------|------------------------------|
| Short Circuit Ratio: 0.3 | Stator Resistance = 0.0069 Ohms | Field Resistance = 1.27 Ohms |
|--------------------------|---------------------------------|------------------------------|

| Voltage Regulation                                 |      | Generator Excitation |                       |                        |
|----------------------------------------------------|------|----------------------|-----------------------|------------------------|
| Voltage level adjustment: +/-                      | 5.0% | No Load              | Full Load, (rated) pf |                        |
| Voltage regulation, steady state: +/-              | 0.5% |                      | Series                | Parallel               |
| Voltage regulation with 3% speed change: +/-       | 0.5% | Excitation voltage:  | 5.7 Volts             | 31.73 Volts      Volts |
| Waveform deviation line - line, no load: less than | 3.0% | Excitation current   | 1.5 Amps              | 6.87 Amps      Amps    |
| Telephone influence factor: less than              | 50   |                      |                       |                        |

## Selected Model

Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY Connection: SERIES STAR      Application: EPG      Status: Current

Version: 39458 /39231 /38580 /4077

## Generator Mechanical Information

## Center of Gravity

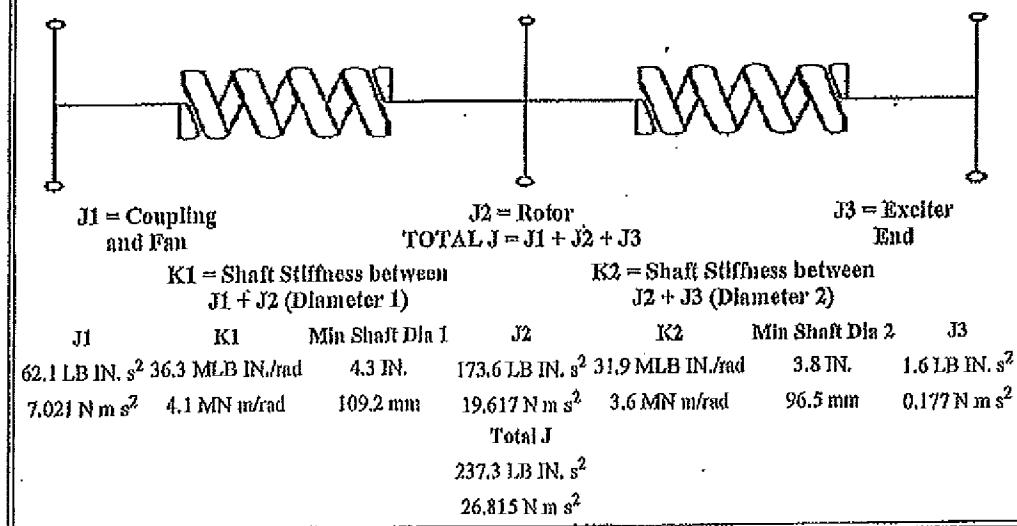
|             |           |           |
|-------------|-----------|-----------|
| Dimension X | -952.5 mm | -37.5 IN. |
| Dimension Y | 0.0 mm    | 0.0 IN.   |
| Dimension Z | 0.0 mm    | 0.0 IN.   |

- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 2898 kg      \* Rotor WT = 946 kg      \* Stator WT = 1953 kg  
 6,389 LB      2,086 LB      4,306 LB

Rotor Balance = 0.0508 mm deflection PTP  
 Overspeed Capacity = 150% of synchronous speed

## Generator Torsional Data



## Selected Model

Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet      Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY      Connection: SERIES STAR      Application: EPG      Status: Current

Version: 39458 /09231 /38580 /4077

**Generator Cooling Requirements -  
Temperature - Insulation Data**

|                                                       |                                          |          |
|-------------------------------------------------------|------------------------------------------|----------|
| <b>Cooling Requirements:</b>                          | <b>Temperature Data: (Ambient 40 °C)</b> |          |
| Heat Dissipated: 56.0 kW                              | Stator Rise:                             | 130.0 °C |
| Air Flow: 223.8 m <sup>3</sup> /min                   | Rotor Rise:                              | 130.0 °C |
| Insulation Class: H                                   |                                          |          |
| Insulation Reg. as shipped: 100.0 MΩ minimum at 40 °C |                                          |          |

**Thermal Limits of Generator**

|                       |            |
|-----------------------|------------|
| Frequency:            | 60 Hz      |
| Line to Line Voltage: | 480 Volts  |
| B BR 80/40            | 944.0 kVA  |
| F BR -105/40          | 1138.0 kVA |
| H BR - 125/40         | 1250.0 kVA |
| F PR - 130/40         | 1250.0 kVA |

## Selected Model

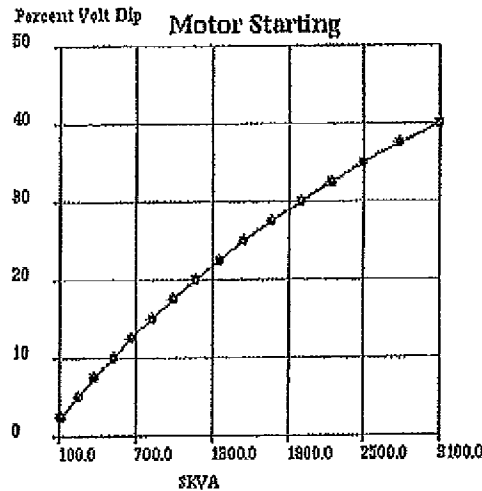
Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY Connection: SERIES STAR      Application: BPG      Status: Current

Version: 39458 /39231 /38580 /4077

## Starting Capability &amp; Current Decrement

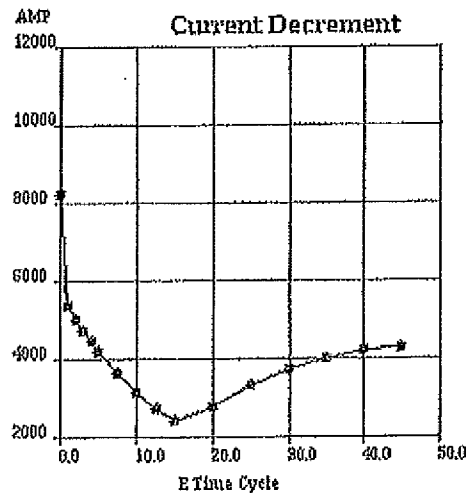
## Motor Starting Capability (0.4 pf)

| SKVA  | Percent Volt Dip |
|-------|------------------|
| 119   | 2.5              |
| 244   | 5.0              |
| 376   | 7.5              |
| 516   | 10.0             |
| 663   | 12.5             |
| 819   | 15.0             |
| 985   | 17.5             |
| 1,161 | 20.0             |
| 1,348 | 22.5             |
| 1,547 | 25.0             |
| 1,761 | 27.5             |
| 1,990 | 30.0             |
| 2,235 | 32.5             |
| 2,500 | 35.0             |
| 2,785 | 37.5             |
| 3,095 | 40.0             |



## Current Decrement Data

| E Time Cycle | AMP   |
|--------------|-------|
| 0.0          | 8,242 |
| 1.0          | 5,866 |
| 2.0          | 5,000 |
| 3.0          | 4,713 |
| 4.0          | 4,444 |
| 5.0          | 4,193 |
| 7.5          | 3,630 |
| 10.0         | 3,152 |
| 12.5         | 2,744 |
| 15.0         | 2,398 |
| 20.0         | 2,777 |
| 25.0         | 3,316 |
| 30.0         | 3,709 |
| 35.0         | 3,991 |
| 40.0         | 4,207 |
| 45.0         | 4,278 |



Instantaneous 3 Phase Fault Current: 8242 Amps      Instantaneous Line - Line Fault Current: 5554 Amps  
 Instantaneous Line - Neutral Fault Current: 8327 Amps

## Selected Model

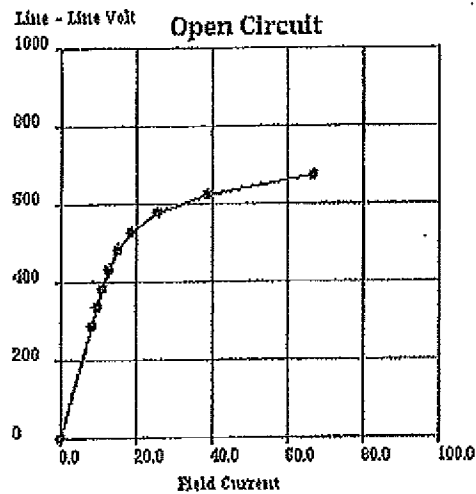
Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY Connection: SERIES STAR      Application: BPG      Status: Current

Version: 39458 / 39231 / 38580 / 4077

## Generator Output Characteristic Curves

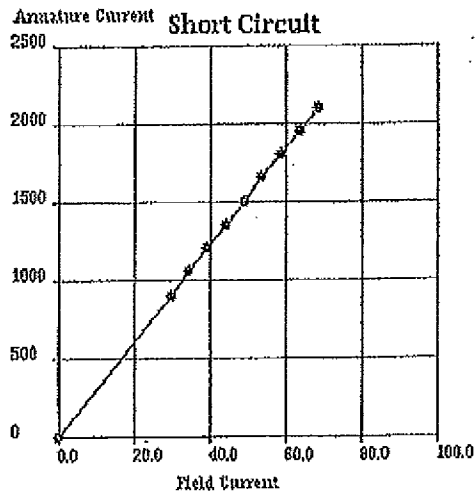
## Open Circuit Curve

| Field Current | Line - Line Volt |
|---------------|------------------|
| 0.0           | 0                |
| 8.1           | 288              |
| 9.5           | 336              |
| 11.0          | 384              |
| 12.8          | 432              |
| 15.1          | 480              |
| 18.8          | 528              |
| 25.3          | 576              |
| 38.5          | 624              |
| 66.9          | 672              |



## Short Circuit Curve

| Field Current | Armature Current |
|---------------|------------------|
| 0.0           | 0                |
| 29.4          | 902              |
| 34.2          | 1,052            |
| 39.1          | 1,203            |
| 44.0          | 1,353            |
| 48.9          | 1,504            |
| 53.8          | 1,654            |
| 58.7          | 1,804            |
| 63.6          | 1,954            |
| 68.5          | 2,105            |



## Selected Model

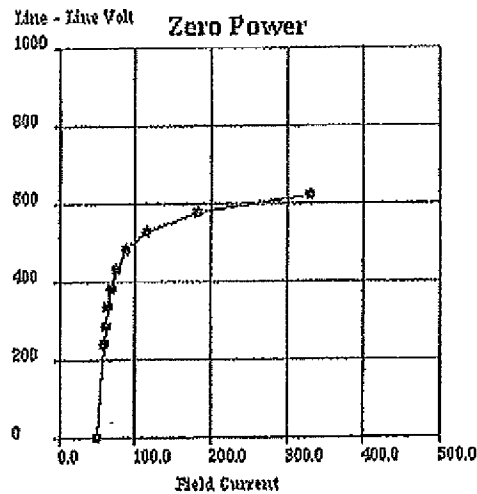
Engine: C32      Generator Frame: 692      Genset Rating (kW): 1000.0      Line Voltage: 480  
 Fuel: Diesel      Generator Arrangement: 2628092      Genset Rating (kVA): 1250.0      Phase Voltage: 277  
 Frequency: 60      Excitation Type: Permanent Magnet Pwr. Factor: 0.8      Rated Current: 1503.5  
 Duty: STANDBY Connection: SERIES STAR      Application: BPG      Status: Current

Version: 39458 / 39231 / 38580 / 4077

## Generator Output Characteristic Curves

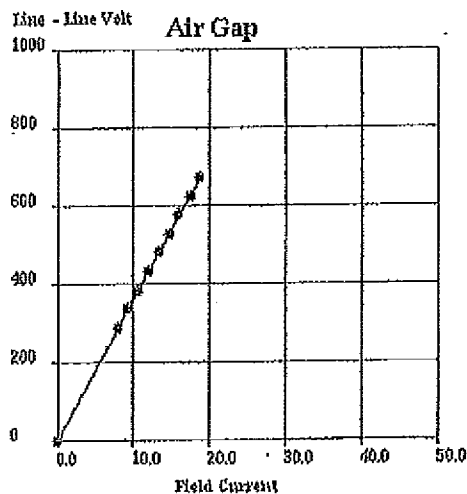
## Zero Power Factor Curve

| Field Current | Line - Line Volt |
|---------------|------------------|
| 48.9          | 0                |
| 59.5          | 240              |
| 61.3          | 288              |
| 63.7          | 336              |
| 67.4          | 384              |
| 74.0          | 432              |
| 87.6          | 480              |
| 116.7         | 528              |
| 181.7         | 576              |
| 328.6         | 624              |



## Air Gap Curve

| Field Current | Line - Line Volt |
|---------------|------------------|
| 0.0           | 0                |
| 8.0           | 288              |
| 9.4           | 336              |
| 10.7          | 384              |
| 12.0          | 432              |
| 13.4          | 480              |
| 14.7          | 528              |
| 16.0          | 576              |
| 17.4          | 624              |
| 18.7          | 672              |



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**Selected Model**

|               |                                   |                             |                       |
|---------------|-----------------------------------|-----------------------------|-----------------------|
| Engine: C32   | Generator Frame: 692              | Genset Rating (kW): 1000.0  | Line Voltage: 480     |
| Fuel: Diesel  | Generator Arrangement: 2628092    | Genset Rating (kVA): 1250.0 | Phase Voltage: 277    |
| Frequency: 60 | Excitation Type: Permanent Magnet | Pwr. Factor: 0.8            | Rated Current: 1503.5 |
| Duty: STANDBY | Connection: SERIES STAR           | Application: EPG            | Status: Current       |

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Version: 39458 /39231 /38560 /4077

**Reactive Capability Curve**[Click to view Chart](#)

## Selected Model

|               |                                                    |                             |                    |
|---------------|----------------------------------------------------|-----------------------------|--------------------|
| Engine: C32   | Generator Frame: 692                               | Genset Rating (kW): 1000.0  | Line Voltage: 480  |
| Fuel: Diesel  | Generator Arrangement: 2628092                     | Genset Rating (kVA): 1250.0 | Phase Voltage: 277 |
| Frequency: 60 | Excitation Type: Permanent Magnet Pwr. Factor: 0.8 | Rated Current: 1503.5       |                    |
| Duty: STANDBY | Connection: SERIES STAR                            | Application: EPG            | Status: Current    |

Version: 39458 /39231 /38580 /4077

## General Information

DM7802  
GENERATOR GENERAL INFORMATION

- I. GENERATOR MOTOR STARTING CAPABILITY CURVES  
 A. THE MOTOR STARTING CURVES ARE REPRESENTATIVE OF THE DATA OBTAINED BY THE FOLLOWING PROCEDURE:
1. THE CATERPILLAR GENERATOR IS DRIVEN BY A SYNCHRONOUS DRIVER.
  2. VARIOUS SIZE THREE PHASE INDUCTION MOTORS (NEMA CODE F) ARE STARTED ACROSS THE LINE LEADS OF THE UNLOADED GENERATOR.
  3. THE RESULTING VOLTAGE DIPS ARE RECORDED WITH AN OSCILLOSCOPE.
  4. MOTOR HORSEPOWER HAS BEEN CONVERTED TO STARTING KILOVOLT AMPERES (SKVA).
  5. RECORDED VOLTAGE DIPS HAVE BEEN EXPRESSED AS A OF GENERATOR RATED VOLTAGE.

- II. USE OF THE MOTOR STARTING CAPABILITY CURVES.  
 A. CALCULATE THE SKVA REQUIRED BY THE MOTOR FOR FULL VOLTAGE STARTING ACROSS THE LINE IF THE VALUE IS NOT LISTED ON THE MOTOR DATA PLATE.

1. MOTORS CONFORMING TO NEMA STANDARDS  
 MULTIPLY THE MOTOR HORSEPOWER BY THE NEMA SKVA/HP FIGURE. FOR NEMA CODE F, USE 5.3 SKVA/HP; FOR NEMA CODE G, USE 6.0 SKVA/HP.

2. ALL OTHER MOTORS:  
 MULTIPLY THE RATED VOLTAGE BY THE LOCKED ROTOR AMPERE AND BY 0.001732. (IF THE LOCKED ROTOR AMPERES ARE NOT LISTED, MULTIPLY THE FULL LOAD (RUNNING) AMPERES BY

- B. USE THE ABOVE SKVA WITH THE MOTOR STARTING TABLE.
1. ACROSS LINE STARTING:  
 READ ACROSS THE ROW OF "ACROSS THE LINE STARTING SKVA IF THE DESIRED VALUE OF SKVA IS NOT GIVEN, CALCULATE THE DIP BY FINDING THE PROPER SKVA INTERVAL AND INTERPOLATING AS FOLLOWS:

SKVA1 IS THE SKVA TABLE ENTRY JUST SMALLER THAN THE DESIRED SKVA, DIP1 IS THE DIP FOR SKVA2, AND SKVA2 IS THE SKVA TABLE ENTRY JUST GREATER THAN THE DESIRED SKVA. THE DIP (IN PERCENT) AT THE DESIRED SKVA IS:

$$DIP = DIP1 + (SKVA - SKVA1) * 2.5 / (SKVA2 - SKVA1)$$

NOTE: VOLTAGE DIPS GREATER THAN 35% MAY CAUSE MAGNETIC CONTACTORS TO DROP OUT.

2. REDUCED VOLTAGE STARTING:  
 REFER TO THE FOLLOWING TABLE. MULTIPLY THE CALCULATE ACROSS LINE SKVA BY THE MULTIPLIER LISTED FOR THE SPECIFIC STARTING METHOD. APPLY THE RESULT TO THE STARTING TABLE AS IN II A, TO CALCULATE THE EXPECTED VOLTAGE DIP:

| TYPE OF REDUCED<br>VOLTAGE STARTING | MULTIPLY<br>LINE SKVA BY |
|-------------------------------------|--------------------------|
| 80% TAP                             | .80                      |
| 65% TAP                             | .65                      |
| 50% TAP                             | .50                      |
| 45% TAP                             | .45                      |
| Wye start, delta run                | .33                      |

| AUTOTRANSFORMER |     |
|-----------------|-----|
| 80% TAP         | .68 |
| 65% TAP         | .46 |
| 50% TAP         | .29 |

NOTE: REDUCE VOLTAGE STARTING LOWERS THE MAXIMUM  
REQUIRED MOTOR SKVA.

### 3. Part winding starting:

Most common is half-winding start, full-winding run.  
Multiply the full motor, across line starting skVA  
by 0.6. Apply the result to the selected curve as  
in ii. A above. Read the expected voltage dip, for  
the required skVA.

### III. DEFINITION:

#### A. GENERATOR TERMS

MODEL: Engine Sales model  
ENG TYPE: DI = Direct Injection,  
NA = Naturally aspirated, etc  
HZ: Running frequency, hertz  
RATING TYPE: PP, SB (prime power or standby)  
KW: Base rating electrical kilowatts (ekW)  
VOLTS: Rating terminal, line to line  
GEN ARR: Cat generator arrangement part number  
GEN FRAME: Generator frame size designation  
CONN: Generator output connection  
(star, wye, delta, ect.)  
POLES: Number of pole pieces on rotor.  
(eg. A 4 pole generator run at 1800)  
RPM will produce 60 Hz alternating current. A 6 pole  
generator run at 1200 RPM will produce 60 Hz alternating  
current.)

#### B. GENERATOR TEMPERATURE RISE:

The indicated temperature rise indicated the NEMA limits  
for standby or prime power applications. These rises are  
used for calculating the losses and efficiencies and are  
not necessarily indicative of the actual temperature rise  
of a given machine.

#### C. CENTER OF GRAVITY

The specified center of gravity is for the generator only.  
For single bearing, and two bearing close coupled generators, the cent  
er of gravity is measured from the generator/engine flywheel housing i  
nterface and from the centerline of the rotor shaft.

For two bearing, standalone generators, the center of gravity is measu  
red from the end of the rotor shaft and from the centerline of the rot  
or shaft.

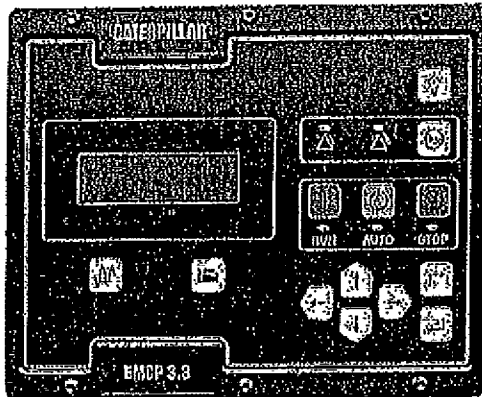
For two bearing, standalone generators, the center of gravity is measu  
red from the end of the rotor shaft and from the centerline of the rot  
or shaft.

#### D. GENERATOR DECREMENT CURRENT CURVES

### E. GENERATOR EFFICIENCY CURVES

The efficiency curve is representative of the overall generator efficiency over the normal range of the electrical load and at the specified parameters. This is not the overall engine generator set efficiency curve.

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## EMCP 3.3 GENERATOR SET CONTROLLER

### GENERAL DESCRIPTION

The Cat® EMCP 3.3 places fully featured power metering, protective relaying and engine and generator control and monitoring at your fingertips. Engine and generator controls, diagnostics, and operating information are accessible via the control panel keypads; diagnostics from the EMCP 3 optional modules can be viewed and reset through the EMCP 3.3. The EMCP 3.3 features a graphical display with a white backlight visible in all types of light as well as an advanced engine monitoring system. These features add to the sense of value and dependability that comes with your purchase of Caterpillar products.

### OPERATOR INTERFACE

- Graphical display with positive image, transreflective LCD, adjustable white backlight/contrast
- Two LED status indicators (1 red, 1 amber)
- Three Engine Control Keys and Status Indicators (Run/Auto/Stop)
- Lamp Test Key
- Alarm Acknowledgement Key
- Display Navigation Keys
- Two Shortcut Keys: Engine Operating Parameters and Generator Operating Parameters

### FEATURES/BENEFITS

- A 64 x 240 pixel, 28 mm x 100 mm, white backlit graphical display denotes text alarm/event descriptions and is visible in all lighting conditions.
- Textual display with multiple language capability, including character languages such as Arabic, Chinese, and Japanese.
- Advanced engine monitoring is available on systems with an electronic engine control module.
- Integration with the CDVR provides enhanced system performance.
- Ability to view and reset diagnostics on EMCP 3 optional modules via the control panel removes the need for a separate service tool for troubleshooting.
- Fully featured power metering, protective relaying, engine and generator parameter viewing, and expanded AC metering are all integrated into this controller.
- Real-time clock allows for date and time stamping of diagnostics and events in the control's logs as well as service maintenance reminders based on engine operating hours or calendar days.
- Customer programmable protective relaying, available as alarm and shutdown, protects against undervoltage, overvoltage, underfrequency, overfrequency, overcurrent, and reverse power.
- Digital, 32-bit microprocessor-based system eliminates the need for multiple switches, meters, transducers, relays, and sensing units, which translates to less wiring and fewer opportunities for mechanical failures.

## EMCP 3.3 GENERATOR SET CONTROLLER

**CATERPILLAR®**

### FEATURES/BENEFITS (CONT'D)

- Expanded remote customer communications are supported by MODBUS RTU (1/2 duplex) protocol using RS-485, which easily interfaces with existing plant systems and equipment.
- Simultaneous viewing of all AC L-L voltages, all AC L-N voltages, or all AC line currents.
- User-friendly, convenient, customer programmability directs the customer to logical parameter groups (Ex. AC metering, protective relaying, engine monitoring) for quick keypad access.
- Set points and software are stored in nonvolatile memory, preventing loss during a power outage.
- Compatibility with both mechanical and electronic engines makes it versatile.
- True RMS sensing ensures AC metering accuracy to within  $\pm 1\%$  of rated AC voltage (L-L and L-N) and current.
- kW and kVA metering to within  $\pm 5\%$  of rating
- Three levels of security allow for configurable operator privileges.
- Single, standard 70-pin connector

### COMMUNICATION

- J1939 (Primary Data Link)
- J1939 #2 (Accessory Data Link)
- MODBUS RTU (1/2 duplex); RS-485 (Customer Communication)

### ENVIRONMENTAL SPECIFICATIONS

- Environmentally sealed front face rated for IP56. Resistant to chemical splash, including: diesel fuel, engine oil and machine oil.
- Protection level IP22 for rear of controller
- Resistant to salt spray
- Vibration: withstands 4.3G @ 24-1000 Hz
- Shock: withstands 15G
- Monitoring Functionality and Controls Operational from  $-40^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $168^{\circ}\text{F}$ )
- Display Operational from  $-20^{\circ}\text{C}$  to  $70^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $158^{\circ}\text{F}$ )
- Storable from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $185^{\circ}\text{F}$ )
- 0 to 95% Humidity, non-condensing from  $30^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  ( $86^{\circ}\text{F}$  to  $140^{\circ}\text{F}$ )

### STANDARDS

- UL Recognized
- CSA C22.2 No.100,14, 94
- Complies with all necessary standards for CE Certification
  - 98/37/EC Machinery Directive
    - BS EN 60204-1 Safety of Machinery
  - 89/336/EEC EMC Directive
    - BS EN 50081-1 Emissions Standard
    - BS EN 50082-2 Immunity Standard
  - 73/23/EEC Low Voltage Directive
    - EN 50178 LVD Standard
- ISO3046, ISO8528
- IEC529, IEC60034-5, IEC61131-3
- MIL STD 461

### STANDARD FEATURES

#### CONTROLS

- Auto/Start/Stop
- Engine Cool-Down Timer
- Emergency Stop
- Engine Cycle Cranking
- Lamp Test
- Generator Voltage
- Engine Speed/Generator Frequency (Electronic Engines Only)

#### DIGITAL (LCD) INDICATION

- Generator AC Voltage - 3 phase (L-L and L-N)
- Generator AC Current (per phase and average)
- Generator Power (kW) (total and per phase)
- Generator kVAR (total and per phase)
- Generator kVAR-hr (total)
- Generator % of rated power (total) (kW, kVA, kVAR)
- Generator kVA (total and per phase)
- Generator kW-hr (total)
- Generator Power Factor (PF) (average and per phase)
- Generator Frequency
- Engine RPM
- Battery Voltage
- Engine Hours
- Engine Successful Start Counter
- Engine Oil Pressure
- Engine Coolant Temperature
- Engine Crank Attempt Counter
- Service Maintenance Interval (Engine Operating Hours or Calendar Days)
- Real Time Clock
- Twenty (20) Event Fault Log

## EMCP 3.3 GENERATOR SET CONTROLLER



### STANDARD FEATURES (CONT'D)

Also available with Electronic Engines\*:

- Air Filter Differential Pressure
- Boost Pressure
- Engine Crankcase Pressure
- Engine Exhaust Temperature (L & R)
- Engine Intake Manifold Temperature
- Engine Oil Temperature
- Fuel Consumption (US/Imperial gal/hr or Liters/hr)
- Fuel Filter Differential Pressure
- Fuel Pressure
- Oil Filter Differential Pressure
- Oil Temperature
- Total Fuel Consumed

#### Notes:

1. Temperature indications are viewable in either °C or °F (operator selectable)
2. Pressure indications are viewable in psi, kPa, or bar
3. Fuel Consumption viewable in US/Imperial gal/hr or Liters/hr

### WARNING/SHUTDOWN INDICATION

- Overcrank
- Low Coolant Temperature Warning
- High Coolant Temperature Warning/Shutdown
- Loss of Coolant Warning/Shutdown
- Low Oil Pressure Warning/Shutdown
- Overspeed
- Control Switch Not In Auto
- High/Low Battery Voltage
- Emergency Stop Activated

Also available with Electronic Engines\*:

- Low Fuel Pressure Warning/Shutdown
- High Fuel Pressure Warning/Shutdown
- Fuel Filter Restriction Warning/Shutdown
- High Intake Manifold Air Temperature Warning/Shutdown
- High Oil Temperature Warning/Shutdown

#### Notes:

- Warning condition activates common alarm output signal and common flashing yellow indicating lamp.
- Shutdown condition activates common alarm output signal and common flashing red indicating lamp.
- Warning/Shutdown conditions result in text message on EMCP 3 display.

\* Engine information obtained from electronic engine controller over J1939 data link when available. Refer to Engine Installation Guide for specific engine application.

### DIGITAL INPUTS (8 TOTAL)

- Emergency Stop
  - Remote Start
  - 6 Programmable
- Digital Inputs can be programmed for various alarm, shutdown, and status conditions including:
- Low Fuel Level
  - High Fuel Level
  - Fuel Leak Detected
  - High Exhaust Temperature
  - Air Damper Closed
  - Circuit Breaker Open/Closed
  - Low Engine Oil Level
  - Low Coolant Level
  - Low Starting Air Pressure
  - Low/High Ambient Air Temperature
  - Spare Fault #1-6

Inputs can be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.

Note: The number of programmable Digital Inputs may vary based on specific package configuration. Refer to Engine Installation Guide for specific engine application.

### PROTECTIVE RELAYING

- Generator Over/Under Voltage
- Generator Over/Under Frequency
- Generator Reverse Power
- Generator Overcurrent

### RELAY OUTPUTS (8 TOTAL)

- Starter Motor
- Fuel Control
- 6 Programmable

Relay outputs can be programmed for various operating conditions including: Air Shut-off, or Pre-lube, Common Alarm, Common Shutdown, Common Warning, Engine Running, Crank Alert, and Idle/Rated.

Relays are rated for 2A @ 30 VDC and consist of 6 Form A (Normally Open) contacts. Two of the programmable outputs are Form C (Normally Open and Normally Closed) contacts.

#### Notes:

1. These are only rated for DC.
2. The number of programmable Relay Outputs may vary based on specific package configuration. Refer to Engine Installation Guide for specific engine application.

# EMCP 3.3 GENERATOR SET CONTROLLER

**CATERPILLAR®**

## STANDARD FEATURES (CONT'D)

### DISCRETE OUTPUTS (2 TOTAL)

- 2 Programmable

Discrete outputs can be programmed for various operating conditions including: Air Shut-off, Pre-lube, Common Alarm, Common Shutdown, Common Warning, Engine Running, Crank Alert, and Idle/Rated.

Discrete outputs can sink up to 300mA and are suitable for driving relay coils or Incandescent lamps.

### SENSOR INPUTS

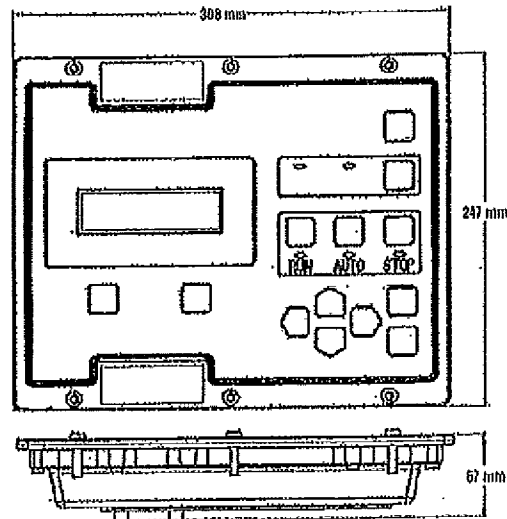
- Engine Speed (Magnetic Pick-up)
- Engine Oil Pressure (0-2 k  $\Omega$  resistive sender, 1 or 2-wire) – MUI Engines only
- Engine Coolant Temperature (0-2 k  $\Omega$  resistive sender, 1 or 2-wire) – MUI Engines only
- Configurable Input (0-2 k  $\Omega$  resistive sender) (for engine oil temperature, etc.)

## AVAILABLE LOCAL DISPLAY LANGUAGES

|             |              |
|-------------|--------------|
| • Arabic    | • Italian    |
| • Chinese   | • Japanese   |
| • Czech     | • Latvian    |
| • Danish    | • Lithuanian |
| • Dutch     | • Norwegian  |
| • Estonian  | • Polish     |
| • Finnish   | • Portuguese |
| • French    | • Russian    |
| • German    | • Spanish    |
| • Greek     | • Slovak     |
| • Hungarian | • Slovene    |
| • Icelandic | • Swedish    |
|             | • Turkish    |

*Note: Displays contain 2 languages  
(English and Local)*

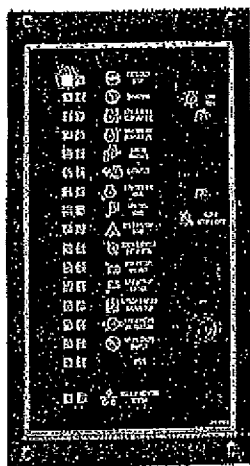
## EMCP 3.3 GENSET CONTROLLER



# EMCP 3.3 GENERATOR SET CONTROLLER

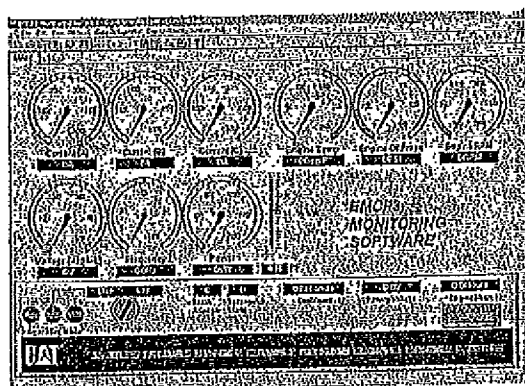
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## OPTIONS



### ANNUNCIATOR

The EMCP 3 Annunciator serves to display Genset system alarm conditions and status indications. The Annunciator has been designed for use on the EMCP 3 Communication Network and may be used in either Local (package mounted) or Remote (up to 800 feet) application. A maximum of three (3) Annunciators may be used with a single EMCP 3.3.

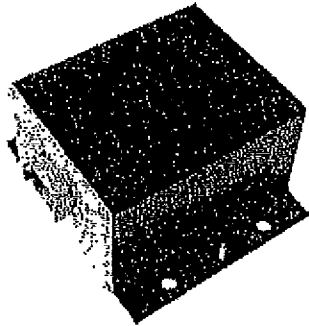


### REMOTE MONITORING SOFTWARE

The EMCP 3 Remote Monitoring Software Package is a PC based program which allows the user to monitor and control a generator set, and is capable of running on a Windows based operating system. The Remote Monitoring software allows the user to configure data monitoring and data acquisition processes for monitoring, graphing, and logging of genset data.

## EMCP 3.3 GENERATOR SET CONTROLLER

**CATERPILLAR**



### DISCRETE INPUT/OUTPUT MODULE

The Discrete Input/Output (DI/O) module serves to provide expandable Input and Output capability of the EMCP 3 and is capable of reading 12 discrete inputs and setting 8 relay outputs. The DI/O Module has been designed for use on the J1939 Communication Network and may be used in either Local (package mounted) or Remote (up to 800 feet) application. A maximum of four (4) DI/O Modules may be used with a single EMCP 3.3.

### RTD MODULE

The RTD module serves to provide expandable engine and generator temperature monitoring capability of the EMCP 3 and is capable of reading up to eight (8) type 2-wire, 3-wire and 4-wire RTD inputs. The RTD Module has been designed for use on the EMCP 3 Communication Network and may be used in either Local (package mounted) or Remote (up to 800 feet) application. A maximum of one (1) RTD Module may be used with a single EMCP 3.3.

### THERMOCOUPLE MODULE

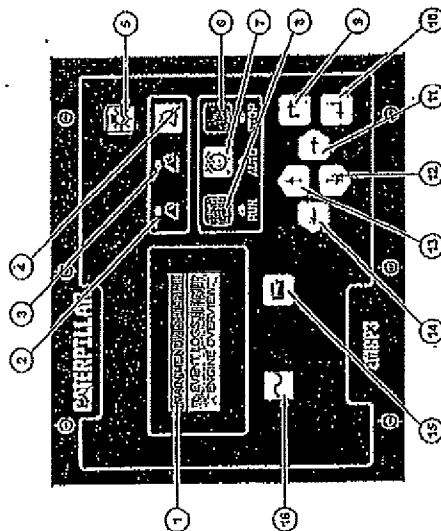
The Thermocouple module serves to provide expandable engine and generator temperature monitoring capability of the EMCP 3 and is capable of reading up to twenty (20) Type J or K Thermocouple inputs. The Thermocouple Module has been designed for use on the EMCP 3 Communication Network and may be used in either Local (package mounted) or Remote (up to 800 feet) application. A maximum of two (2) Thermocouple Modules may be used with a single EMCP 3.3.

### EMCP 3 Control Panel Fault Reset

The Caterpillar generator you have purchased has inherent features that protect the unit from a multiple of conditions and faults. These faults are annunciated (reported) via the control panel as alarms and shutdowns. When a fault occurs your control panel protects the generator from damage by latching the fault (shuts unit down) and will not allow generator to start, all active faults must be cleared and control panel placed back in Auto before the generator will run in a time of power outage. Knowing what alarm or shutdown has taken place will determine what course of action needs to take place. If a fault occurs that requires Cashman Power assistance, your knowing the fault will aid Cashman Power in diagnosing the problem.

These instructions list two ways of resetting these faults; the first lets you see the fault. Please take note of this fault as if there is an actual repair situation Cashman Power will need this fault code to be able to help you troubleshoot your generator. The second method clears all faults without identifying the fault this only needs to be done when you know what caused the fault.

Please find Cashman Power Service Department phone numbers at the bottom of this sheet, never hesitate to call and allow us to help you in your decision making in reference to an fault event.



- Revision 7  
EMCP 3 Control System Panel
- (1) Stop key
  - (2) Run key
  - (3) Alarm Acknowledge/Shutdown key
  - (4) Alarm Acknowledge/Shutdown key
  - (5) Stop key
  - (6) Stop key
  - (7) Stop key
  - (8) Stop key
  - (9) Stop key
  - (10) Stop key
  - (11) Stop key
  - (12) Stop key
  - (13) Stop key
  - (14) Stop key
  - (15) Stop key

### Event Resetting- Checking Active Code

A flashing Red Shutdown Lamp (3) indicates that there is an unacknowledged shutdown event. The lamp will change from flashing red to solid red when the Alarm Acknowledge key (4) is pressed.

Only Shutdown events can be reset. These events are described as "Active". Use the following procedure in order to reset these active shutdown events.

1. Press the STOP key (5).
2. Note: The control must be in "STOP" in order to reset active shutdown events.
3. Using the Scroll Down key (12), navigate from the MAIN MENU to the EVENT LOGS menu and press the Enter key (10). An ACTIVE EVENTS menu is displayed listing the ECMs. The total number of active events for an ECM is listed to the right of the ECM.
4. Using the Scroll Down key, highlight an ECM with active events, and then press the Enter key in order to display the active events for the selected ECM.

Note: Events are sorted from top to bottom such that highest priority events will be at the top of the event log.

The event states, priority level, and event types that can be associated with a specific event state are listed in Table 2.

| Event State | Priority Level | Event Type         |
|-------------|----------------|--------------------|
| Present (1) | Highest        | Warnings Shutdowns |
| Active      | Medium         | Shutdowns          |
| Inactive    | Lowest         | Warnings Shutdowns |

(1) Does not apply to optional modules

4. Scroll through the events in order to highlight an active event.
5. Ensure that the condition which caused the event is no longer present and then press the Enter key. If the condition that caused the event is no longer present, and the control is in "STOP", then either RESET or RESET ALL will be highlighted.
6. Press the Enter key again. The fault will clear. If there are no other active shutdown events, then the Red Shutdown Lamp will be turned off.
7. Repeat steps 3 through 6 until there are no active shutdown events remaining. When all active shutdown events have been reset, then the Red Shutdown Lamp will be turned off.
8. Press the Escape key (9) three times in order to return to the MAIN MENU screen.

### Event Resetting- Reset All at One Time

1. Press the STOP key (5).
2. Hold down the alarm acknowledge key (4) for a few seconds. It will give you the option to clear all the faults at once.

3. Press the enter button to clear all faults and escape to exit reset menu.
- Note: The EMCP3 panel be return to auto mode when done for generator to run in time of emergency.

CASHMAN POWER SOLUTIONS  
Las Vegas EPG Service  
702-683-4625  
Reno EPG Service  
775-332-2449

# ANNUNCIATOR

CATERPILLAR®

## EMCP 3 ANNUNCIATOR

The EMCP 3 Annunciator serves to display generator set system alarm conditions and status indications. The Annunciator has been designed for use on the EMCP 3 J1939 Communication Network and may be used in either local or remote applications, providing customers with enhanced site flexibility.

In local applications, the Annunciator may be mounted on the package generator set with the EMCP 3 Controller to provide a complete package-mounted monitoring solution.

The Annunciator may also be mounted separate from the generator set to provide remote indication of system operating and alarm conditions.

The EMCP 3 Annunciator is configurable to the standards of NFPA 99/110 for emergency standby generator systems.



### FEATURES

- The EMCP 3 Annunciator provides sixteen (16) individual points of annunciation, with two (2) LED's included for each point.
- An additional pair of LED's provides status indication of the J1939 data link connection.
- Includes alarm horn with lamp test and alarm acknowledge pushbuttons.
- Configurable using standard Caterpillar® Service Tool
- Configurable to NFPA 99/110 requirements for local and remote annunciation on emergency standby generator systems.
- Provides custom label kit including software for customer's specific alarms and arrangement
- Designed and tested to meet stringent impulse shock and operating vibration requirements
- Uses high quality shielded twisted-pair cable for robust remote communications
- Graphic symbols are provided next to each pair to indicate various alarms and events
- The Annunciator can be mounted either locally, on the package generator set, or remotely (up to 800 feet)
- Provides superior visibility of the LED's in direct sunlight

### SPECIFICATIONS

#### Technical Data

##### Electrical

Battery Voltage Functional Range: 9 to 32 VDC

##### Power Consumption

Maximum: ~12 watt at 24 VDC

Standby: ~5 watt at 24 VDC

Control Power: 12-24 VDC

Communication: J1939 (Accessory Data Link)

Single, 6-pin Connector

##### Alarm

Sound Level 80 db

#### PHYSICAL

Weight 4 lb or ~ 1.8 kg

#### ENVIRONMENTAL

Operating Temperature -40° C to 70° C

-40° F to 158° F

Storage Temperature -50° C to 70° C

-58° F to 158° F

Relative Humidity 90%

#### CERTIFICATIONS

UL Recognized



# EMCP 3 ANNUNCIATOR



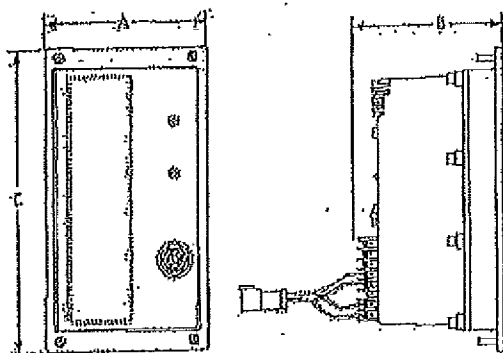
## LED COLOR SCHEME

Each pair of LED's on the Annunciator consists of two of three colors: green, yellow and red, which allows for custom configuration of status, warning and shutdown conditions.  
The available colors and combinations are:

| Row | LED 1 | LED 2  |
|-----|-------|--------|
| 1   | Red   | Yellow |
| 2   | Red   | Yellow |
| 3   | Red   | Yellow |
| 4   | Red   | Yellow |
| 5   | Red   | Yellow |
| 6   | Red   | Yellow |
| 7   | Red   | Yellow |
| 8   | Red   | Yellow |
| 9   | Red   | Yellow |
| 10  | Red   | Yellow |
| 11  | Red   | Yellow |
| 12  | Red   | Yellow |
| 13  | Green | Yellow |
| 14  | Green | Yellow |
| 15  | Red   | Green  |
| 16  | Red   | Green  |

## STANDARD LED CONFIGURATION

- Emergency stop shutdown
- Overcrank shutdown
- Low coolant temperature warning
- High coolant temperature warning/shutdown
- Low oil pressure warning/shutdown
- Overspeed warning/shutdown
- Low coolant level warning/shutdown
- Low fuel level warning/shutdown
- EPS supplying load status
- Control switch not in auto warning
- High battery voltage warning/shutdown
- Low battery voltage warning/shutdown
- BATT charger AC failure warning/shutdown
- Low starting air pressure warning/shutdown
- Air shutdown damper status
- Spare



| Annunciator Dimensions |        |          |
|------------------------|--------|----------|
| A                      | 150 mm | 5.91 in  |
| B                      | 139 mm | 5.47 in  |
| C                      | 268 mm | 10.55 in |

Information contained in this publication may be considered confidential.  
Discretion is recommended when distributing.

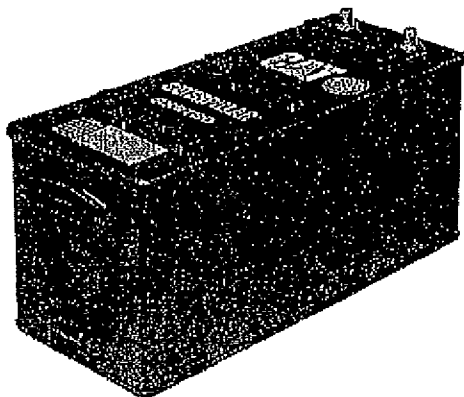
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1EHE4753-01 (09-05)

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CASH1111  
J54-589  
JA 00004429



## PREMIUM HIGH OUTPUT BATTERIES

Cat Premium High Output Batteries are designed to survive the toughest abuse and built to perform in the harshest environments. They offer reliable starting power and long life in all climates. Their high cold cranking amps and reserve capacities have earned them the maximum performance rating in the battery industry.

### FEATURES

- Rugged plates, connectors and element anchoring resist the industry's most abusive vibration tests
- Through-partition connectors shorten the electrical path and maximize starting power
- Extra-heavy grids increase life and power in extreme cold and heat
- Extra corrosion resistance and built-in overcharge protection reduce maintenance
- Durable plates with optimum acid/paste combination provide excellent charge acceptance after deep discharge
- Microporous polyethylene separator protects against "shorts" and vibration damage
- 40-degree tilt capacity eliminates damaging spills
- Impact-resistant cases provide extra strength, especially in sub-zero temperatures
- Flame arrestor safety vents reduce the possibility of explosion from external sparks

### PREMIUM HIGH OUTPUT PERFORMANCE

| BBI Group Size | Part No. | Volts | Cold Cranking Amps <sup>1</sup> | Reserve Capacity Minutes <sup>2</sup> | Amp Hr. Capacity @ 25 hrs. | Construction | Add Water Maintenance Check/Ms. | Max. Overall Dimensions |               |                | Normal Weight |             | Nominal Acid to Fill liter (qt) |
|----------------|----------|-------|---------------------------------|---------------------------------------|----------------------------|--------------|---------------------------------|-------------------------|---------------|----------------|---------------|-------------|---------------------------------|
|                |          |       |                                 |                                       |                            |              |                                 | Length mm (in)          | Width mm (in) | Height mm (in) | Wet kg (lb)   | Dry kg (lb) |                                 |
| 34D            | 9X-9730  | 12    | 1300                            | 400                                   | 190                        | LAC/P        | 1000                            | 628 (20.8)              | 278 (8.8)     | 250 (8.0)      | 54 (11.9)     | 37 (8.2)    | 14 (14.8)                       |
| 4D             | 9X-9720  | 12    | 1000                            | 275                                   | 140                        | LAC/P        | 1000                            | 628 (20.8)              | 278 (8.8)     | 250 (8.0)      | 40 (10.1)     | 27 (6.0)    | 15 (15.9)                       |

<sup>1</sup> For 30 seconds at -18° C (0° F)

<sup>2</sup> Minimum of 25 amp output at 27° C (80° F)

LA = Low Antimony design  
LAC = Low Antimony Calcium design  
P = Polypropylene case  
R = Hard Rubber case

Batteries have taper post design and are shipped dry.

### PGS MODELS

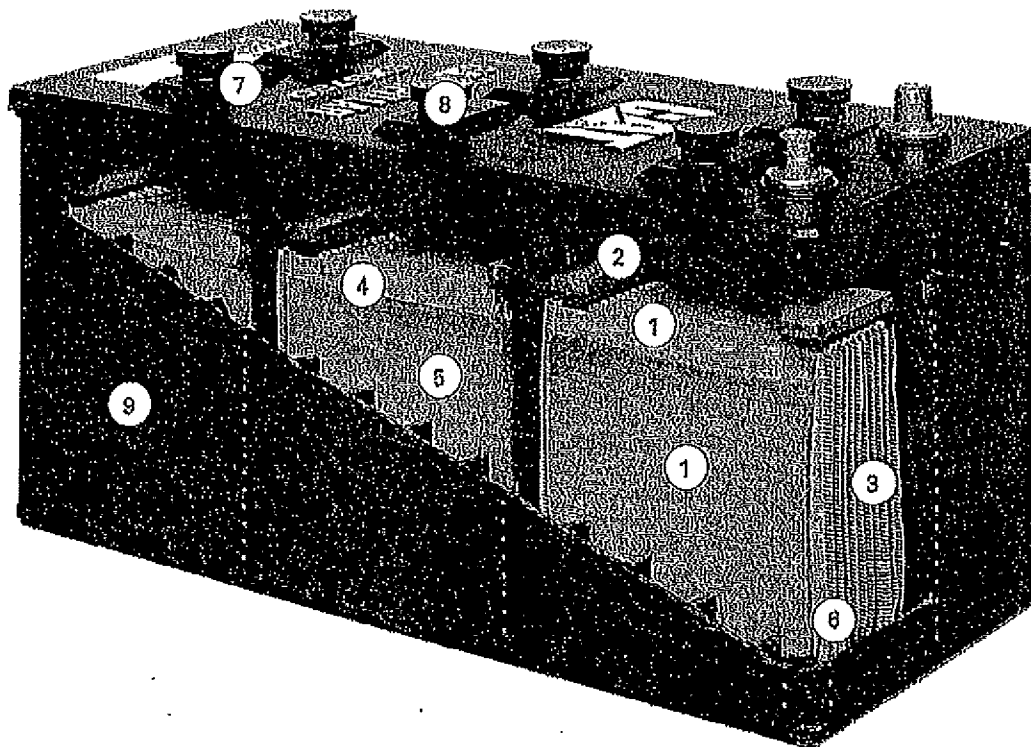
| Diesel                        | PGS 300-500F    | PGS 900S-1800<br>PGS 426SL-600SL | PGS 1750-2250   |
|-------------------------------|-----------------|----------------------------------|-----------------|
| Gas                           | PGS 150-450     |                                  |                 |
| Standard Batteries            | 9X-9720 (qty 2) | 9X-9730 (qty 2)                  | 9X-9720 (qty 4) |
| Optional "Oversize Batteries" | 9X-9730 (qty 2) | 9X-9730 (qty 4)                  | 9X-9730 (qty 4) |



WHERE THE WORLD TURNS FOR POWER

# ATTACHMENTS

**CATERPILLAR**



- ① Rugged plates, connectors, and element anchoring resist vibration.
- ② Through-partition connectors shorten the electrical path and maximize starting power.
- ③ Extra-heavy grids increase life and power in extreme cold and heat.
- ④ Extra corrosion resistance and built-in overcharge protection reduce maintenance.
- ⑤ Durable plates with optimum acid/paste combination provide excellent charge acceptance after deep discharge.

- ⑥ Microporous polyethylene separators protect against "shorts" and vibration damage.
- ⑦ 40-degree tilt capacity eliminates damaging spills.
- ⑧ Impact-resistant cases provide extra strength, especially in sub-zero temperatures.
- ⑨ Flame arrestor safety vents reduce the possibility of explosion from external sparks.



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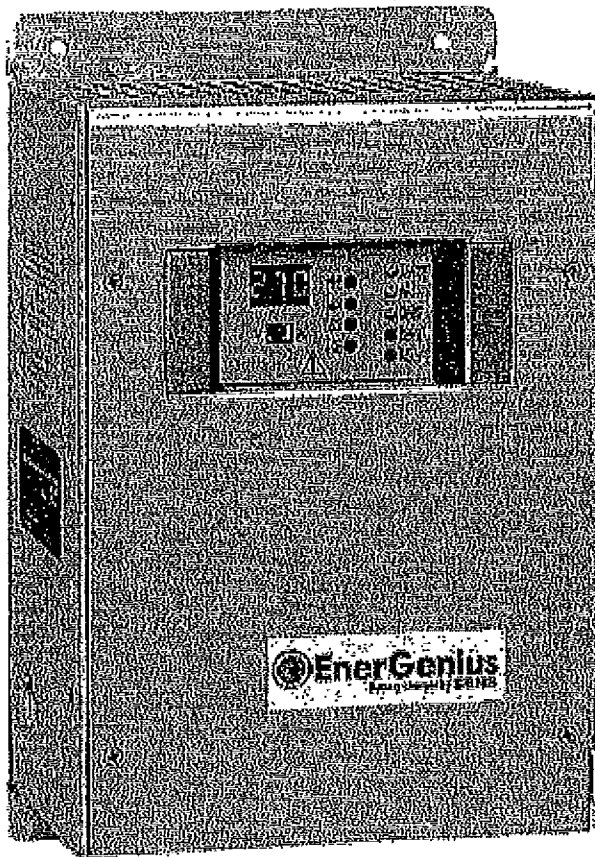
LEHX7069-03 (6-01)

Materials and specifications are subject to change without notice.  
The International System of Units (SI) is used in this publication.

CASH1113  
J54-591  
JA 00004431

# NRG

## Intelligent Engine Start Battery Charger



### The Smart Choice for Mission-Critical Engine Starting

- Fast, accurate, mission-critical charging – gives best starting reliability
- Replace nearly any charger – without planning ahead
- Industry-first battery-fault alarm – helps dispatch service early
- 1 million hour observed MTBF – means longest charger life
- Smart design – stops load dump and other damaging transients



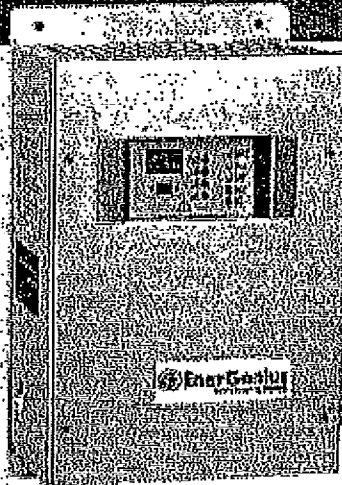
# SENS<sup>®</sup>

*Our energy means business<sup>®</sup>*

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CASH1114  
J54-592  
JA 00004432

# NRG Battery Charger Benefits and Features



Failure to start due to battery problems is the leading cause of inoperable engine generator sets.

SENS NRG battery charger maximizes starting system reliability while slashing genset servicing costs.

One NRG replaces almost any charger without extra site visits. Installers can select or change at any time 120, 208 or 240 volts AC input, 12 or 24-volt battery and output settings optimized for nearly any lead-acid or nickel cadmium battery.

Easy to understand user interface provides state-of-the-art system status — including digital metering, NFPA 110 alarms and a battery fault alarm that can send service personnel to the site before failure to start.

Batteries charged by NRG give higher performance and last longer. In uncontrolled environments precision charging by SENS increases battery life and watering intervals 400% or more.

NRG meets all relevant industry standards — including UL, NFPA 110 and CE. All units are either C-UL listed or C-UL recognized. 50/60 Hz units add CE marking to UL agency marks.

**EnerGenius** reliability technology built into every charger includes:

- All-electronic operation with generous component de-rating
- Disconnected/reversed/incorrect voltage battery alarm and protection
- Protection of connected equipment against load dump transients
- Widest temperature rating, and overtemperature protection
- Superior lightning and voltage transient protection
- Demonstrated field MTBF > 1 million hours
- Standard 3-year warranty and available reimbursement of customer field service costs

Earn the best return on your charger investment — choose **SENS NRG**

# NRG Specifications

## AC Input

Voltage  
Input current

110-120/200-240 VAC,  $\pm 10\%$ , single phase, switch selectable

10A charger: 6.6/3.3 amps maximum

20A charger: 12.6/6.3 amps maximum

Frequency

60 Hz  $\pm 5\%$  standard; 50/60 Hz  $\pm 5\%$  optional

Input protection

1-pole fuse, soft-start, transient suppression

## Charger Output

Nominal voltage ratings

12 or 24 volt nominal

Optional voltage rating

12/24 volt, field selectable

Battery settings

Six discrete battery voltage programs

- Low or high S.G. flooded

- Low or high S.G. VRLA

- Nickel cadmium 9, 10, 18, 19 or 20 cells

Regulation

$\pm 0.5\%$  (1/2%) line and load regulation

Current

10 or 20 amps nominal

Electronic current limit

105% rated output typical - no crank disconnect required

Charge characteristic

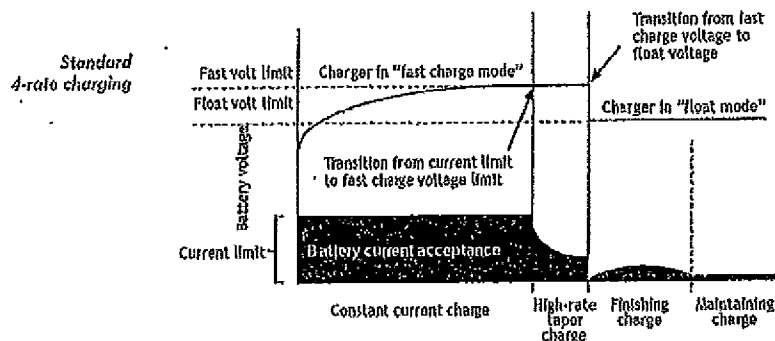
Constant voltage, current limited, 4-rate automatic equalization

Temperature compensation

Enable or disable anytime, remote sensor optional

Output protection

Current limit, 1-pole fuse, transient suppression



## User Interface, Indication and Alarms

Digital meter

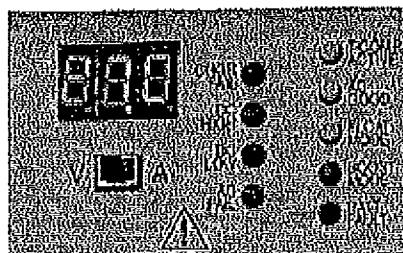
Switch-selectable meter for output volts, amps

Accuracy

$\pm 2\%$  volts,  $\pm 5\%$  amps

Alarms

LED and Form C contact(s) per table:



Front panel  
status display

## Alarm System Functions

|                            | Alarm code "I" <sup>1</sup> | Alarm code "C" <sup>2</sup><br><small>(contact requirements of NFPA 710)</small> |
|----------------------------|-----------------------------|----------------------------------------------------------------------------------|
| AC good                    | LED                         | LED                                                                              |
| Float mode                 | LED                         | LED                                                                              |
| Fast charge                | LED                         | LED                                                                              |
| Temp comp active           | LED                         | LED                                                                              |
| AC fail                    | LED <sup>2</sup>            | LED and Form C contact                                                           |
| Low battery volts          |                             | LED and Form C contact                                                           |
| High battery volts         |                             | LED and Form C contact                                                           |
| Charger fail               | LED <sup>2</sup>            | LED and Form C contact                                                           |
| Battery fault <sup>3</sup> | LED <sup>2</sup>            | LED and Form C contact                                                           |

1. Alarms "I" available only on 10A charger

2. Form C contact provides summary alarm of these conditions. BBH chargers include this alarm configuration. Contacts rated 2A @ 26 VDC resistive

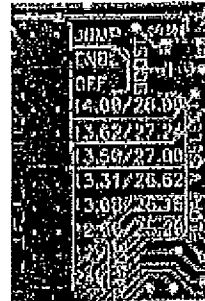
3. Battery fault alarm indicates these fault conditions:

- Battery disconnected - Battery polarity reversed - Mismatched charger battery voltage - Open or high resistance charger to battery connection
- Open battery cell or excessive internal resistance

### Controls

AC input voltage select  
Optional 12/24-volt output select  
Battery program select  
Fast charger enable/disable  
Temp compensation enable  
Remote temp comp enable

Field-selectable switch  
Field-selectable two-position jumper  
Field-selectable six-position jumper  
Field-selectable two-position jumper  
Standard. Can be disabled or re-enabled in the field  
Connect optional remote sensor to temp comp port



Simple field adjustments

### Environmental

Operating temperature  
Over temperature protection  
Humidity  
Vibration (10A unit)  
Transient immunity

-20C to +60C, meets full specification to +45C  
Gradual current reduction to maintain safe power device temperature  
5% to 95%, non-condensing  
UL 991 Class B (2G shunsoldo)  
ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy Industrial

### Agency Standards

Safety

C-UL listed to UL 1236 (required for UL 2200 gensets), CSA standard 22.2 no. 107.2-M89

Agency marking

CE; 50/60 Hz units DOC to EN 60335  
60 Hz: C-UL-US listed  
50/60 Hz: C-UL-US listed plus CE marked

EMI

FCC Part 15 Class B; EN 60081-2

NFPA standards

NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")

Optional agency compliance

Units with Alarms "1" configuration available with additional compliance to UL category BBHH and NFPA 20

### Construction

Housing/configuration

Material: Heavy clear anodized aluminum. Configuration options:

- Fully enclosed: C-UL listed enclosure
- Open frame: C-UL recognized
- Slimline: C-UL recognized open frame construction with remote isolation transformer

Packaging

Open-frame and Slimline configurations only available in bulk OEM quantities and packaging

Dimensions

See Drawings and Dimensions page for details

Printed circuit card

Surface mount technology, conformal coated

Cooling

Natural convection

Protection degree

Listed housings: NEMA-1 (IP20). Optional NEMA 3R enclosure

Damage prevention

Fully recessed display and controls

Electrical connections

Compression terminal blocks

### Warranty

Standard warranty

Three year parts and labor warranty from date of shipment

Optional warranty

If specified at time of order, warranty coverage is increased to reimburse customer's documented field service costs up to the original charger price. Contact the factory for full details

### Optional features

Input

Input frequency, 50/60 Hz

Remote temp comp sensor

Recommended where battery and charger are in different locations

Drp shield

Protects from dripping water

NEMA 3R housing

Enables outdoor installation (remote temp sensor recommended)

UL BBHH listing

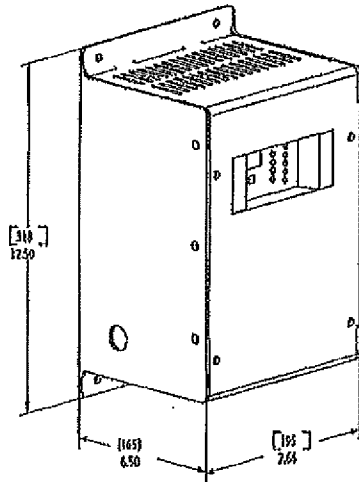
Available in 10A units with Alarms "1"

Field service warranty

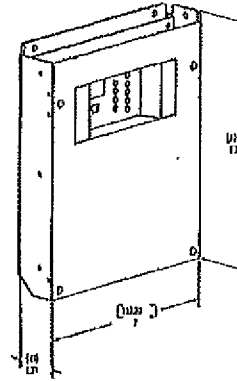
Reimbursement of customer field service expenses up to charger price

# Drawings and Dimensions

**10A Chargers**  
Enclosed and Open Frame Configurations

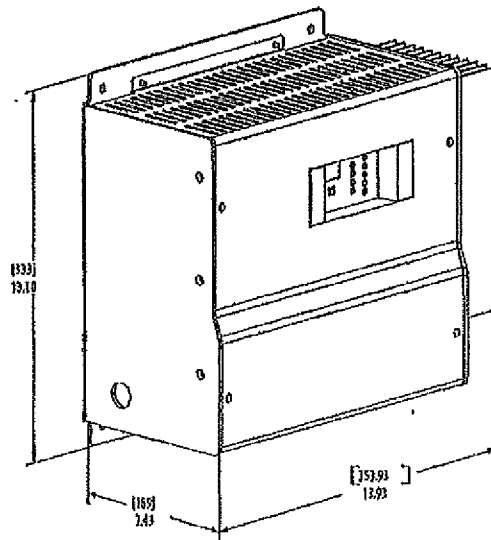


**10A Chargers**  
Slimline Open Frame Configuration



Slimline can be mounted either flat or edgewise

Open-frame configuration omits front cover



**20A Chargers**  
Enclosed and Open Frame Configurations

Open-frame configuration omits front cover

**Housing Dimensions Table**

| Amps | Configuration         | Width           | Depth          | Height          |
|------|-----------------------|-----------------|----------------|-----------------|
| 10   | Enclosed              | 7.66" (195 mm)  | 6.50" (165 mm) | 12.50" (318 mm) |
| 10   | Open-frame            | 7.66" (195 mm)  | 6.50" (165 mm) | 12.50" (318 mm) |
| 10   | Slimline - flat mount | 7.00" (178 mm)  | 1.71" (43 mm)  | 8.78" (223 mm)  |
| 10   | Slimline - edge mount | 1.71" (43 mm)   | 7.00" (178 mm) | 8.78" (223 mm)  |
| 20   | Enclosed              | 13.93" (354 mm) | 7.43" (189 mm) | 13.10" (333 mm) |
| 20   | Open-frame            | 13.93" (354 mm) | 7.43" (189 mm) | 13.10" (333 mm) |

### NRG Ordering Information

| Output volts | Output amps | Model       | Available configurations       | NFPA 110 Alarms | Lbs/Kg    |
|--------------|-------------|-------------|--------------------------------|-----------------|-----------|
| 12           | 10          | NRG12-10-R1 | Enclosed, Open-frame, Slimline | No              | 19 / 8.7  |
| 12           | 10          | NRG12-10-RC | Enclosed, Slimline             | Yes             | 19 / 8.7  |
| 24           | 10          | NRG24-10-R1 | Enclosed, Open-frame, Slimline | No              | 24 / 10.9 |
| 24           | 10          | NRG24-10-RC | Enclosed, Slimline             | Yes             | 24 / 10.9 |
| 12/24        | 10          | NRG22-10-R1 | Enclosed, Open-frame, Slimline | No              | 24 / 10.9 |
| 12/24        | 10          | NRG22-10-RC | Enclosed, Slimline             | Yes             | 24 / 10.9 |
| 12           | 20          | NRG12-20-RC | Enclosed, Open-frame           | Yes             | 39 / 17.7 |
| 24           | 20          | NRG24-20-RC | Enclosed, Open-frame           | Yes             | 42 / 19.1 |
| 12/24        | 20          | NRG22-20-RC | Enclosed, Open-frame           | Yes             | 42 / 19.1 |

All models offer field-selectable input 120/208-240 volts. 60 Hz input is standard with C-UL listing. Optional 50/60 Hz input includes C-UL listing and adds CE mark.

### Model Number Breakout



Model

Output voltage  
12: 12 volts  
24: 24 volts  
22: 12/24-volt  
Field selectable

Output current  
10: 10 amps  
20: 20 amps

AC input  
R: 120/208-240 VAC, 60 Hz  
H: 120/208-240 VAC, 50/60 Hz

Alarm system code  
1: LED and single Form C contact  
G: LEDs and Form C contacts to meet NFPA 110

Housing/Agency  
L: Enclosed: C-UL listed  
R: Open-frame: C-UL recognized  
S: Slimline open-frame: C-UL recognized (10A only)

UL category code  
S: UL category BBGQ (standard)  
H: UL category BBHH (Alarms "1" only)

## The Smart Choice for Mission-Critical Engine Starting

### Additional Information

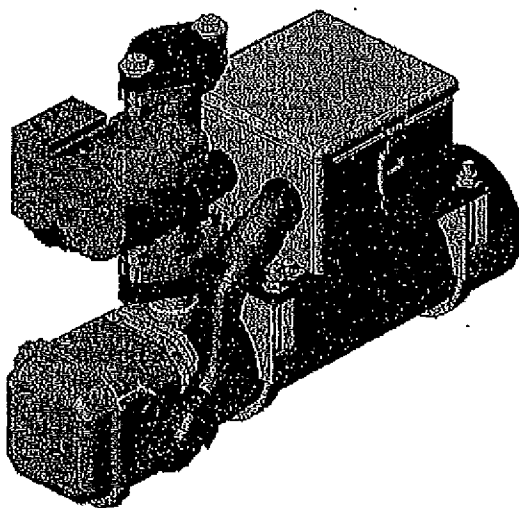
Contact SENS or your local sales representative for additional specification, engineering and installation information



### Contact Information

For information and service on any SENS product, please contact us at:  
Sales 1.866.736.7872 • 303.678.7500 • Fax 303.678.7504  
www.sens-usa.com • info@sens-usa.com  
1840 Industrial Circle, Longmont, CO 80501 USA





## C32 JACKET WATER HEATER

With Circulating Pump

This is a factory-installed jacket water heater for increased cold-starting capability. The system includes heater, isolation valves, circulation pump, hoses and generator space heater relay.

### FEATURES

#### FACTORY INSTALLED

- Completed with hoses, circulating pump, and isolation valves
- Base frame mounting minimizes engine induced vibration
- Automatically disconnected when engine is running via the generator space heater relay
- Thermostat is factory pre-set to 49° C (120° F)
- A control box with the element, pump, and thermostat pre-wired for ease of installation
- Heavy-duty (0.25" steel) mounting brackets
- Control box has a contactor to cycle the heater elements on and off per the heater thermostat
- Uniform heating over entire cooling system
- Reduced temperature at outlet extends hose and coolant life
- Longer heating element life
- Available with CE or UL/CSA compliant packages

### SPECIFICATIONS

| Unit Specifications     | Design Voltage                |                               |
|-------------------------|-------------------------------|-------------------------------|
|                         | 220                           | 240                           |
| Power                   | 30 kW                         | 30 kW                         |
| Frequency               | 50/60                         | 50/60                         |
| Amperage                | 136                           | 125                           |
| Amps                    | 41                            | 37                            |
| Flow Rate               | 32 l/min<br>(10 gpm)          | 32 l/min<br>(10 gpm)          |
| Circulation Pump Rating | 95W                           | 95W                           |
| Control Voltage         | 24 VDC                        | 24 VDC                        |
| Adjustable Thermostat   | 21.1°-98.8° C<br>(70°-210° F) | 21.1°-98.8° C<br>(70°-210° F) |
| Shipping Weight         | 16.3 kg<br>(36 lb)            | 16.3 kg<br>(36 lb)            |

# ATTACHMENTS C32 JACKET WATER HEATER WITH CIRCULATING PUMP

**CATERPILLAR®**

## DESCRIPTION

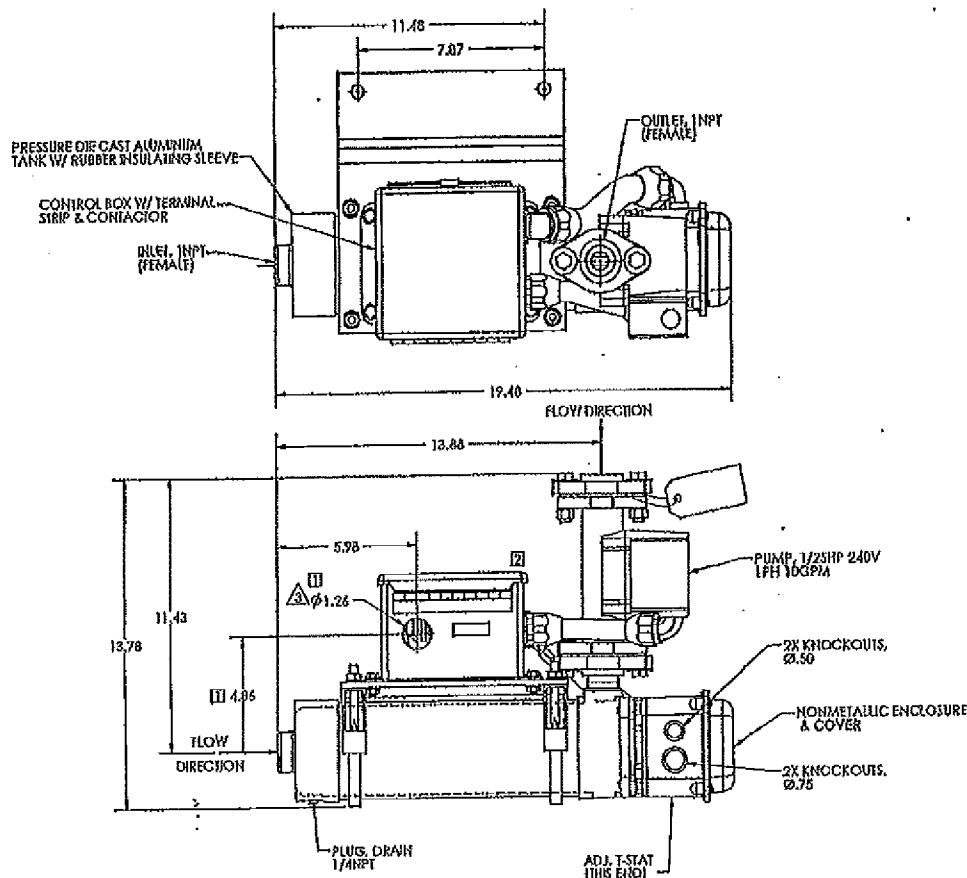
### HEATER DESIGN DESCRIPTION

The jacket water heater package is designed to efficiently pre-heat the C32 engine by heating and circulating the engine's coolant. The forced coolant circulation allows the design to operate at a higher wattage and efficiency than standard thermal siphon tank heaters (tank heaters). This design results in the following benefits:

- Reduction of the maximum coolant temperatures associated with tank heater design.
- Increase life of heater hoses, engine seals, and heating elements.
- Improve heat transfer efficiency from elements to engine coolant.
- More uniform engine temperature distribution.
- Application of a thermostat with a reduced thermal differential.
- Lower customer utility costs and increased heater reliability.
- Heater thermostat's setpoint is preset from the factory.

### HEATER OPERATION/WIRING

A 10-gallon per minute pump is located at the heater outlet to pull the coolant through the heater. An adjustable thermostat probe is located inside the heater tank near the inlet of the heater and responds to the temperature of the coolant entering the tank. The figure below shows the general heater design.



# ATTACHMENTS C32 JACKET WATER HEATER WITH CIRCULATING PUMP

**CATERPILLAR®**

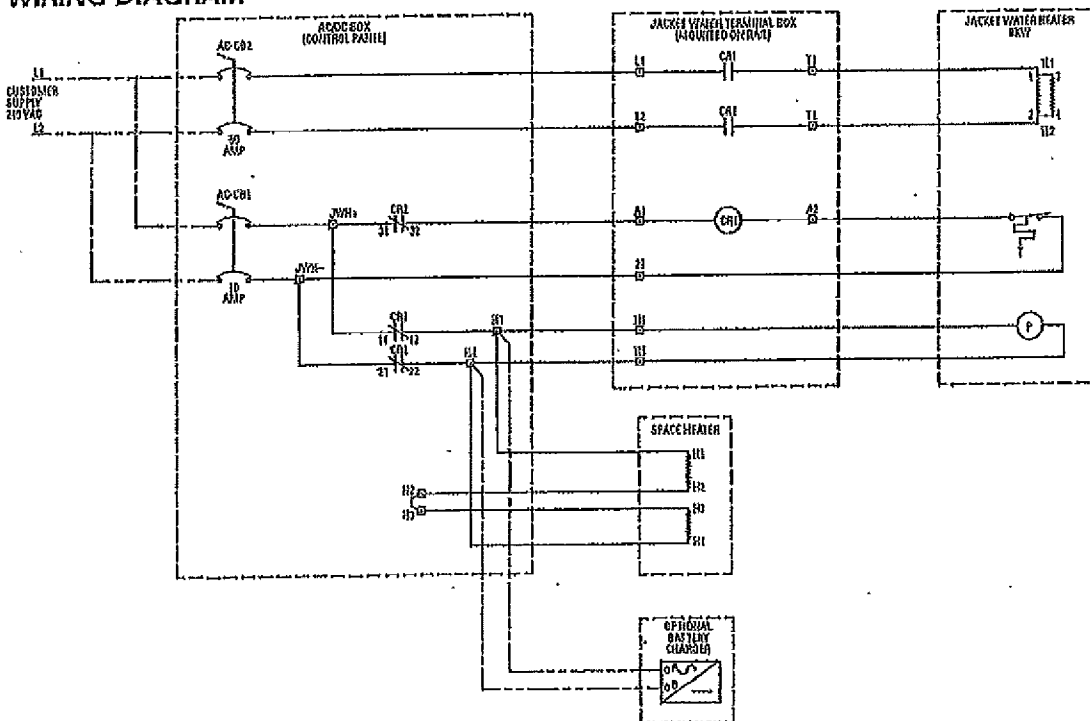
## DESCRIPTION (continued)

### ADJUSTABLE THERMOSTAT SETPOINT

Due to the high amperage associated with the 9 kW heater, the thermostat is wired such that it opens and closes a contactor that controls the heating elements. To maintain uniform engine temperature while the engine is not operating, the system pump requires either a 220 or a 240 VAC supply and must run continuously independent of heater thermostat. The pump and heating elements are de-energized whenever the engine starts.

The figures below show the wiring diagram for the engine jacket water heater systems.

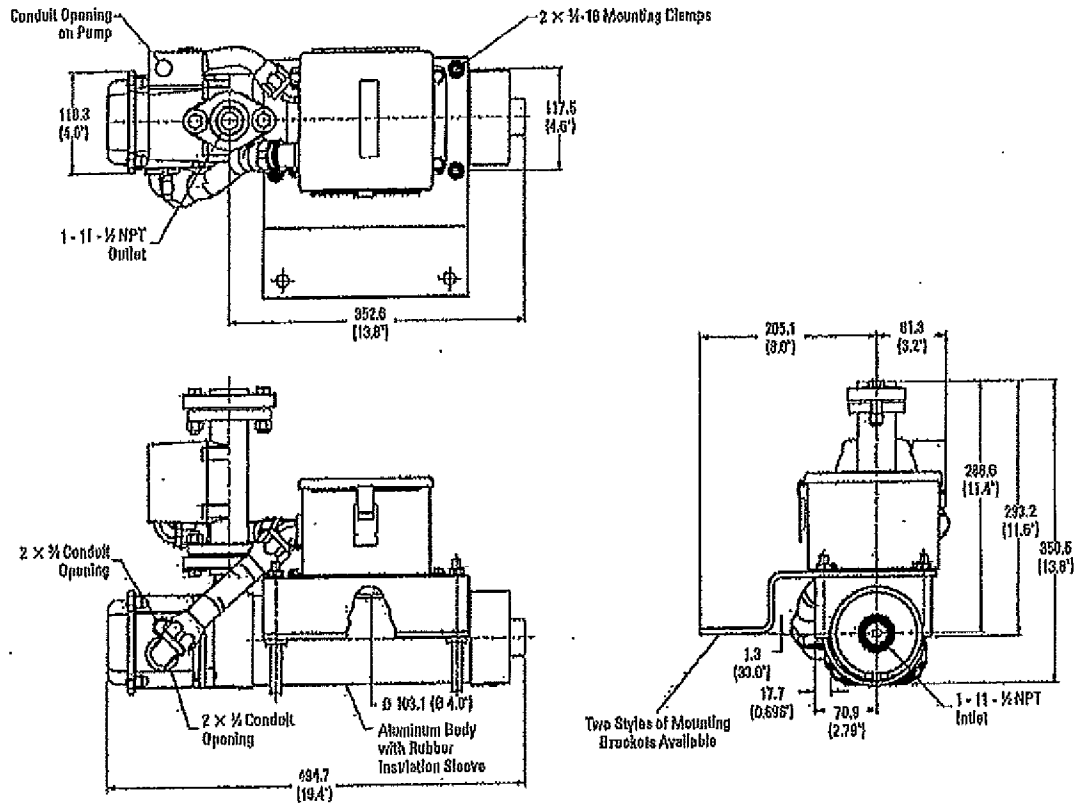
## WIRING DIAGRAM



# ATTACHMENTS C32 JACKET WATER HEATER WITH CIRCULATING PUMP

**CATERPILLAR®**

## JACKET WATER HEATER GROUP GENERAL DIMENSION



| Package Dimensions |          |          |
|--------------------|----------|----------|
| Length             | 394.7 mm | 15.54 in |
| Width              | 195 mm   | 7.68 in  |
| Height             | 350.5 mm | 13.8 in  |
| Shipping Weight    | 16.3 kg  | 36.0 lb  |

Note: Unless otherwise specified;  
all dimensions are for reference.  
(Drawing # 273-3755, 274-4541).

U.S. sourced

LEHEG018-01 (06-08)

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CASH1123  
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## CAT® AIR FILTERS

### FEATURES

#### UP TO 50 PERCENT MORE CAPACITY

- Longer service life than the competition

#### A NEW, MORE RELIABLE SEAL

- Formed with the advanced design of the self-sealing, self-centering, self-aligning RADIALSEAL air cleaner and filter system

#### 5-MINUTE, NO TOOLS FILTER CHANGE

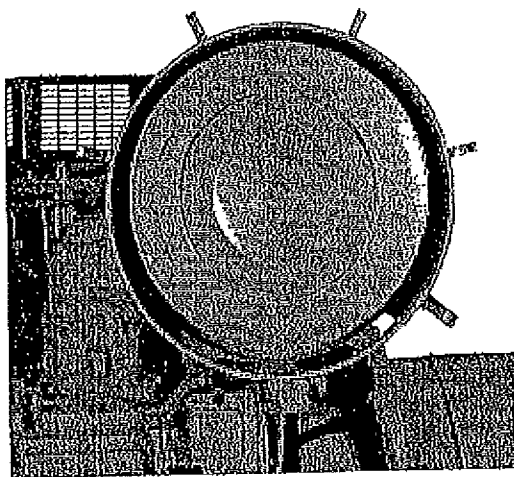
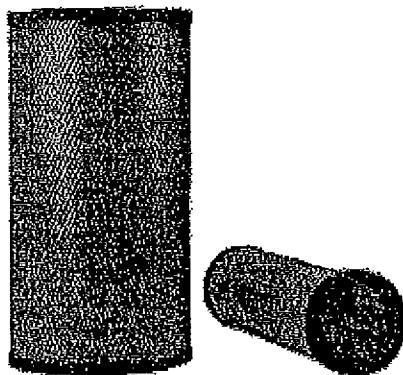
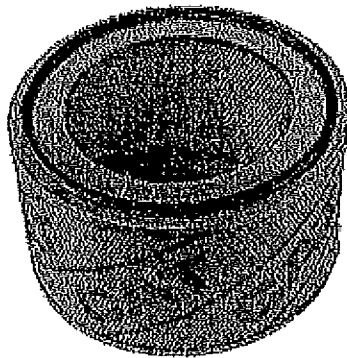
- Easy-fasten latches on the service cover

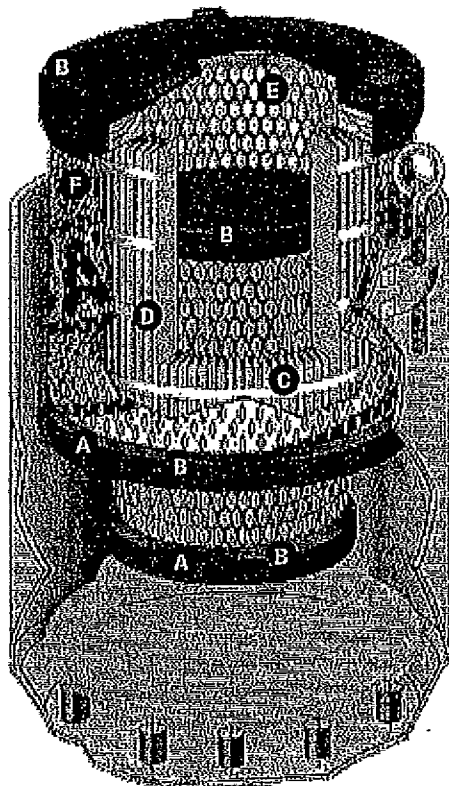
#### OVERSERVICING IS VIRTUALLY ELIMINATED

- When the Cat radial seal air filter is used with the Air Filter Service Indicator, resulting in the lowest cost per hour for your air filters

#### CORROSION RESISTANCE AND VIBRATION TOLERANCE

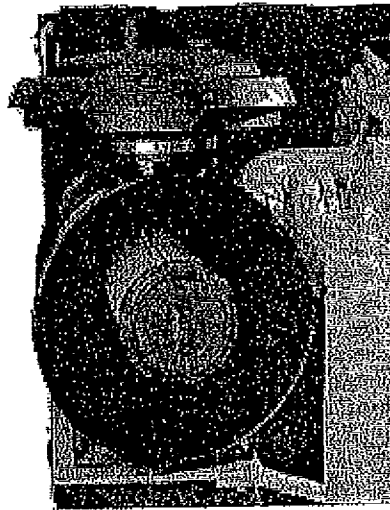
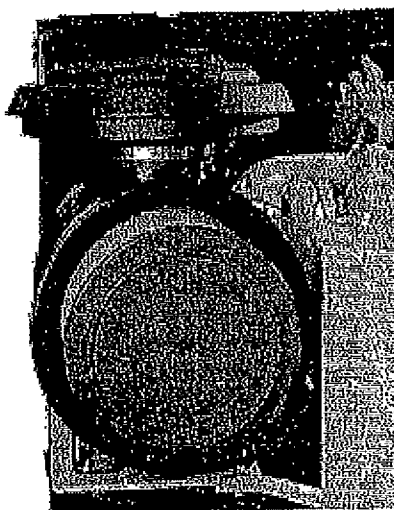
- Durable yet lightweight molded polymer end caps and polymer painted metal bodies





- (A) **Radial Seal Design**
  - No tools required
  - Reduces service times
  - Lowers maintenance costs
- (B) **One-piece Molded Urethane End Caps with Integral Seal**
  - Forms tough, reliable bond to paper media — will not corrode. More reliable sealing with most filters having up to 30 percent more seal contact area.
- (C) **Densely Pleated Filter Paper**
  - Large media area provides superior capacity without impeding airflow.
- (D) **Built-in Pleat Support and Positive Pleat Spacing**
  - Prevents pleat bunching and ensures optimum filter media surface area.
- (E) **Heavy-duty Metal Inner and Outer Wrap**
  - Increases structural strength and durability.
- (F) **Baked-on Enamel Outer Filter Wrap**
  - Resists corrosion.

## Dual Element



[www.CAT-ElectricPower.com](http://www.CAT-ElectricPower.com)

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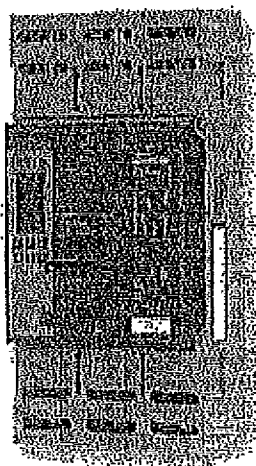
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The International System of Units (SI) is used in this publication.

CASH1125  
J54-603  
JA 00004443

# CIRCUIT BREAKERS

**CATERPILLAR®**



## C27/C32/C175/C3500 MOLDED CASE CIRCUIT BREAKERS

### R-Frame

1600A-2500A (UL), 1600A-3200A (IEC)

### P-Frame

800A-1200A (UL), 800A-1600A (IEC)

### NSJ

400A-600A (UL), 400A-630A (IEC)

### FEATURES

- Moisture and fungus protection
- Clear indication of breaker status
- Reinforced insulation
- Shunt trip
- Auxiliary contacts
- Load side extension bars
- 80% Rated – P&R Frame (UL) Upgradeable to 100%
- 100% Rated – NSJ (IEC)
- Maintenance-free operation
- Exceptional characteristics under short-circuit conditions
- Adjustable trip settings

### CONFORMITY WITH INTERNATIONAL STANDARDS

The P&R Frames plus the NSJ Circuit Breakers have been designed to comply with the International standard IEC 60947-2 as well as with these other major standards:

#### P&R – FRAMES

UL 489

CSA 22.2 No 5.1

Federal Specification W-C-375B/GEN

NEMA AB1

NMX J-266

UTE, VDE, BS, CEI, UNE

#### NSJ

Federal Specification W-C-375B/GEN

NEMA AB1

UTE, VDE, BS, CEI, UNE

Additionally, the P&R Frames plus NSJ Circuit Breakers have been approved for Marine application by American Bureau of Shipping, Registro Italiano Navale, Germanischer Lloyd, and Det Norske Veritas.

# CIRCUIT BREAKERS

**CATERPILLAR**

## STANDARD FEATURES

### RATINGS

#### UL-CSA

- R-Frame Rating: 3200 Amps (max) IEC
- P-Frame Rating: 1600 Amps (max) IEC

### SHUNT TRIP

The shunt trip provides a means of tripping the circuit breaker electronically. Shunt trip ratings are as follows:

Voltage: 24 VDC

Coil Burden (Holding/Inrush): 4.5/200 VA

Power Consumption: 4.5 VA

### AUXILIARY CONTACTS

The auxiliary contacts provide a means of remote circuit breaker position indication and consist of one (1) Form C Contact (1 Normally open and 1 Normally closed contact) with the following current ratings:

6A @ 240-480 VAC, 50/60 Hz

### CUSTOMER CABLE CONNECTIONS

Connection options include bus, cable I-Line for installation flexibility.

## TRIP UNITS

All circuit breakers come equipped with True RMS Current Sensing. The trip units for each of the circuit breaker ratings sample the current waveform to provide true RMS protection through the 15th harmonic. This true RMS sensing gives accurate values for the magnitude of a nonsinusoidal waveform. Therefore, the heating effects of harmonically distorted waveforms are accurately evaluated. The trip system comes equipped with a set of current transformers (CTs) to sense current, a trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker. Additionally, each trip unit comes equipped with Active Thermal Imaging which is active 20 minutes before and after tripping.

The P&R Frame circuit breakers come equipped with basic trip unit (LI), which includes the following features:

- Long-Time setting – adjustable dial settings from 0.4 – 1.0 x sensor rating (In)
- Long-Time Delay – adjustable
- Instantaneous setting – adjustable dial settings from 1.5 – 12 x sensor rating (In)
- Neutral protection (four-pole breakers)
- Type A Rating Plug

# CIRCUIT BREAKERS



## CIRCUIT BREAKER CHARACTERISTICS

| UL-IEC/CSA Breakers                          |       | P-Frame                                   |
|----------------------------------------------|-------|-------------------------------------------|
| Number of Poles                              |       | 3 & 4                                     |
| Rated Current (Amps)                         |       | 800/<br>1200A (UL)<br>800/<br>1600A (IEC) |
| Voltage Rating (VAC)                         |       | 600 UL/<br>690 IEC                        |
| Interrupting Rating (UL)<br>(60 Hz) – kA RMS | 240 V | 65                                        |
|                                              | 480 V | 35                                        |
|                                              | 600 V | 18                                        |
| IEC 60947-2 Rating<br>(50/60 Hz) –<br>kA RMS | Icu   | 240 V 60                                  |
|                                              |       | 380/415 V 35                              |
|                                              | Ics   | 240 V 25                                  |
|                                              |       | 380/415 V 20                              |

| UL-IEC/CSA Breakers                          |       | NSJ-Frame                               |
|----------------------------------------------|-------|-----------------------------------------|
| Number of Poles                              |       | 3 & 4                                   |
| Rated Current (Amps)                         |       | 400/<br>600A (UL)<br>400/<br>630A (IEC) |
| Voltage Rating (VAC)                         |       | 600 UL/<br>690 IEC                      |
| Interrupting Rating (UL)<br>(60 Hz) – kA RMS | 240 V | 85                                      |
|                                              | 480 V | 35                                      |
|                                              | 600 V | 18                                      |
| IEC 60947-2 Rating<br>(50/60 Hz) –<br>kA RMS | Icu   | 240 V 85                                |
|                                              |       | 380/415 V 45                            |
|                                              | Ics   | 240 V 85                                |
|                                              |       | 380/415 V 45                            |

| UL-IEC/CSA Breakers                          |       | R-Frame                                     |
|----------------------------------------------|-------|---------------------------------------------|
| Number of Poles                              |       | 3 & 4                                       |
| Rated Current (Amps)                         |       | 1600/<br>2500A (UL)<br>1600/<br>3200A (IEC) |
| Voltage Rating (VAC)                         |       | 600 UL/<br>690 IEC                          |
| Interrupting Rating (UL)<br>(60 Hz) – kA RMS | 240 V | 65                                          |
|                                              | 480 V | 35                                          |
|                                              | 600 V | 18                                          |
| IEC 60947-2 Rating<br>(50/60 Hz) –<br>kA RMS | Icu   | 240 V 50                                    |
|                                              |       | 380/415 V 35                                |
|                                              | Ics   | 240 V 25                                    |
|                                              |       | 380/415 V 20                                |

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Conductor<br>Material       | Frame<br>Rating<br>(Amps)<br>NSJ | Cat. Part<br>Number<br>- Ckt. Brk. | No. of<br>Poles | IEC<br>947-2<br>UL 489<br>Speed | Standard<br>Fixed Short<br>Circuit Trip<br>Unit 9/40mg<br>Time and<br>Short Time<br>Adjustable | Shunt<br>Trip        | Aux.<br>Contacts w/<br>Switches<br>Connected<br>- Disconnected | ADDS<br>LSO<br>MO<br>LSIG<br>MO | Customer Spec.<br>Cat. Part Number<br>- Lug                                                                                                                                                                |
|-----------------------------|----------------------------------|------------------------------------|-----------------|---------------------------------|------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3508<br>3512<br>3516 | NSJ<br>400A                      | 244-9700                           | 3               | IEC-<br>947-2                   | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSO                             | -LUG-244-0848 (1-Cable)<br>#2 AWG-600 kcmil CU 35-300 mm²                                                                                                                                                  |
|                             | NSJ<br>400A                      | 244-9701                           | 3               | IEC-<br>947-2                   | 240 85KA<br>480 42KA<br>600 10KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSO<br>& MO                     | #2 AWG-500 kcmil AL 35-240 mm² CU/AL<br>Stranded Only                                                                                                                                                      |
|                             | NSJ<br>400A                      | 244-9702                           | 3               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG                            | Length of Stripped wire connection<br>1.2 in (31 mm)                                                                                                                                                       |
|                             | NSJ<br>400A                      | 244-9703                           | 3               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9708                           | 4               | IEC-<br>947-2                   | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSO                             | -LUG-244-0862 (1-Cable)<br>#2 AWG-600 kcmil CU 35-300 mm²<br>#2 AWG-500 kcmil AL 35-240 mm² CU/AL<br>Stranded Only<br>Length of Stripped wire connection<br>1.2 in (31 mm)                                 |
|                             | NSJ<br>400A                      | 244-9709                           | 4               | IEC-<br>947-2                   | 240 85KA<br>480 42KA<br>600 10KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSO<br>& MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9710                           | 4               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSO<br>& MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9711                           | 4               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9704                           | 3               | UL-489/<br>IEC 100%             | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSI                             | -LUG-169-1855 (1-Cable)<br>#2 AWG-600 kcmil CU 35-300 mm²<br>#2 AWG-500 kcmil AL 35-240 mm² CU/AL<br>Stranded Only<br>Length of Stripped wire connection<br>1.2 in (31 mm)                                 |
|                             | NSJ<br>400A                      | 244-9705                           | 3               | UL-489/<br>IEC 100%             | 240 65KA<br>480 33KA<br>600 18KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSI &<br>MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9706                           | 3               | UL-489/<br>IEC 100%             |                                                                                                |                      |                                                                | LSIG                            |                                                                                                                                                                                                            |
|                             | NSJ<br>400A                      | 244-9707                           | 3               | UL-489/<br>IEC 100%             |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |
|                             | NSJ<br>600A                      | 244-9712                           | 3               | UL-489/<br>IEC 80%              | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSI                             | -LUG-169-0345 (1-Cable)<br>#2 AWG-600 kcmil CU 35-300 mm²<br>#2 AWG-500 kcmil AL 35-240 mm² CU/AL<br>Stranded Only<br>Length of Stripped wire connection<br>1.2 in (31 mm)                                 |
|                             | NSJ<br>600A                      | 244-9713                           | 3               | UL-489/<br>IEC 80%              | 240 65KA<br>480 33KA<br>600 18KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSI &<br>MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>600A                      | 244-9714                           | 3               | UL-489/<br>IEC 80%              |                                                                                                |                      |                                                                | LSIG                            |                                                                                                                                                                                                            |
|                             | NSJ<br>600A                      | 244-9715                           | 3               | UL-489/<br>IEC 80%              |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9716                           | 3               | IEC-<br>947-2                   | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSO                             | -LUG-244-0849 (2-Cable)<br>#2/0 AWG-350 kcmil CU (Stranded Only)<br>70-185 mm²<br>#2/0 AWG-500 kcmil AL (Stranded Only)<br>70-240 mm² CU/AL<br>Length of Stripped wire connection<br>1.2-2.4 in (31-61 mm) |
|                             | NSJ<br>830A                      | 244-9717                           | 3               | IEC-<br>947-2                   | 240 85KA<br>480 42KA<br>600 10KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSO &<br>MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9718                           | 3               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG                            |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9719                           | 3               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9720                           | 4               | IEC-<br>947-2                   | Interrupting<br>Current                                                                        | 24VDC<br>@<br>5/10VA | 240-480 6A<br>600 3A                                           | LSO                             | -LUG-244-0853 (2-Cable)<br>#2/0 AWG-350 kcmil CU (Stranded Only)<br>70-185 mm²<br>#2/0 AWG-500 kcmil AL (Stranded Only)<br>70-240 mm² CU/AL<br>Length of Stripped wire connection<br>1.2-2.4 in (31-61 mm) |
|                             | NSJ<br>830A                      | 244-9721                           | 4               | IEC-<br>947-2                   | 240 85KA<br>480 42KA<br>600 10KA                                                               |                      | DC<br>125 0.8A<br>250 0.3A                                     | LSO &<br>MO                     |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9722                           | 4               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG                            |                                                                                                                                                                                                            |
|                             | NSJ<br>830A                      | 244-9723                           | 4               | IEC-<br>947-2                   |                                                                                                |                      |                                                                | LSIG<br>& MO                    |                                                                                                                                                                                                            |

LEHE6130-01

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Genie Model                 | Frame Rating (Amps) | Cat. Part Number | No. Poles | UL/IEC Rating | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | ADDS LSI, MO, LSIG, MO | Shunt Trip        | AC Contacts w/ Switches - Connected - Disconnected | Customer Shio Lugs - Bus                                                                                                                             |
|-----------------------------|---------------------|------------------|-----------|---------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------|-------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3500<br>3512<br>3810 | P-FRAME 800A        | 244-0724         | 3         | IEC-947-2     | 5.0A                                                                                         |                                                                                              | LSI EO                 | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>600 DC<br>125 0.8A<br>250 0.3A    | Load Take-off Bus:<br>3-Pole; Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CCI) |
|                             | P-FRAME 800A        | 244-0725         | 3         | IEC-947-2     |                                                                                              | 6.0A                                                                                         | LSIG EO                |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0727         | 3         | IEC-947-2     |                                                                                              | 6.0P                                                                                         | LSIG-P EO & MODBUS     |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0728         | 3         | IEC-947-2     | 5.0A                                                                                         |                                                                                              | LSI                    |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0729         | 3         | IEC-947-2     |                                                                                              | 6.0A                                                                                         | LSIG                   |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0731         | 3         | IEC-947-2     |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS          |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0740         | 4         | IEC-947-2     | 5.0A                                                                                         |                                                                                              | LSI EO                 | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>600 DC<br>125 0.8A<br>250 0.3A    | Load Take-off Bus:<br>4-Pole; Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CCI) |
|                             | P-FRAME 800A        | 244-0741         | 4         | IEC-947-2     |                                                                                              | 6.0A                                                                                         | LSIG EO                |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0743         | 4         | IEC-947-2     |                                                                                              | 6.0P                                                                                         | LSIG-P EO & MODBUS     |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0744         | 4         | IEC-947-2     | 5.0A                                                                                         |                                                                                              | LSI                    |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0745         | 4         | IEC-947-2     |                                                                                              | 6.0A                                                                                         | LSIG                   |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0747         | 4         | IEC-947-2     |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS          |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0732         | 3         | UL/IEC 80%    | 5.0A                                                                                         |                                                                                              | LSI & EO               | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>600 DC<br>125 0.8A<br>250 0.3A    | Load Take-off Bus:<br>3-Pole; Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CCI) |
|                             | P-FRAME 800A        | 244-0733         | 3         | UL/IEC 80%    |                                                                                              | 6.0A                                                                                         | LSIG & EO              |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0734         | 3         | UL/IEC 80%    |                                                                                              | 6.0H                                                                                         | LSIG-H EO & MODBUS     |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0735         | 3         | UL/IEC 80%    |                                                                                              | 6.0P                                                                                         | LSIG-P EO & MODBUS     |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0982         | 3         | UL/IEC 80%    | 5.0P                                                                                         |                                                                                              | LSI-P EO & MODBUS      |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0736         | 3         | UL/IEC 80%    | 5.0A                                                                                         |                                                                                              | LSI                    |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0737         | 3         | UL/IEC 80%    |                                                                                              | 6.0A                                                                                         | LSIG                   |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0738         | 3         | UL/IEC 80%    |                                                                                              | 6.0H                                                                                         | LSIG-H MODBUS          |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0739         | 3         | UL/IEC 80%    |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS          |                   |                                                    |                                                                                                                                                      |
|                             | P-FRAME 800A        | 244-0983         | 3         | UL/IEC 80%    | 5.0P                                                                                         |                                                                                              | LSI-P MODBUS           |                   |                                                    |                                                                                                                                                      |

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Breaker Model               | Frame Rating (Amperes) | Cat. Part Number - Ckt. Bkr. | No. Poles | UL/IEC Spec. | MICROLOGIC TRIP (LSI) Long-time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LSI) Short-time Instantaneous Protection (UL Listed, IEC Rated) | ADD'L MO. LSI MO. LSI MO. MODBUS | Short Trip        | Aux. Controls w/ Switches - Connected / Disconnected | Customer Side (Lug, Bus)                                                                                                                             |
|-----------------------------|------------------------|------------------------------|-----------|--------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------|-------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>350B<br>3512<br>351B | P-FRAME 800A           | 244-9704                     | 3         | UL/IEC 100%  | 5.0A                                                                            |                                                                                  | LSI EO                           | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>DC<br>125 0.8A<br>250 0.3A          | Load Take-off Bus;<br>3-Pole; Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CC1) |
|                             | P-FRAME 800A           | 244-9802                     | 3         | UL/IEC 100%  |                                                                                 | 6.0A                                                                             | LSIG EO                          |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9808                     | 3         | UL/IEC 100%  |                                                                                 | 6.0H                                                                             | LSIG-H EO & MODBUS               |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9814                     | 3         | UL/IEC 100%  |                                                                                 | 6.0P                                                                             | LSIG-P EO MODBUS                 |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9904                     | 3         | UL/IEC 100%  | 5.0P                                                                            |                                                                                  | LSI-P EO & MODBUS                |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9818                     | 3         | UL/IEC 100%  | 6.0A                                                                            |                                                                                  | LSI                              |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9822                     | 3         | UL/IEC 100%  |                                                                                 | 6.0A                                                                             | LSIG                             |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9828                     | 3         | UL/IEC 100%  |                                                                                 | 6.0H                                                                             | LSIG-H MODBUS                    |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9803                     | 3         | UL/IEC 100%  |                                                                                 | 6.0P                                                                             | LSIG-P MODBUS                    |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 800A           | 244-9905                     | 3         | UL/IEC 100%  | 5.0P                                                                            |                                                                                  | LSI-P MODBUS                     |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9756                     | 3         | UL/IEC 80%   | 5.0A                                                                            |                                                                                  | LSI & EO                         | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>DC<br>125 0.8A<br>250 0.3A          | Load Take-off Bus;<br>3 Pole; Each has 2-hole pattern spaced on centers 0.37" (9.5) apart<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CC1)  |
|                             | P-FRAME 1200A          | 244-9757                     | 3         | UL/IEC 80%   |                                                                                 | 6.0A                                                                             | LSIG & EO                        |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9758                     | 3         | UL/IEC 80%   |                                                                                 | 6.0H                                                                             | LSIG-H EO & MODBUS               |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9759                     | 3         | UL/IEC 80%   |                                                                                 | 6.0P                                                                             | LSIG-P EO & MODBUS               |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9988                     | 3         | UL/IEC 80%   | 5.0P                                                                            |                                                                                  | LSI-P EO & MODBUS                |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9760                     | 3         | UL/IEC 80%   | 5.0A                                                                            |                                                                                  | LSI                              |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9701                     | 3         | UL/IEC 80%   |                                                                                 | 6.0A                                                                             | LSIG                             |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9762                     | 3         | UL/IEC 80%   |                                                                                 | 6.0H                                                                             | LSIG-H MODBUS                    |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9763                     | 3         | UL/IEC 80%   |                                                                                 | 6.0P                                                                             | LSIG-P MODBUS                    |                   |                                                      |                                                                                                                                                      |
|                             | P-FRAME 1200A          | 244-9987                     | 3         | UL/IEC 80%   | 5.0P                                                                            |                                                                                  | LSI-P MODBUS                     |                   |                                                      |                                                                                                                                                      |

# CIRCUIT BREAKERS

# CATERPILLAR®

| Channel Model               | Frame Rating (Amps) | Cat. Part Number | No. Poles | UL/IEC Rating | Micrologic Trip (LSI) Long-Time Delay (Sec.) Instantaneous Protection (UL Listed, IEC Rated) | Micrologic Trip (LSI) Long-Time Delay (Sec.) Instantaneous Protection (UL Listed, IEC Rated) | Additional LSI, MO, LSI, MO | Shunt Trip        | Aux. Contacts w/ Switching Connected/Disconnected | Customer Side Lug                                                                                                                                    |
|-----------------------------|---------------------|------------------|-----------|---------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3508<br>3512<br>3516 | P-FRAME 1200A       | 244-9742         | 3         | UL/IEC 100%   | 5.0A                                                                                         |                                                                                              | LSI EO                      | 24VDC @ 4.5/200VA | 240-480 6A 600 3A<br>DC<br>125 0.8A 250 0.3A      | Load Take-off Bus:<br>3-Pole: Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CC1) |
|                             | P-FRAME 1200A       | 244-9746         | 3         | UL/IEC 100%   |                                                                                              | 6.0A                                                                                         | LSIG EO                     |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9766         | 3         | UL/IEC 100%   |                                                                                              | 6.0H                                                                                         | LSIG-H EO & MODBUS          |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9770         | 3         | UL/IEC 100%   |                                                                                              | 6.0P                                                                                         | LSIG-P EO MODBUS            |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9888         | 3         | UL/IEC 100%   | 5.0P                                                                                         |                                                                                              | LSI-P EO & MODBUS           |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9774         | 3         | UL/IEC 100%   | 5.0A                                                                                         |                                                                                              | LSI                         |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9778         | 3         | UL/IEC 100%   |                                                                                              | 6.0A                                                                                         | LSIG                        |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9788         | 3         | UL/IEC 100%   |                                                                                              | 6.0H                                                                                         | LSIG-H MODBUS               |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9790         | 3         | UL/IEC 100%   |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS               |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1200A       | 244-9889         | 3         | UL/IEC 100%   | 5.0P                                                                                         |                                                                                              | LSI-P MODBUS                |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9748         | 3         | IEC           | 5.0A                                                                                         |                                                                                              | LSI & EO                    | 24VDC @ 4.5/200VA | 240-480 6A 600 3A<br>DC<br>125 0.8A 250 0.3A      | Load Take-off Bus:<br>3-Pole: Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CC1) |
|                             | P-FRAME 1250A       | 244-9749         | 3         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG & EO                   |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9751         | 3         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P EO & MODBUS          |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9752         | 3         | IEC           | 5.0A                                                                                         |                                                                                              | LSI                         |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9753         | 3         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG                        |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9756         | 3         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS               |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9784         | 4         | IEC           | 5.0A                                                                                         |                                                                                              | LSI EO                      | 24VDC @ 4.5/200VA | 240-480 6A 600 3A<br>DC<br>125 0.8A 250 0.3A      | Load Take-off Bus:<br>4-Pole: Each has 2-hole pattern spaced on centers 0.37" (9.5) apart.<br>Dia of holes 0.43" (11.0)<br>(Meets NEMA Standard CC1) |
|                             | P-FRAME 1250A       | 244-9785         | 4         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG EO                     |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9787         | 4         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P EO MODBUS            |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9768         | 4         | IEC           | 5.0A                                                                                         |                                                                                              | LSI                         |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9769         | 4         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG                        |                   |                                                   |                                                                                                                                                      |
|                             | P-FRAME 1250A       | 244-9771         | 4         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS               |                   |                                                   |                                                                                                                                                      |

LEHE6130-01

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Connet Model                | Frame Rating (Amperes) | Cat Part Number - CK, UK | No. Poles | UL/IEC Trip | MICROLOGIC TRIP (LS) Long-time Short-time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LS) Long-time Short-time Instantaneous Equipment Protection (UL Listed, IEC Rated) | ABDS (SO, MO, LSIG, MODBUS) | 24VDC @ 4.5/200VA | App. Contacts w/ Switches Connected or Disconnected | Customer Side Lug Bus                                                                                                                                          |
|-----------------------------|------------------------|--------------------------|-----------|-------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------|-------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3508<br>3512<br>3516 | R-FRAME 1600A          | 244-9780                 | 3         | UL/IEC 80%  | 5.0A                                                                                      |                                                                                                     | LSI                         | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>DC<br>125 0.8A<br>250 0.3A         | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 1600A          | 244-9781                 | 3         | UL/IEC 80%  |                                                                                           | 6.0A                                                                                                | LSIG                        |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9782                 | 3         | UL/IEC 80%  |                                                                                           | 6.0H                                                                                                | LSIG-H MODBUS               |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9783                 | 3         | UL/IEC 80%  |                                                                                           | 6.0P                                                                                                | LSIG-P MODBUS               |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9890                 | 3         | UL/IEC 80%  | 5.0P                                                                                      |                                                                                                     | LSI-P MODBUS                |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9804                 | 3         | UL/IEC 100% | 5.0A                                                                                      |                                                                                                     | LSI                         | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>DC<br>125 0.8A<br>250 0.3A         | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 1600A          | 244-9806                 | 3         | UL/IEC 100% |                                                                                           | 6.0A                                                                                                | LSIG                        |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9808                 | 3         | UL/IEC 100% |                                                                                           | 6.0H                                                                                                | LSIG-H MODBUS               |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9867                 | 3         | UL/IEC 100% |                                                                                           | 6.0P                                                                                                | LSIG-P MODBUS               |                   |                                                     |                                                                                                                                                                |
|                             | R-FRAME 1600A          | 244-9891                 | 3         | UL/IEC 100% | 5.0P                                                                                      |                                                                                                     | LSI-P MODBUS                |                   |                                                     |                                                                                                                                                                |
|                             | P-FRAME 1600A          | 244-9772                 | 3         | IEC         | 5.0A                                                                                      |                                                                                                     | LSI & EO                    | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>DC<br>125 0.8A<br>250 0.3A         | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | P-FRAME 1600A          | 244-9773                 | 3         | IEC         |                                                                                           | 6.0A                                                                                                | LSIG & EO                   |                   |                                                     |                                                                                                                                                                |
|                             | P-FRAME 1600A          | 244-9775                 | 3         | IEC         |                                                                                           | 6.0P                                                                                                | LSIG-P EO & MODBUS          |                   |                                                     |                                                                                                                                                                |
|                             | P-FRAME 1600A          | 244-9776                 | 3         | IEC         | 5.0A                                                                                      |                                                                                                     | LSI                         |                   |                                                     |                                                                                                                                                                |
|                             | P-FRAME 1600A          | 244-9777                 | 3         | IEC         |                                                                                           | 6.0A                                                                                                | LSIG                        |                   |                                                     |                                                                                                                                                                |
|                             | P-FRAME 1600A          | 244-9770                 | 3         | IEC         |                                                                                           | 6.0P                                                                                                | LSIG-P MODBUS               |                   |                                                     |                                                                                                                                                                |

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Frame                       | Frame Rating (Amps) | Cat. Part Number | No. Poles | UL/IEC Rating | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | ADPS LSI MO LSI MO | 24VDC @ 4.5/200VA | Aux. Contacts w/ Switches Connected/Disconnected | Customer Side Lug Bus                                                                                                                              |
|-----------------------------|---------------------|------------------|-----------|---------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------|-------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3609<br>3612<br>3616 | P-FRAME 1600A       | 244-9784         | 4         | IEC           | 5.0A                                                                                         |                                                                                              | LSI & EO           | 24VDC @ 4.5/200VA | 240-480 6A 600 3A                                | Load Take-off Bus: 4-Pole; Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5). Dia of holes 0.57" (14.5) (Meets NEMA Standard CC1) |
|                             | P-FRAME 1600A       | 244-9785         | 4         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG & EO          |                   | DC 125 0.8A 250 0.3A                             |                                                                                                                                                    |
|                             | P-FRAME 1600A       | 244-9787         | 4         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P EO & MODBUS |                   |                                                  |                                                                                                                                                    |
|                             | P-FRAME 1600A       | 244-9788         | 4         | IEC           | 5.0A                                                                                         |                                                                                              | LSI                |                   |                                                  |                                                                                                                                                    |
|                             | P-FRAME 1600A       | 244-9789         | 4         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG               |                   |                                                  |                                                                                                                                                    |
|                             | P-FRAME 1600A       | 244-9791         | 4         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9788         | 3         | UL/IEC 80%    | 5.0A                                                                                         |                                                                                              | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 600 3A                                | Load Take-off Bus: 3-Pole; Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5). Dia of holes 0.57" (14.5) (Meets NEMA Standard CC1) |
|                             | R-FRAME 2000A       | 244-9797         | 3         | UL/IEC 80%    |                                                                                              | 6.0A                                                                                         | LSIG               |                   | DC 125 0.8A 250 0.3A                             |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9798         | 3         | UL/IEC 80%    |                                                                                              | 6.0H                                                                                         | LSIG-H MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9799         | 3         | UL/IEC 80%    |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9902         | 3         | UL/IEC 80%    | 6.0P                                                                                         |                                                                                              | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9868         | 3         | UL/IEC 100%   | 5.0A                                                                                         |                                                                                              | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 600 3A                                | Load Take-off Bus: 3-Pole; Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5). Dia of holes 0.57" (14.5) (Meets NEMA Standard CC1) |
|                             | R-FRAME 2000A       | 244-9880         | 3         | UL/IEC 100%   |                                                                                              | 6.0A                                                                                         | LSIG               |                   | DC 125 0.8A 250 0.3A                             |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9917         | 3         | UL/IEC 100%   |                                                                                              | 6.0H                                                                                         | LSIG-H MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9918         | 3         | UL/IEC 100%   |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9993         | 3         | UL/IEC 100%   | 6.0P                                                                                         |                                                                                              | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9782         | 3         | IEC           | 5.0A                                                                                         |                                                                                              | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 600 3A                                | Load Take-off Bus: 3-Pole; Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5). Dia of holes 0.57" (14.5) (Meets NEMA Standard CC1) |
|                             | R-FRAME 2000A       | 244-9793         | 3         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG               |                   | DC 125 0.8A 250 0.3A                             |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9795         | 3         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9800         | 4         | IEC           | 5.0A                                                                                         |                                                                                              | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 600 3A                                | Load Take-off Bus: 4-Pole; Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5). Dia of holes 0.57" (14.5) (Meets NEMA Standard CC1) |
|                             | R-FRAME 2000A       | 244-9801         | 4         | IEC           |                                                                                              | 6.0A                                                                                         | LSIG               |                   | DC 125 0.8A 250 0.3A                             |                                                                                                                                                    |
|                             | R-FRAME 2000A       | 244-9803         | 4         | IEC           |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                    |

# CIRCUIT BREAKERS

**CATERPILLAR**

| Design Model                | Frame Rating (Amperes) | Cat. Part Number (Circuit Breaker) | No. Poles | UL/IEC Rating | MICROLOGIC TRIP (LSI) Long-Time Short-Time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LSI) Long-Time Short-Time Instantaneous Protection (UL Listed, IEC Rated) | ADDS LSI MO LSI MO | Shunt Trip        | Aux. Contacts w/ Switches Connected/Disconnected | Customer Side (L/R) Bus                                                                                                                                        |
|-----------------------------|------------------------|------------------------------------|-----------|---------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------|-------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3508<br>3512<br>3516 | R-FRAME 2500A          | 244-9808                           | 3         | UL/IEC 80%    | 5.0A                                                                                       |                                                                                            | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>125 0.8A<br>250 0.3A            | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 2500A          | 244-9800                           | 3         | UL/IEC 80%    |                                                                                            | 6.0A                                                                                       | LSIG               |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9810                           | 3         | UL/IEC 80%    |                                                                                            | 6.0H                                                                                       | LSIG-H & MODBUS    |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9811                           | 3         | UL/IEC 80%    |                                                                                            | 6.0P                                                                                       | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9994                           | 3         | UL/IEC 80%    | 5.0P                                                                                       |                                                                                            | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9919                           | 3         | UL/IEC 100%   | 5.0A                                                                                       |                                                                                            | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>125 0.8A<br>250 0.3A            | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 2500A          | 244-9920                           | 3         | UL/IEC 100%   |                                                                                            | 6.0A                                                                                       | LSIG               |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9921                           | 3         | UL/IEC 100%   |                                                                                            | 6.0H                                                                                       | LSIG-H MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9922                           | 3         | UL/IEC 100%   |                                                                                            | 6.0P                                                                                       | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9995                           | 3         | UL/IEC 100%   | 5.0P                                                                                       |                                                                                            | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9804                           | 3         | IEC           | 5.0A                                                                                       |                                                                                            | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>125 0.8A<br>250 0.3A            | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 2500A          | 244-9805                           | 3         | IEC           |                                                                                            | 6.0A                                                                                       | LSIG               |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9807                           | 3         | IEC           |                                                                                            | 6.0P                                                                                       | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9812                           | 4         | IEC           | 5.0A                                                                                       |                                                                                            | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>125 0.8A<br>250 0.3A            | Load Take-off Bus:<br>4-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 2500A          | 244-9813                           | 4         | IEC           |                                                                                            | 6.0A                                                                                       | LSIG               |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 2500A          | 244-9815                           | 4         | IEC           |                                                                                            | 6.0P                                                                                       | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 3200A          | 244-9816                           | 3         | IEC           | 5.0A                                                                                       |                                                                                            | LSI                | 24VDC @ 4.5/200VA | 240-480 6A 3A<br>125 0.8A<br>250 0.3A            | Load Take-off Bus:<br>3-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.75" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 3200A          | 244-9817                           | 3         | IEC           |                                                                                            | 6.0A                                                                                       | LSIG               |                   |                                                  |                                                                                                                                                                |
|                             | R-FRAME 3200A          | 244-9819                           | 3         | IEC           |                                                                                            | 6.0P                                                                                       | LSIG-P MODBUS      |                   |                                                  |                                                                                                                                                                |

# CIRCUIT BREAKERS

**CATERPILLAR®**

| Order Part Number           | Frame (Amp)   | Cat Part Number (Ckt Brk) | No. Poles | UL/IEC Spec | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | MICROLOGIC TRIP (LSI) Long-time & Short-time Instantaneous Protection (UL Listed, IEC Rated) | ADD'S LSI MO, LSIQ MO | 24VDC @ 600 4.5/ 200VA | App. Contacts W/ Switches Controlled Disconnected | Customer Side Lug Dis.                                                                                                                                         |
|-----------------------------|---------------|---------------------------|-----------|-------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------|------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C32<br>3508<br>3512<br>3516 | R-FRAME 3200A | 244-9820                  | 4         | IEC         | 5.0A                                                                                         |                                                                                              | LSI                   | 24VDC @ 600            | 240-460 6A 3A                                     | Load Take-off Bus:<br>4-Pole;<br>Each has 4 Bolt Hole pattern evenly spaced on centers 1.76" (44.5).<br>Dia of holes 0.57" (14.5)<br>(Meets NEMA Standard CC1) |
|                             | R-FRAME 3200A | 244-9821                  | 4         | IEC         |                                                                                              | 6.0A                                                                                         | LSIG                  | 4.5/ 200VA             | DG 125 0.2A                                       |                                                                                                                                                                |
|                             | R-FRAME 3200A | 244-9823                  | 4         | IEC         |                                                                                              | 6.0P                                                                                         | LSIG-P MODBUS         |                        | 250 0.3A                                          |                                                                                                                                                                |

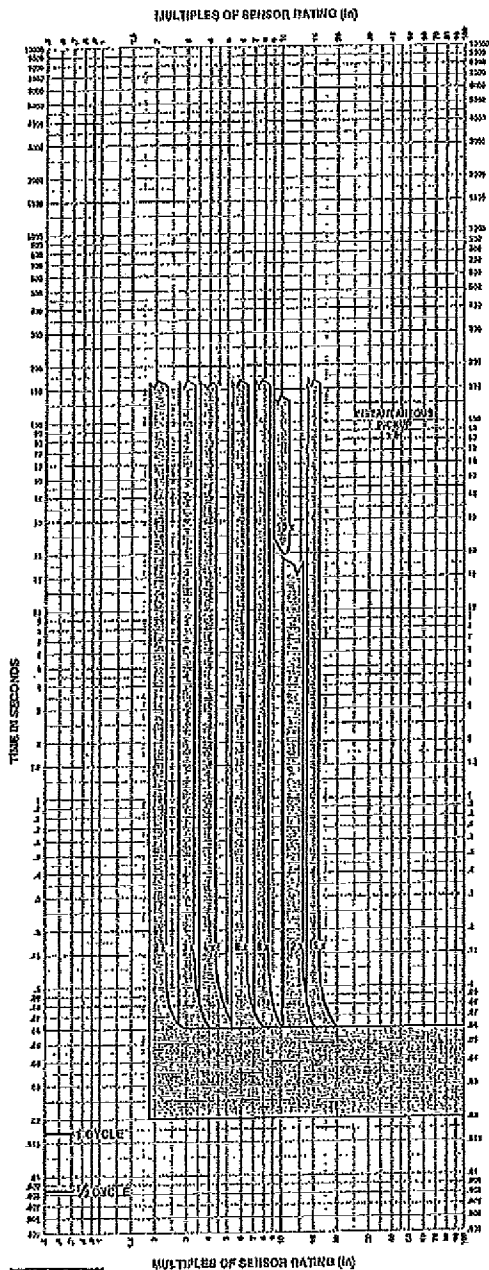
**CATERPILLAR®**

**Schneider**  
**Electric**

8. Overload indicator illuminates at 100%.

# CIRCUIT BREAKERS

**CATERPILLAR®**



## MICROLOGIC® 8.0/6.0 A/P/H TRIP UNIT CHARACTERISTIC TRIP CURVE NO. 613-7 Instantaneous Pickup 2x-15x and OFF

The time-current curve information is to be used for application and coordination purposes only. Curves apply from -30° to +60° C ambient temperature.

### Notes:

1. The end of the curve is determined by the interrupting rating of the circuit breaker.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. The instantaneous region of the trip curve shows maximum total clearing times. Actual clearing times in this region can vary depending on the circuit breaker mechanism design and other factors. The actual clearing time can be considerably faster than indicated. Contact your local Sales Office for additional information.
4. For a withstand circuit breaker, instantaneous can be turned OFF. See 613-7 for instantaneous trip curves. See 613-10 for instantaneous override values.
5. See 613-4 and 613-5 for long-time pickup, long-time delay, short-time pickup, and short-time delay trip curves.

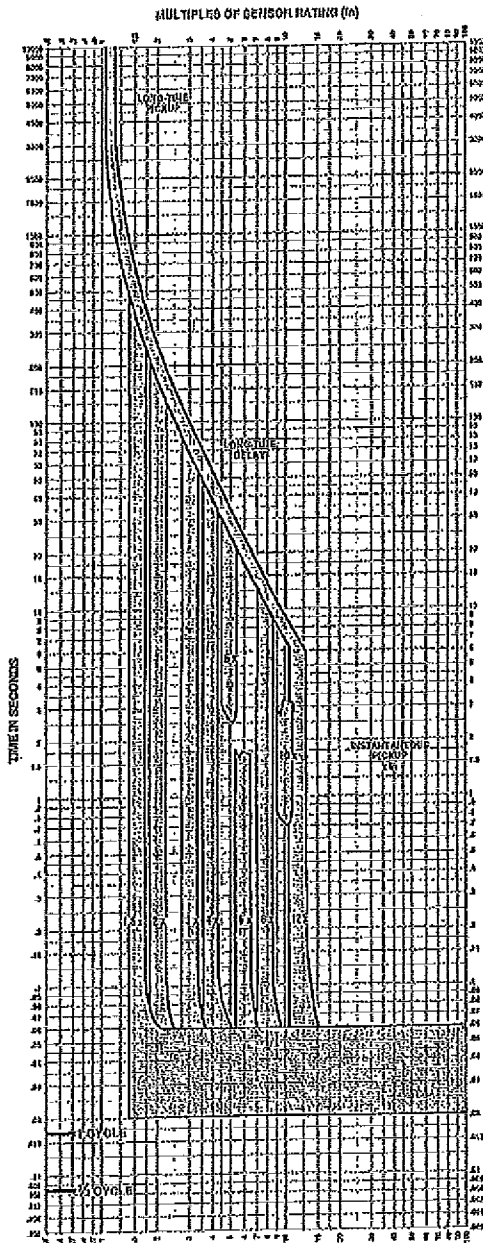


**Schneider Electric**  
Circuit Breakers

Ordering Information  
See page 613-10

# CIRCUIT BREAKERS

**CATERPILLAR®**



## ELECTRONIC TRIP 1.01 CHARACTERISTIC TRIP CURVE NO. 618-12 Long-Time Pickup and Fixed Delay Instantaneous Pickup 1.5x-12x

The time-current curve information is to be used for application and coordination purposes only. Curves apply from -30° C to +90° C ambient temperature.

Instantaneous override values are given on 613-10.

### Notes:

1. There is a thermal-lagging effect that can act to shorten the long-time delay. The thermal-lagging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-lagging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

|            |            |
|------------|------------|
| Media Bulk | Media Bulk |
| Media Bulk | Media Bulk |
| Media Bulk | Media Bulk |
| Media Bulk | Media Bulk |
| Media Bulk | Media Bulk |
| Media Bulk | Media Bulk |

MULTIPLES OF SENSOR RATING (In)

**Schneider**  
Electric

Curve No. 618-12  
Drawing No. 618-12-01

# CIRCUIT BREAKERS

**CATERPILLAR®**

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# CIRCUIT BREAKERS



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1EHE6138-01 (10-08)

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CASH1141  
J54-619  
JA 00004459



CALIFORNIA DYNAMICS CORPORATION  
5572 ALHAMBRA AVE.  
LOS ANGELES, CA 90032-3105

CALL US - TO SET THINGS RIGHT

FAX (323) 223 - 7941

PH (323) 223 - 3882

email: daldyn@earthlink.net

TYPE RJSD

ISOLATOR/RESTRAINT

PERFORMANCE RATED

FILE 293

11/26/01

JOB: \_\_\_\_\_

CUST: \_\_\_\_\_

ENG'R: \_\_\_\_\_

TAG: \_\_\_\_\_

DEPT: \_\_\_\_\_

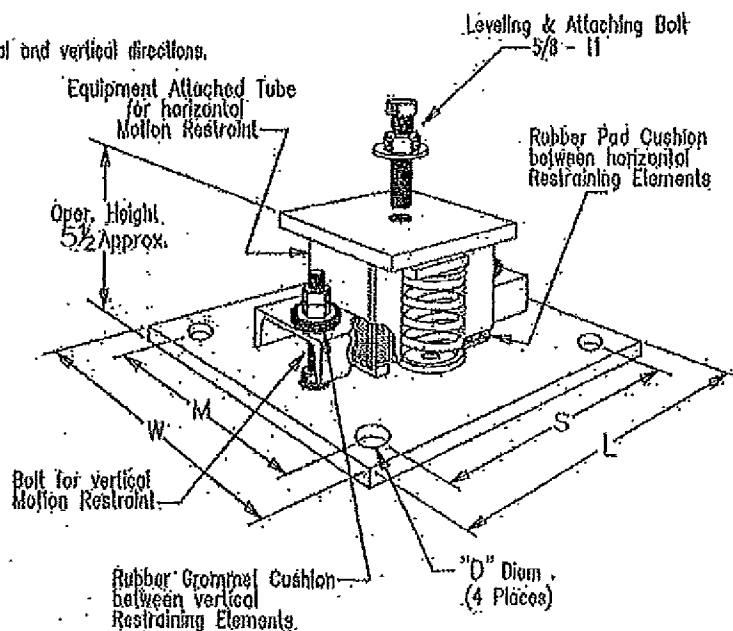
DATE: \_\_\_\_\_

#### RESTRAINT PERFORMANCE

Equipment motion is limited in all horizontal and vertical directions.

#### PROTECTION FOR

- Earthquakes
- Windloads
- Marine Installations
- Mobile Installations
- Equipment weight change due to drainage
- Unstable installations due to high equipment center of gravity



#### RESTRAINT CHARACTERISTICS

| Rating          | (lbs) |
|-----------------|-------|
| Up restraint    | 5856  |
| End restraint   | 5600  |
| Slide restraint | 3666  |

Restraint ratings determined by independent laboratory test.

#### VIBRATION ISOLATION CHARACTERISTICS

| Type | Max. Load (lbs) | Max. Defl. (in) | Spring Rate (lbs/in) |
|------|-----------------|-----------------|----------------------|
| RJSD | 42K             | 1.13            | 36                   |
| RJSD | 110K            | 1.13            | 98                   |
| RJSD | 156K            | 1.13            | 140                  |
| RJSD | 212K            | 1.13            | 188                  |
| RJSD | 240K            | 2.30            | 104                  |
| RJSD | 310K            | 2.00            | 155                  |
| RJSD | 402K            | 1.70            | 236                  |
| RJSD | 488K            | 1.13            | 432                  |
| RJSD | 592K            | 1.60            | 370                  |
| RJSD | 636K            | 1.13            | 562                  |
| RJSD | 790K            | 1.80            | 440                  |
| RJSD | 1022K           | 1.50            | 682                  |
| RJSD | 1430K           | 1.30            | 1100                 |
| RJSD | 1602K           | 1.00            | 1602                 |
| RJSD | 2120K           | 1.00            | 2120                 |
| RJSD | 3040K           | .78             | 3900                 |
| RJSD | 3920K           | .78             | 5030                 |

| BASE PLATE DESIGNATION | DIMENSION (Inches) |       |        |       |     |
|------------------------|--------------------|-------|--------|-------|-----|
|                        | L                  | S     | W      | M     | D   |
| 7855                   | 10                 | 8 1/2 | 7 1/2  | 6     | 5/8 |
| 7856                   | 10                 | 8 1/2 | 9      | 7 1/2 | 3/4 |
| 7857                   | 12                 | 10    | 10 1/2 | 9     | 7/8 |

BASE PLATE DESIGNATION MUST BE INCLUDED IN CALLOUT

#### TYPICAL CALLOUTS

RJSD 1022K 7855

(Minimum base size for use with 1/2 inch anchors).

RJSD 3040K 7857

(Maximum base size to accommodate 3/4 inch anchors).

This rugged spring isolator provides excellent vibration protection for medium & high speed machines installed on grade. Earthquake protection is also provided by means of cushioned, rugged, motion restraining elements manufactured with ideal clearances for maximum vibration isolation efficiency and earthquake protection.



**Mojave  
Electric**

## TRANSMITTAL

MOJAVE JOB # 767810

DATE: 05/18/10

JOB NAME: City of Las Vegas New City Hall  
ADDRESS: 495 Main Street  
Las Vegas Nevada 89101

TO: Customer

ATTN: Kim Symons

WE ARE SENDING  
☐ SHOP DRAWINGS  
☐ LETTER  
☐ DIMENSIONS  
☒ SUBMITTAL  
☐ SAMPLES  
☐ SUB CONTRACT

SUBMITTED FOR  
☐ APPROVAL  
☒ YOUR RECORDS  
☐ CORROSION AND RESISTANT  
☐ IMMEDIATE RELEASE TO JOB SITE  
☐ IMMEDIATE RELEASE TO GRID

ACTION TAKEN  
☒ APPROVED  
☐ APPROVED AS NOTED  
☐ REVISE AND RESUBMIT  
☐ REJECTED

| REQ. SECT. | ITEMS SUBMITTED  | MANUFACTURER | COPIES SENT | COPIES TO BE RETURNED |
|------------|------------------|--------------|-------------|-----------------------|
| 263500     | Paralleling Gear |              | 1           | 0                     |
|            |                  |              |             |                       |
|            |                  |              |             |                       |
|            |                  |              |             |                       |
|            |                  |              |             |                       |
|            |                  |              |             |                       |
|            |                  |              |             |                       |

RESUBMITTAL DUE BY: \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

RECEIVED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

3755 W. Hacienda Avenue

Las Vegas, Nevada 89118-1755

FAX 702-798-3740

CASH1143

J54-621  
JA 00004461

# Submittal Transmittal

Project Name : Las Vegas New City Hall  
Project Number : 12600

Package Name: Various Electrical Qualification Data & Certificates



Majava Electric, Inc.  
3753 W. Hacienda Ave.  
Las Vegas, NV 89118  
Tel: 702-798-1970  
Fax: 702-798-0547

The Winning-Turner Contracting Company  
6720 Via Austi Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2450

Attn: Chris Albers  
Delivered Via:

From: Elliott Lloyd  
Tracking Number:

| Item # | Rev | Description                                                | Submittal Type | Submitted Date | Reviewed Date | Reviewed By | Status   |
|--------|-----|------------------------------------------------------------|----------------|----------------|---------------|-------------|----------|
| 21120  | 001 | Low Voltage Transformers: Safety Qualification Certificate | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21060  | 001 | Electric Light                                             | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21010  | 001 | Electric Conduits                                          | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21020  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21030  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21040  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21050  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21060  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21070  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21080  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21090  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21100  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21110  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |
| 21120  | 001 | Telephone Cable System for Low Voltage System              | Qualification  | 01/17/2010     | 01/21/2010    | Approved    | Approved |

Subcontractor : Majava Electric, Inc.

Contractor

Comments:

Transmittal

Remarks:

| To         | From      | Date       | Reviewed Date | Reviewed By | Status   |
|------------|-----------|------------|---------------|-------------|----------|
| Mr. Albers | Mr. Lloyd | 01/17/2010 | 01/21/2010    | Approved    | Approved |
| Mr. Albers | Mr. Lloyd | 01/17/2010 | 01/21/2010    | Approved    | Approved |

A/E Remarks

Copies To:

02/22/2010

Winning-Turner Contracting Company

Page 1 of 1

CASH1144

J54-622  
JA 00004462

jma

Integrated Architecture

TRANSMITTAL  
No. 00481

PROJECT: City of Las Vegas City Hall  
TO: The Whiting-Turner Contracting Co.  
518 South 1st Street  
Las Vegas, NV 89101

DATE: 6/22/2010  
REF: Various Elan Oval Data & Cuts  
Submitted

JMA Project number: 2007516

ATTN: Edell Lloyd

Phone: 702-851-4189 Fax: 702-851-4188

| USE AND SEND TO:                                 | SUBMITTED FOR:                                    | ACTION TAKEN:                                        |
|--------------------------------------------------|---------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Design Review           | <input type="checkbox"/> Approved                 | <input type="checkbox"/> Approved as Submitted       |
| <input type="checkbox"/> Letter                  | <input type="checkbox"/> Your Use                 | <input type="checkbox"/> Approved as Revised         |
| <input type="checkbox"/> EIR                     | <input type="checkbox"/> As Requested             | <input type="checkbox"/> Returned After Loan         |
| <input type="checkbox"/> Change Order            | <input type="checkbox"/> Review and Comment       | <input type="checkbox"/> Resubmit                    |
| <input type="checkbox"/> Plans                   |                                                   | <input type="checkbox"/> Update                      |
| <input type="checkbox"/> Samples                 | <input type="checkbox"/> SENT VIA:                | <input type="checkbox"/> Returned by Courier/Express |
| <input type="checkbox"/> Specifications          | <input type="checkbox"/> Approved                 | <input type="checkbox"/> Returned by Courier/Express |
| <input type="checkbox"/> Other: (Please Itemize) | <input type="checkbox"/> Approved Cover Via: Mail | <input type="checkbox"/> True Date:                  |

| ITEM NO. | COPIES | DATE      | ITEM | NUMBERS       | REV. NO. | DESCRIPTION                                                           | STATUS |
|----------|--------|-----------|------|---------------|----------|-----------------------------------------------------------------------|--------|
| 0741     | 3      | 6/22/2010 | REV  | 20 22 00 0741 | 001      | Draw: Title: Bidder's Qualification Questionnaire<br>Qualification    | APP    |
| 0749     | 3      | 6/22/2010 | REV  | 20 24 13 0749 | 001      | Draw: Title: For Testing Agency Data: Qualification<br>Data           | APP    |
| 0749     | 3      | 6/22/2010 | REV  | 20 24 10 0749 | 001      | Draw: Title: For Testing Agency Data: Qualification<br>Data           | APP    |
| 0760     | 3      | 6/22/2010 | REV  | 20 26 10 0760 | 001      | Draw: Title: Enclosed Contractor Data: Shop<br>Drawings               | APP    |
| 0762     | 3      | 6/22/2010 | REV  | 20 26 13 0762 | 001      | Draw: Title: Enclosed Contractor Data: Qualification<br>Data          | APP    |
| 0774     | 3      | 6/22/2010 | REV  | 20 35 00 0774 | 001      | Draw: Title: Manufacturer Qualification Data:<br>Qualification Data   | APP    |
| 0782     | 3      | 6/22/2010 | REV  | 20 43 13 0782 | 001      | Draw: Title: For Qualified Testing Agency Data:<br>Qualification Data | APP    |
| 0783     | 3      | 6/22/2010 | REV  | 20 43 13 0783 | 001      | Draw: Title: Product Certificates for TMS Data:<br>Certification      | APP    |
| 0784     | 3      | 6/22/2010 | REV  | 20 43 13 0784 | 001      | Draw: Title: Sample Warranty Data: Warranty                           | APP    |
| 0785     | 3      | 6/22/2010 | REV  | 20 51 00 0785 | 001      | Draw: Title: Bidder's Qualification Data: Qualification Data          | APP    |

CO:

10150 Covington Cross Drive Las Vegas NV 89144 702-731-2037 T 702-731-2038 F www.jmaarch.com  
JMA Transmittal - 00481 Page 1 of 2

CASH1145

J54-623  
JA 00004463

jma

elevated architecture

TRANSMITTAL  
No. 00431

PROJECT: City of Las Vegas City Hall  
TO: The Whiting-Turner Contracting Co.  
618 South 1st Street  
Las Vegas, NV 89101  
DATE: 8/22/2010  
REF: Various Elec Civil Plans & Specs  
Submitted  
JMA Project number: 2007516

ATTN: Elliot Lloyd  
Phone: 702-851-4180 Fax: 702-851-4109

| THE ARCHITECT                                        | CONTRACTOR                                         | EXCEPTION Y/N                                    |
|------------------------------------------------------|----------------------------------------------------|--------------------------------------------------|
| <input checked="" type="checkbox"/> Shop Drawings    | <input type="checkbox"/> Approved                  | <input type="checkbox"/> Approved as Submitted   |
| <input type="checkbox"/> Letter                      | <input type="checkbox"/> Your Use                  | <input type="checkbox"/> Approved as Noted       |
| <input type="checkbox"/> Print                       | <input type="checkbox"/> As Requested              | <input type="checkbox"/> Returned After Loan     |
| <input type="checkbox"/> Change Order                | <input type="checkbox"/> Revisions and Comments    | <input type="checkbox"/> Rejected                |
| <input type="checkbox"/> Plans                       |                                                    | <input type="checkbox"/> Rejected                |
| <input type="checkbox"/> Samples                     |                                                    | <input type="checkbox"/> Rejected for Correction |
| <input type="checkbox"/> Specifications              | <input type="checkbox"/> Attached                  | <input type="checkbox"/> Due Date                |
| <input type="checkbox"/> Other: Needs Item Submitted | <input type="checkbox"/> Separate Owner Visc. List |                                                  |

| ITEM NO. | COPIES | DATE      | ITEM | NUMBER        | REV. NO. | DESCRIPTION                                                         | STATUS |
|----------|--------|-----------|------|---------------|----------|---------------------------------------------------------------------|--------|
| 0781     | 0      | 9/22/2010 | EUT  | 20 05 00 0781 | 001      | Desc: Title Plate and Support Component Data<br>Type: Certification | APP    |
| 0787     | 0      | 9/22/2010 | EUT  | 20 05 00 0787 | 001      | Desc: Title Plate Lighting Data: Confirmation Data                  | APP    |

CC:

Signoff: ECNE FOR  
Robert Messner

10150 Covington Cross Drive Las Vegas NV 89144 702-731-2033 T 702-731-2039 F www.jma.com  
JMAtransmit - L1, 8/21/10 Page 2 of 2

CASH1146

J54-624  
JA 00004464



September 21, 2010

JMA Architecture Studios  
10160 Covington Cross  
Las Vegas, NV 89144

Attention: Mr. Robert Measiana  
Subject: Las Vegas City Hall  
Our Project No. 08.0214

RECEIVED  
SEP 21 2010  
JMA

Dear Robert:

We have completed our review of the various electrical submittals for the subject project. Our comments follow:

Various Electrical Qualification Data and Certifications-Reviewed

1. Submit for vibration isolation and seismic restraint detailed design. See specification sections 260548-1.05B, 260548 2.02C and 260548 3.03.

We are retaining one (1) copy for our files and returning the balance of four (4).

If you should have any questions or concerns, please do not hesitate to call.

Very truly yours,

JBA CONSULTING ENGINEERS

*Clint Gordon*  
Clint Gordon  
Senior Project Manager- Electrical Engineering

CROVW  
FOR THE ARCHITECT - 01 SEP 2010 10:11 AM - 01 SEP 2010 10:11 AM - 01 SEP 2010 10:11 AM - 01 SEP 2010 10:11 AM - 01 SEP 2010 10:11 AM

JBA Las Vegas - 5168 W Patrick Ln - Las Vegas, NV 89110 - 702.382.0200  
Atlanta - Chicago - Houston - Las Vegas - London - Los Angeles - Miami - New Orleans - Orange County

04511147

J54-625  
JA 00004465

**Package Name: Various Electrical Qualification Data & Certificates**



The Whiting-Turner Contracting Company  
6720 Via Austli Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2650  
From: Elliott Lloyd  
Tracking Number

RECEIVED  
SEP 13 2010  
JMA

Atini: Robert Messiana  
Dellyored Vlat

ENTERED

W1502010 WTSep Turner Journal of the Society for Social Work and Human Services Page 1 of 1



for

### 1.03C - Manufacturer Certificates

Page 1 of 1

[illegible]

REVIEWED BY  
THE HARTING TURNER CONTRACTING CO  
BY SUBMITAL NO.

263500-0774-

**CASH1149**

J54-627  
JA 00004467



Las Vegas City Hall  
Division 26 35 00  
Certifications

See following pages.

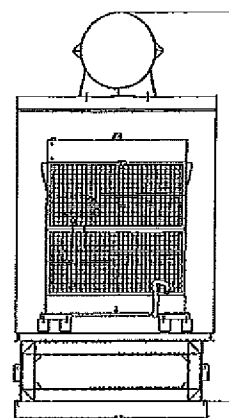
Las Vegas  
3355 W. Rosemary  
Henderson, NV 89002  
TEL: 702 438-1777  
FAX: 702 438-1156

Phoenix  
4330 Camelback Road  
Phoenix, AZ 85018  
TEL: 602 998-1111  
FAX: 602 998-1111

Phoenix  
3000 N. Central Expressway  
Phoenix, AZ 85018  
TEL: 602 998-1111  
FAX: 602 998-1111

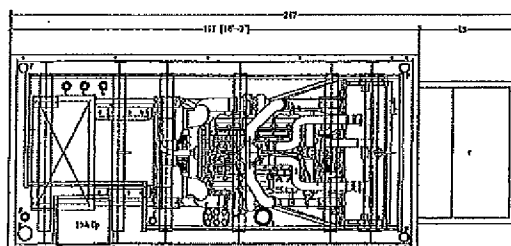
CASH1150

J54-628  
JA 00004468



**ELEVATION VIEW**

## THE VIEW



FLAY-YEV

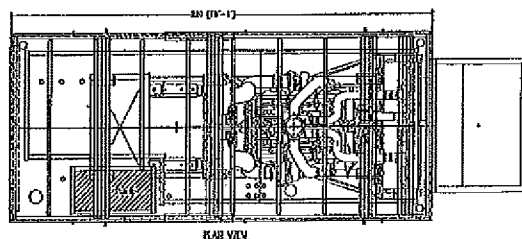
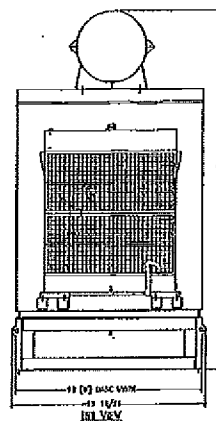
"CONCEPTUAL"

|                   |          |                                                                                                                                                                                                                                                 |                  |
|-------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| DATE              | 12/16/10 |  <b>B1 Power</b><br>405-557-5544 FAX 405-557-5544<br>1111 MILLER BLVD. SUITE 1000 OKLAHOMA CITY, OK 73102<br>DALLAS OFFICE: 214-635-1111   WWW.B1POWER.COM |                  |
| TO                |          | Custom 550 Cotton Tank -2085 LT-                                                                                                                                                                                                                |                  |
| FROM              |          | Gina Cashman                                                                                                                                                                                                                                    |                  |
| RE                |          | Agd. Kansas Vegas City Hall                                                                                                                                                                                                                     |                  |
| BY                |          | Project Manager                                                                                                                                                                                                                                 |                  |
| TOTAL<br>0.011410 |          | 06508151                                                                                                                                                                                                                                        | 341.172<br>1/8 B |

CASH/151

J54-629  
JA 00004469





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[illegible]

**CASH1153**

J54-631  
JA 00004471



REVISED 12-28-64

A1 - AIRCRAFT POSITION  
 A2 - AIRCRAFT TYPE  
 A3 - AIRCRAFT WEIGHT  
 A4 - AIRCRAFT LENGTH  
 A5 - AIRCRAFT WIDTH  
 A6 - AIRCRAFT HEIGHT  
 A7 - AIRCRAFT DENSITY  
 A8 - AIRCRAFT PRESSURE  
 A9 - AIRCRAFT TEMPERATURE  
 A10 - AIRCRAFT VIBRATION  
 A11 - AIRCRAFT NOISE  
 A12 - AIRCRAFT LIGHTS  
 A13 - AIRCRAFT SOUNDS  
 A14 - AIRCRAFT TASTE  
 A15 - AIRCRAFT TOUCH  
 A16 - AIRCRAFT SMELL  
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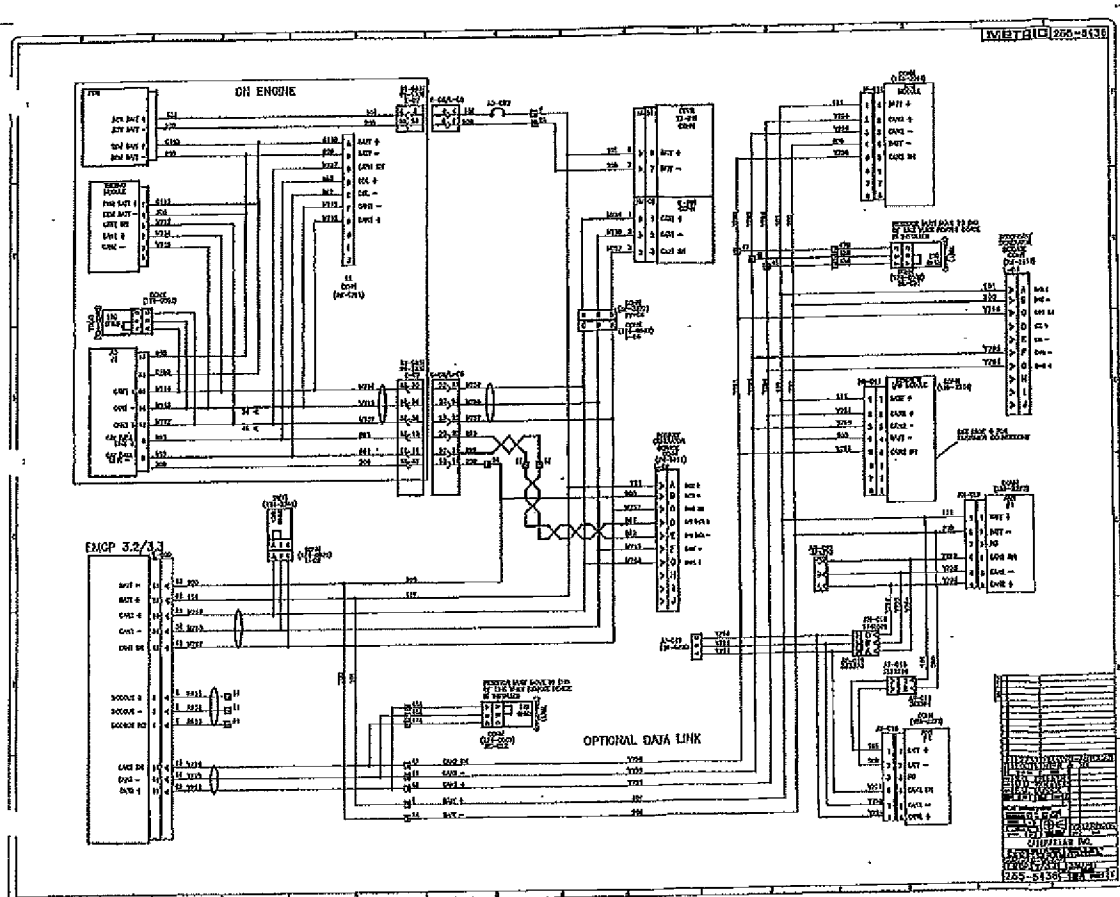
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| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70  |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
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NOTE: THIS IS A SAMPLE OF THE DATA THAT CAN BE OBTAINED FROM THE AIRCRAFT. THE DATA IS NOT TO BE USED FOR ANY OTHER PURPOSE.

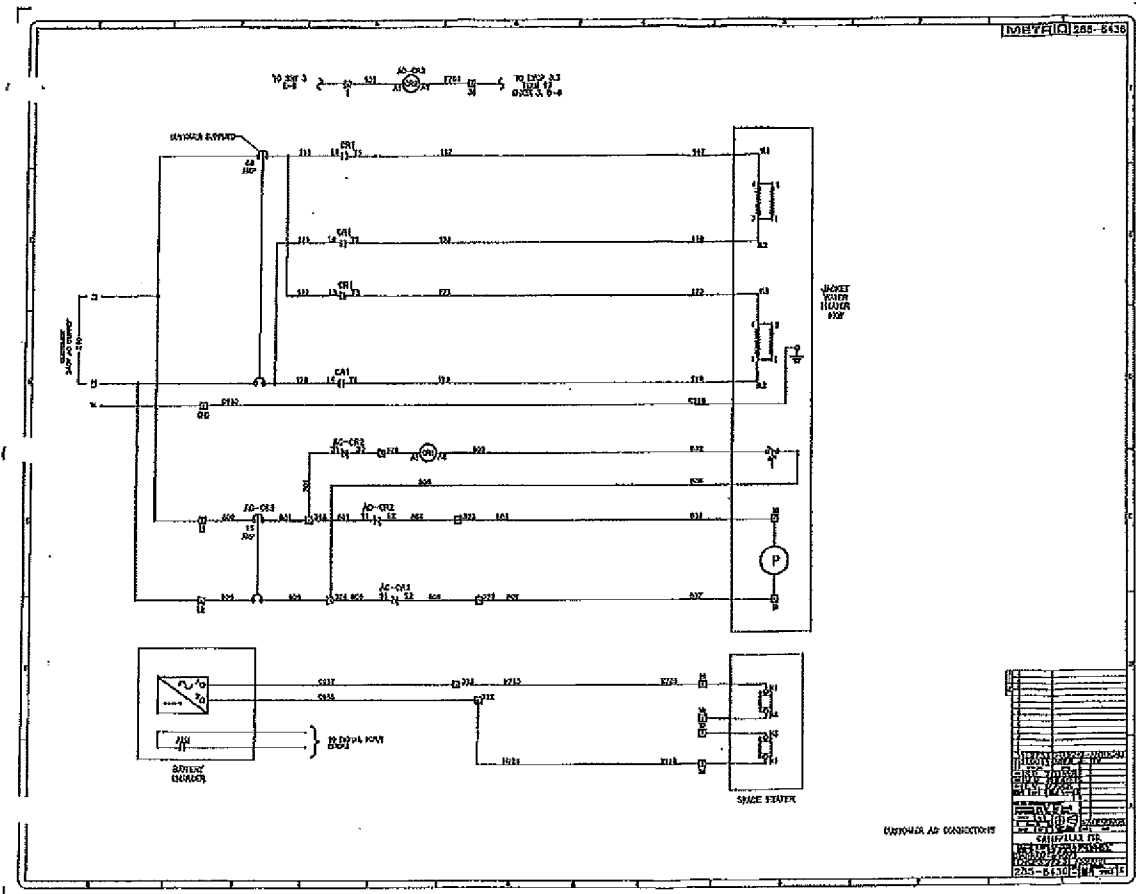
CASH1155





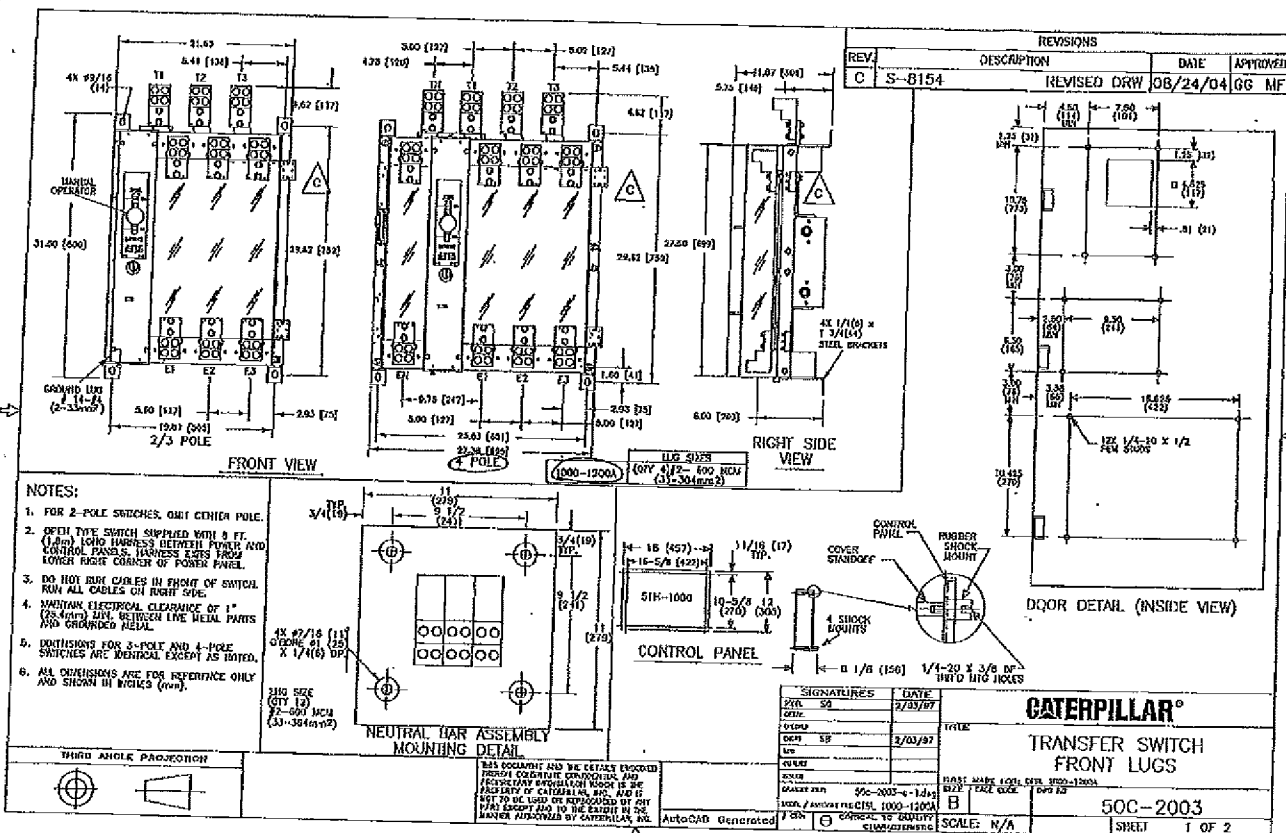


CASH115B

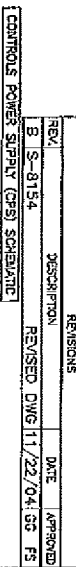


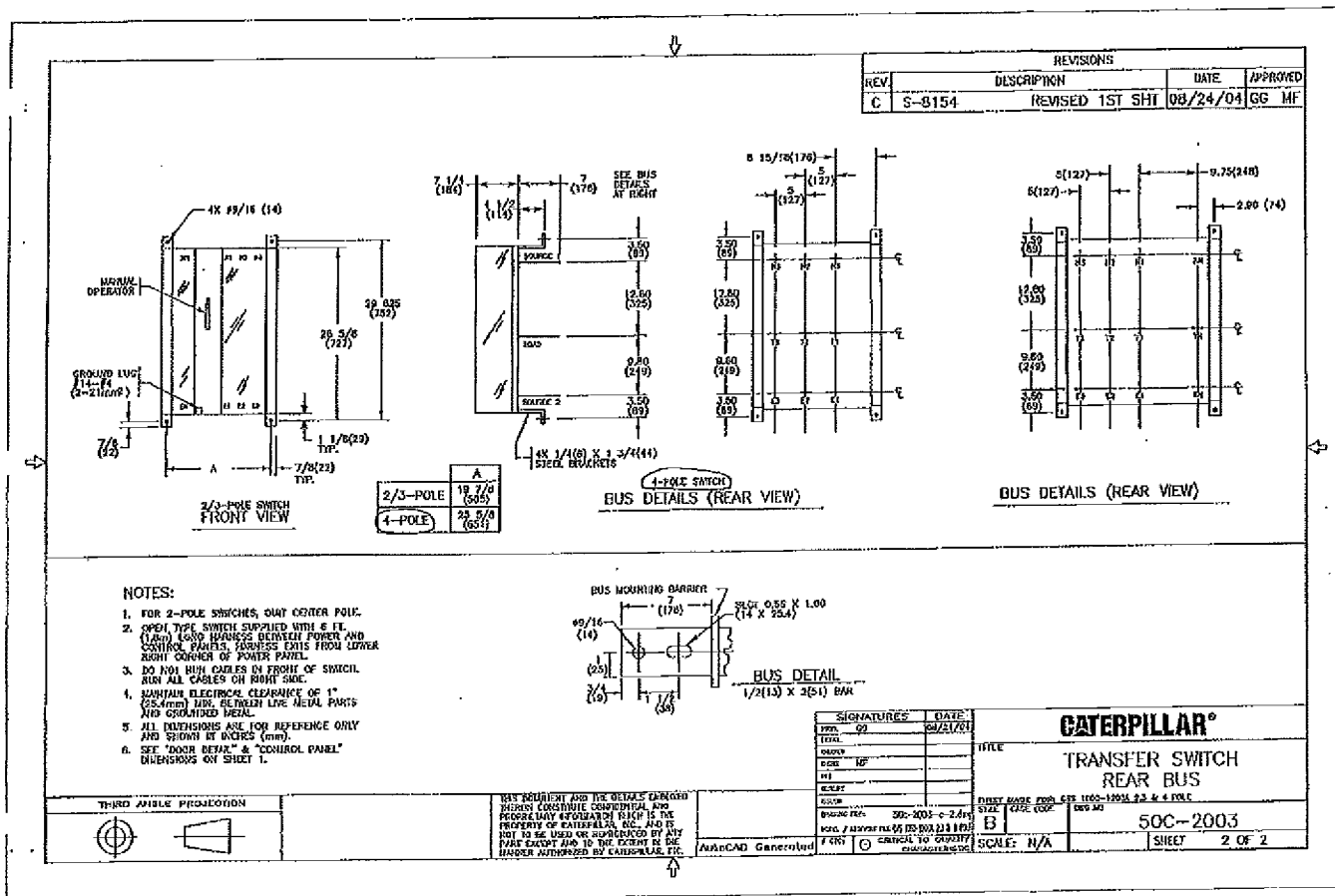
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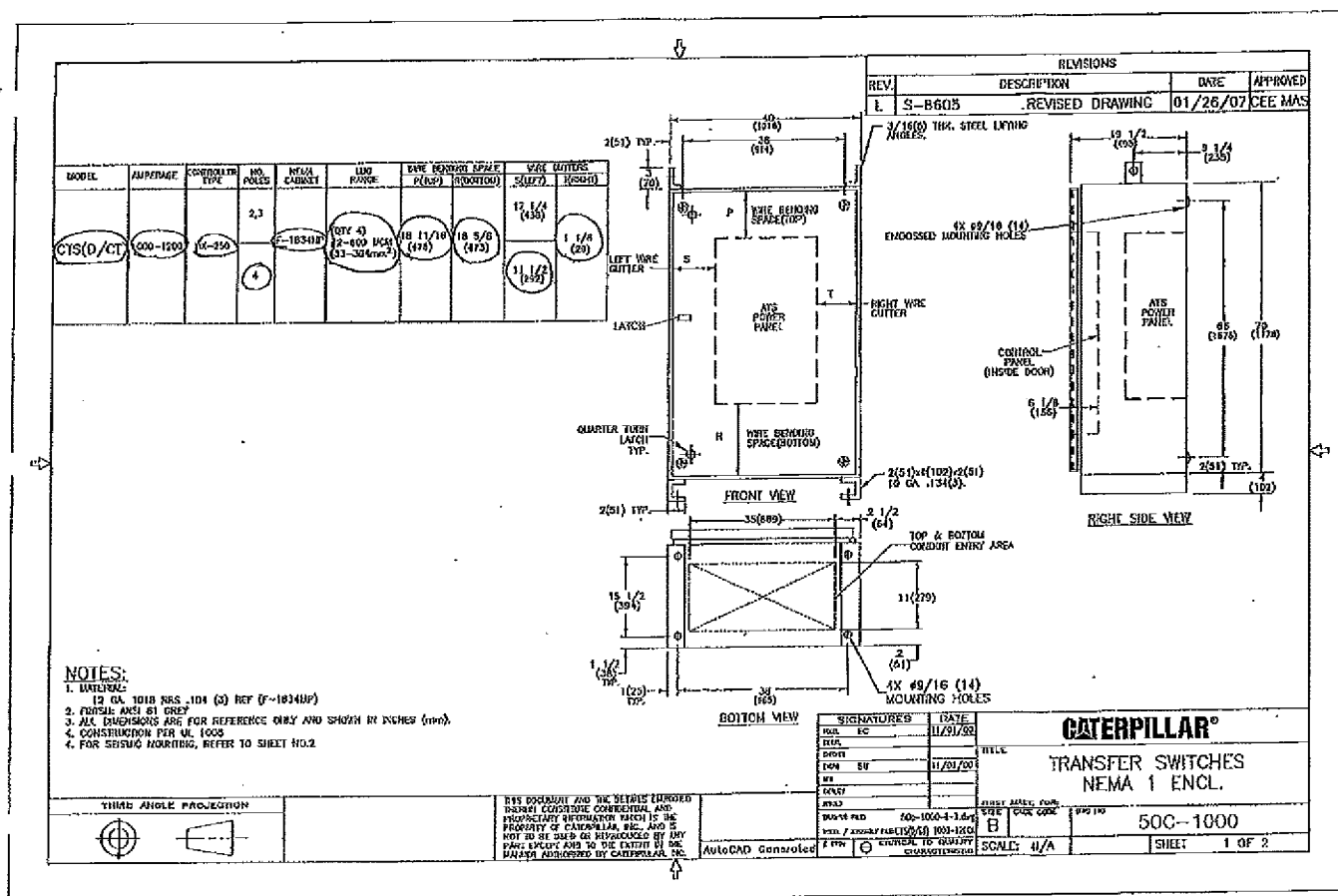


CASH111701





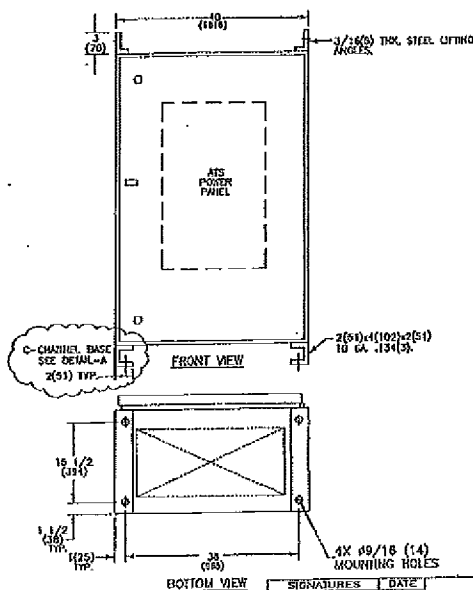
CASH11163



CASH1184

MAXIMUM DEFLECTION AT TOP OF DECK  $\delta_{50}=0.89$  INCHES (23mm)  
 $\delta_{75}=0.21$  INCHES (5mm)  
 GUARANTEED END TESTS: FRICTION: SHOCK TABLE TEST  
 ETC-0291-2005-SEAL/2.5 (4mm)  
 ETC-2002-2007KG  
 RESONANCE FREQUENCIES:  
 f1=40.3Hz  
 f2=19.5Hz  
 f3=23.3 Hz  
 MAXIMUM REACTION TO ANY BOLT  
 (TOTAL LOAD +/- SEISMIC)  
 V=8.25S EDS (450%) SHEAR  
 M=4.45S LBS (200%) CUMULATIVE  
 T=7.45S LBS (315%) WP  
 U=2.61S LBS (112%) CUMULATIVE

- 
- 2 (01)
- 5/64 (1)
- 25/64 (25)
- 1/8 (14)
- 3/16 (14)
- 3/4 (05)
- 1/2 (02)
- SEE NOTE 3
- 0-CHANNEL BASE  
DETAIL-A



| MODEL | INTERFACE | NO. PILES | NDA CABINET |
|-------|-----------|-----------|-------------|
| CLS   | 1000-1200 | 2, 3<br>4 | F-1034UP    |
| UTS0  | 1000-1200 | 2, 3<br>4 |             |
| UTS01 | 1000-1200 | 2, 3<br>4 |             |

[illegible]

CASH1165

**CTSD SERIES WITH MAX250 MICROPROCESSOR-BASED  
AUTOMATIC TRANSFER SWITCH (ATS)**

**FOR USE ON EMERGENCY OR STANDBY SYSTEMS RATED FOR TOTAL SYSTEM & MOTOR LOAD**

**A. LEGEND**

DS ..... Disconnect Switch  
 DW ..... Time Delay to SOURCE 1  
 DW ..... Time Delay to SOURCE 2  
 L1 ..... SOURCE 1 Position Light  
 L2 ..... SOURCE 2 Position Light  
 L3 ..... SOURCE 1 Available Light  
 L4 ..... SOURCE 2 Available Light  
 L5 ..... SOURCE 2 Available Light

Controls Power Supply (CPS)  
 XE1, XE2 ..... Control Transformer, SOURCE 1  
 XE1, XE2 ..... Control Transformer, SOURCE 2

Power Lamp  
 XE1, XE2 ..... Control Transformer, SOURCE 1  
 XE1, XE2 ..... Control Transformer, SOURCE 2

Transfer Operator  
 CE1 ..... Transfer Operator, Open SOURCE 1  
 CE2 ..... Transfer Operator, Open SOURCE 2  
 CE3 ..... Transfer Operator, Open SOURCE 2  
 CE4 ..... Transfer Operator, Open SOURCE 2  
 CE5 ..... Transfer Operator, Open SOURCE 2  
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 CE100 ..... Transfer Operator, Open SOURCE 2

**REVISIONS**

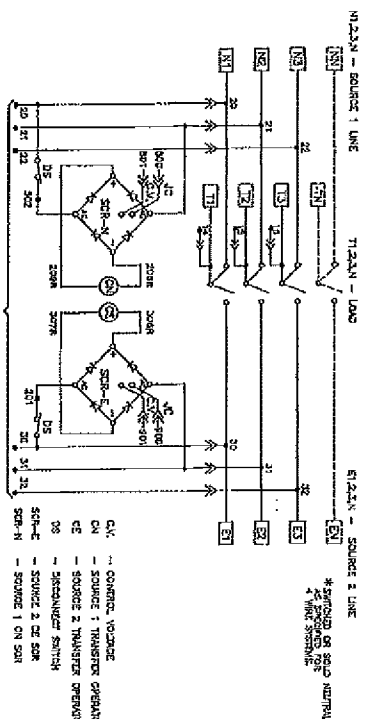
| REV | DESCRIPTION                      | DATE | APPROVED |
|-----|----------------------------------|------|----------|
| 1   | REVISED SHEET 2 04/05/07 NIS MES |      |          |

**NOTES:**

- CAUTION: In using a 3 phase, 4 wire delta or open delta power supply (usually 120/240V, sometimes listed as 120/208V) with one leg having a grounded center tap, one line will be 160 to 208A to ground. When this system is used, the load must be connected to the high leg. DO NOT CONNECT 120A LOAD CIRCUIT TO THE HIGH LEG.
- GROUNDING TERMINAL: A grounding terminal (GND) is provided. When installing open type without connect this terminal to the metal enclosure or an equivalent earth ground.
- WARNING - TO ENSURE AGAINST SHOCK OR ACCIDENT HAZARD, DISCONNECT ALL SOURCES OF SUPPLY BEFORE SERVICING.
- ON SINGLE PHASE UNITS WHERE THE SOURCE 2 IS A UTILITY LINE, CONNECT SOURCE 2 LINE SO THAT MINIMUM VOLTAGE IS MEASURED FROM N1 TO E1.
- ON SINGLE PHASE 12 POLE UNITS, CENTER POLE IS NOT SUPPLIED. RIGHT-HAND POLE IS NOT SUPPLIED ON 400A UNITS.

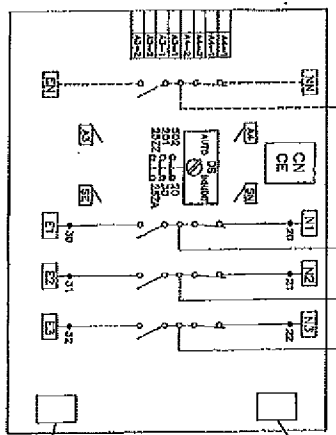
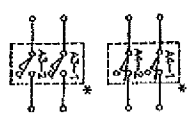
| REV.     | DESCRIPTION                | DATE | APPROVED |
|----------|----------------------------|------|----------|
| B S-8154 | REVISED DWG 07/09/04 GS TS |      |          |

ATS POWER CIRCUIT SCHEMATIC

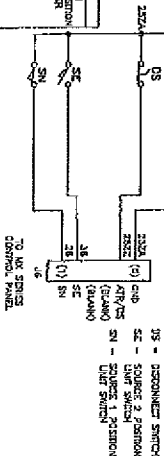


TO CONTROLS POWER SUPPLY (CPS) SCHEMATIC - SHEET 2

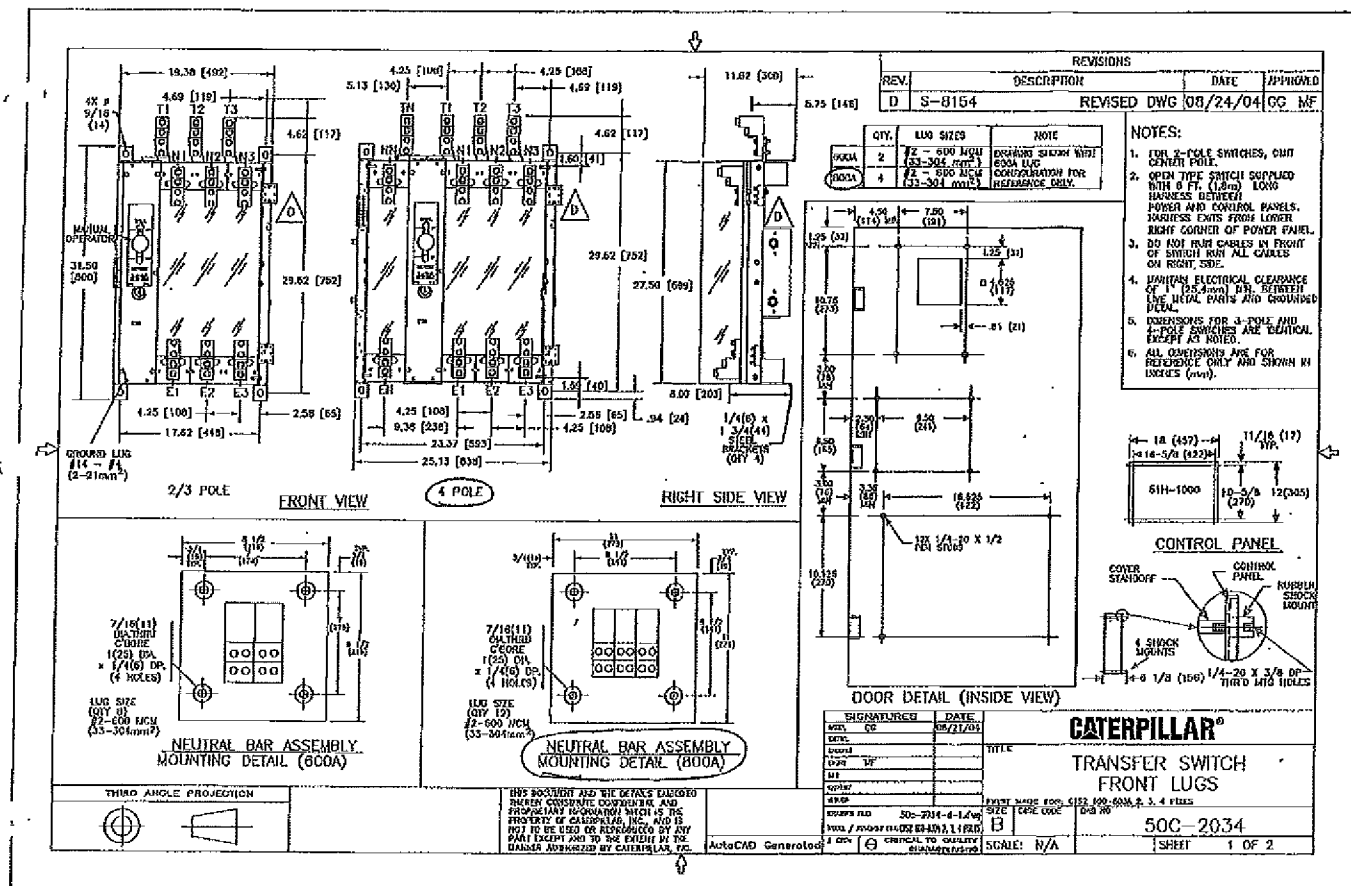
AUXILIARY CONTACTS



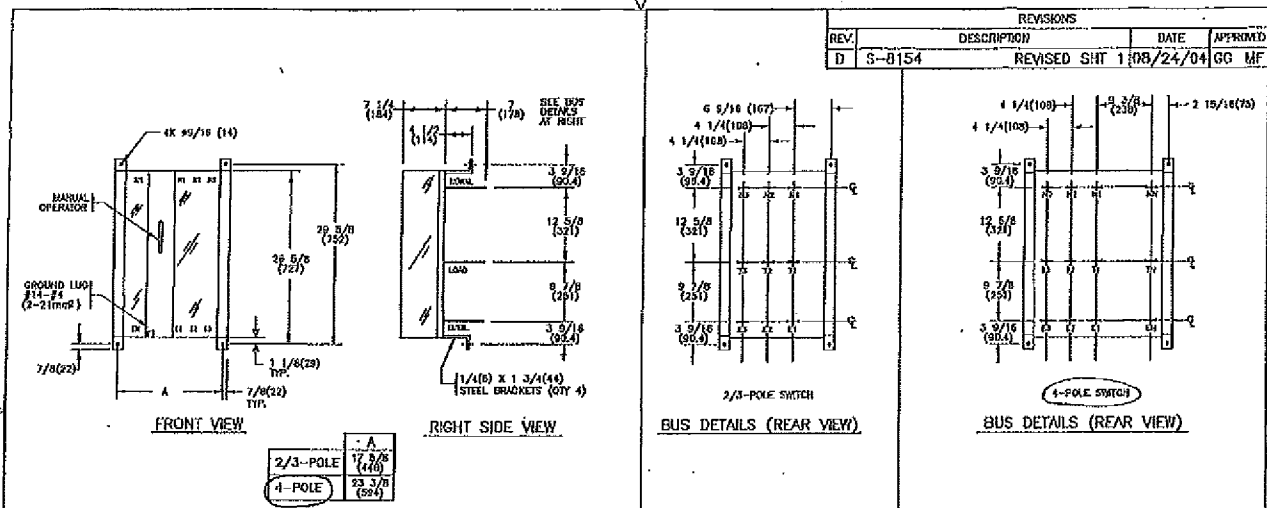
LIMIT SWITCH SCHEMATIC



| LIMIT SWITCH SCHEMATIC |                   |
|------------------------|-------------------|
| 1. LIMIT SWITCH        | 2. LIMIT SWITCH   |
| 3. LIMIT SWITCH        | 4. LIMIT SWITCH   |
| 5. LIMIT SWITCH        | 6. LIMIT SWITCH   |
| 7. LIMIT SWITCH        | 8. LIMIT SWITCH   |
| 9. LIMIT SWITCH        | 10. LIMIT SWITCH  |
| 11. LIMIT SWITCH       | 12. LIMIT SWITCH  |
| 13. LIMIT SWITCH       | 14. LIMIT SWITCH  |
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| 23. LIMIT SWITCH       | 24. LIMIT SWITCH  |
| 25. LIMIT SWITCH       | 26. LIMIT SWITCH  |
| 27. LIMIT SWITCH       | 28. LIMIT SWITCH  |
| 29. LIMIT SWITCH       | 30. LIMIT SWITCH  |
| 31. LIMIT SWITCH       | 32. LIMIT SWITCH  |
| 33. LIMIT SWITCH       | 34. LIMIT SWITCH  |
| 35. LIMIT SWITCH       | 36. LIMIT SWITCH  |
| 37. LIMIT SWITCH       | 38. LIMIT SWITCH  |
| 39. LIMIT SWITCH       | 40. LIMIT SWITCH  |
| 41. LIMIT SWITCH       | 42. LIMIT SWITCH  |
| 43. LIMIT SWITCH       | 44. LIMIT SWITCH  |
| 45. LIMIT SWITCH       | 46. LIMIT SWITCH  |
| 47. LIMIT SWITCH       | 48. LIMIT SWITCH  |
| 49. LIMIT SWITCH       | 50. LIMIT SWITCH  |
| 51. LIMIT SWITCH       | 52. LIMIT SWITCH  |
| 53. LIMIT SWITCH       | 54. LIMIT SWITCH  |
| 55. LIMIT SWITCH       | 56. LIMIT SWITCH  |
| 57. LIMIT SWITCH       | 58. LIMIT SWITCH  |
| 59. LIMIT SWITCH       | 60. LIMIT SWITCH  |
| 61. LIMIT SWITCH       | 62. LIMIT SWITCH  |
| 63. LIMIT SWITCH       | 64. LIMIT SWITCH  |
| 65. LIMIT SWITCH       | 66. LIMIT SWITCH  |
| 67. LIMIT SWITCH       | 68. LIMIT SWITCH  |
| 69. LIMIT SWITCH       | 70. LIMIT SWITCH  |
| 71. LIMIT SWITCH       | 72. LIMIT SWITCH  |
| 73. LIMIT SWITCH       | 74. LIMIT SWITCH  |
| 75. LIMIT SWITCH       | 76. LIMIT SWITCH  |
| 77. LIMIT SWITCH       | 78. LIMIT SWITCH  |
| 79. LIMIT SWITCH       | 80. LIMIT SWITCH  |
| 81. LIMIT SWITCH       | 82. LIMIT SWITCH  |
| 83. LIMIT SWITCH       | 84. LIMIT SWITCH  |
| 85. LIMIT SWITCH       | 86. LIMIT SWITCH  |
| 87. LIMIT SWITCH       | 88. LIMIT SWITCH  |
| 89. LIMIT SWITCH       | 90. LIMIT SWITCH  |
| 91. LIMIT SWITCH       | 92. LIMIT SWITCH  |
| 93. LIMIT SWITCH       | 94. LIMIT SWITCH  |
| 95. LIMIT SWITCH       | 96. LIMIT SWITCH  |
| 97. LIMIT SWITCH       | 98. LIMIT SWITCH  |
| 99. LIMIT SWITCH       | 100. LIMIT SWITCH |



CASH1150



**BUS DETAIL**  
3/4(19) X 1 1/2(38) UNIT

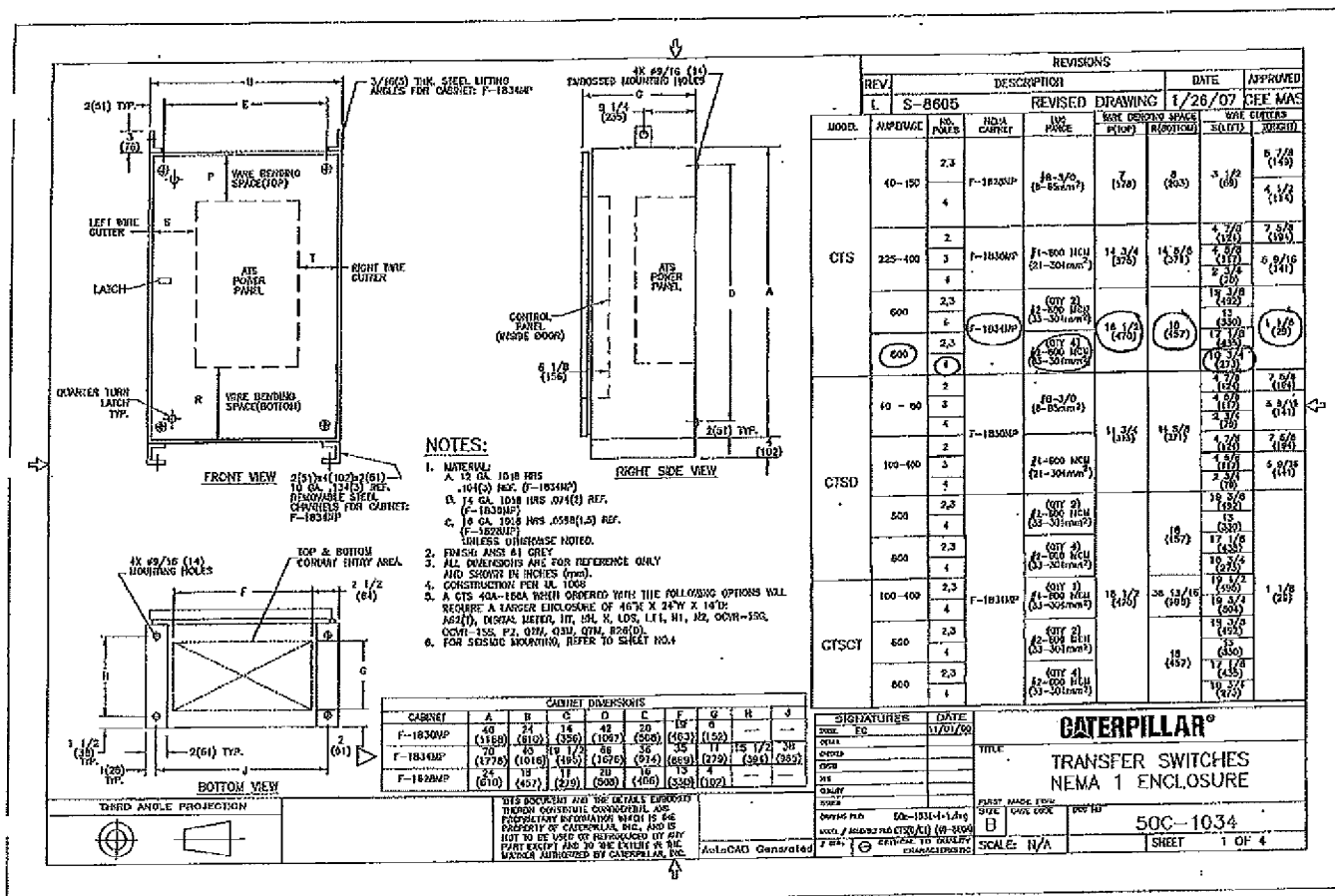
**NOTES:**

- FOR 2-POLE SWITCH, OMIT CENTER POLE.
- ONLY THE SWITCH SUPPLIED WITH 8 FT. (2.4m) LONG BARS BETWEEN POWER AND CONTROL PANELS. HANGERS EXTEND FROM LOWER RIGHT CORNER OF POWER PANEL.
- DO NOT RUN CABLES TO RIGHT OF SWITCH. RUN ALL CABLES ON RIGHT SIDE.
- Maintain electrical clearance of 1" (25.4mm) MIN. BETWEEN LIVE WIRE PAINS AND GROUNDED DETAIL.
- ALL DIMENSIONS ARE FOR FORWARD ONLY AND SHOWN IN DIMS ONLY.
- SEE "DOOR DETAIL" & "CONTROL PANEL" DIMENSIONS ON SHEET 1.

| SIGNATURES |  | DATE     | TITLE |
|------------|--|----------|-------|
| DESIGN     |  | 01/22/04 |       |
| CHECKED    |  |          |       |
| DESIGNED   |  |          |       |
| DATE       |  |          |       |
| BY         |  |          |       |

|            |              |
|------------|--------------|
| SCALE: N/A | SHEET 2 OF 2 |
|------------|--------------|

CASH1169



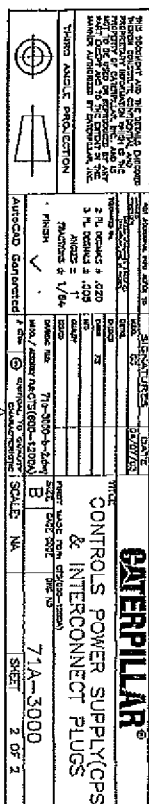
CASH1170



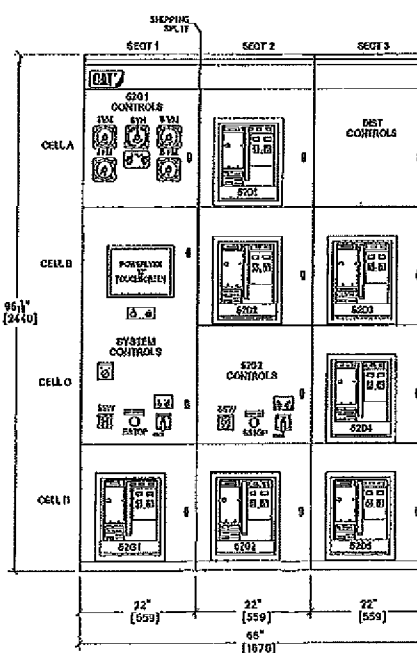
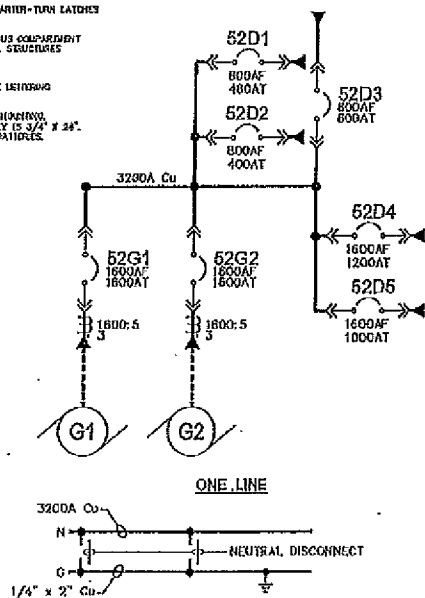


[illegible]





QUENSSETS - BONES  
(MM)  
ESTIMATED SHIPPING WEIGHTS:  
SECT 1 - 1,644 LBS.  
SECT 2 - 1,973 LBS.  
SECT 3 - 1,943 LBS.  
SECT 2 TO 3 - 3,916 LBS.



FRONT ELEVATION

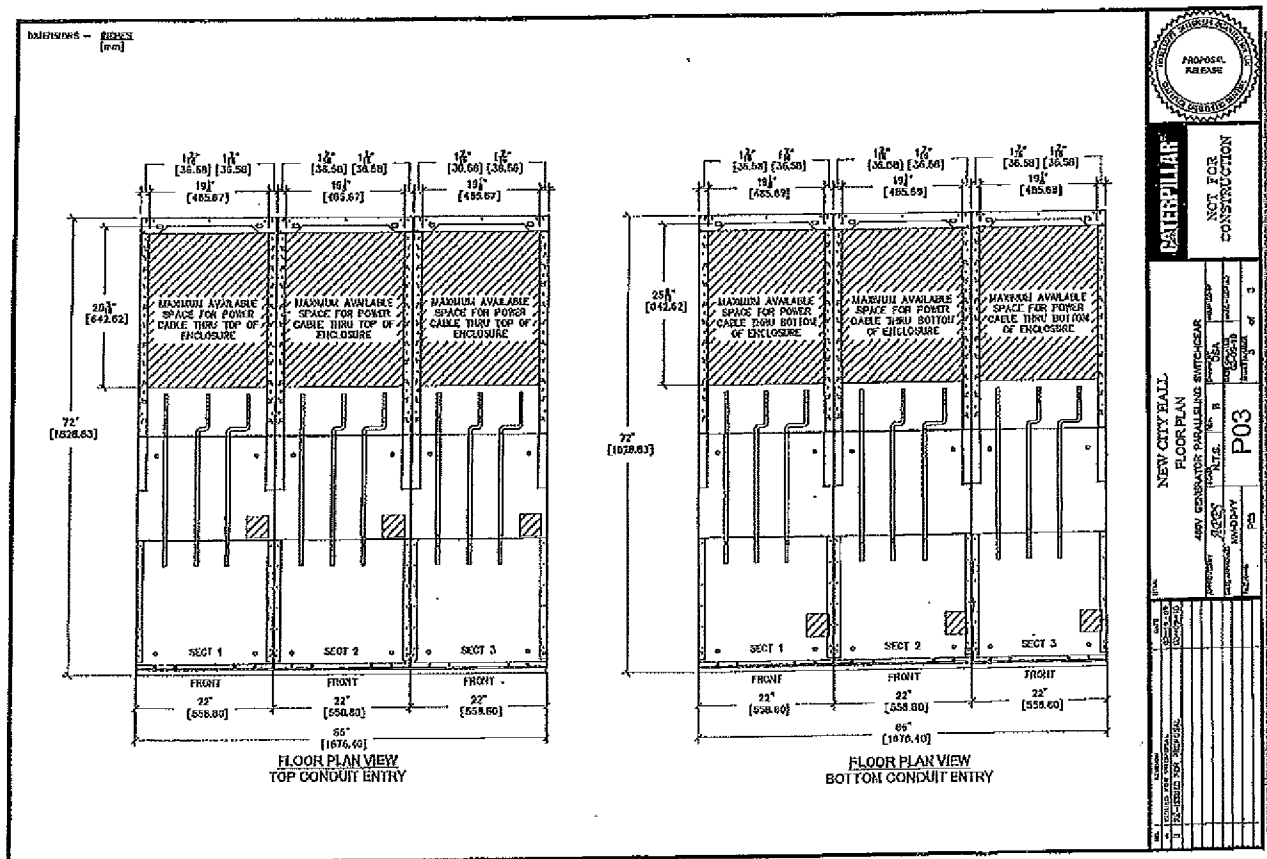


**WATERPILLAR<sup>®</sup>**

NEW CITY HALL  
FRONT ELEVATION AND ONE-LINE

|                                |    |     |
|--------------------------------|----|-----|
| 500V GENERATOR PARALLEL SWITCH | ON | OFF |
|--------------------------------|----|-----|

P01



CASH1177



# EXHIBIT 92.J55

Frances McCombs

---

From: Frances McCombs  
Sent: Tuesday, April 26, 2011 12:12 PM  
To: Atrebor Prince  
Subject: RE: Payment 109502

I have no invoice for \$329.71.

How are you getting your dollar amount, as that is not what I see on the other two invoices.

Thanks,  
Frances

From: Atrebor Prince [mailto:Atrebor\_Prince@cashmanequipment.com]  
Sent: Tuesday, April 26, 2011 11:22 AM  
To: Frances McCombs  
Subject: Payment 109502

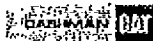
Frances,

Please review and let me know if this is the same total you have that Cam is to pay Cashman Equipment balance on this job? I have attached the back up that I have.

Thanks,

Atrebor Prince  
Collector  
Cashman Equipment Co.  
800 937-2326 Toll Free  
702 633-4604 Direct Line  
702 633-4695 Fax

[atrebor\\_prince@cashmanequipment.com](mailto:atrebor_prince@cashmanequipment.com)



**Frances McCombs**

---

**From:** Frances McCombs  
**Sent:** Monday, April 25, 2011 9:26 AM  
**To:** 'Angelo Carvalho (angelo4nevada@aol.com)'  
**Subject:** checks  
**Attachments:** cam.pdf; 767810 U F.doc; 767810 U P.doc  
**Contacts:** Angelo Carvalho

| Job #            | Release                                                      |
|------------------|--------------------------------------------------------------|
| 767810-GEN-10010 | Unconditional Final from your sub-tier                       |
| 767810-UPS-10011 | Unconditional Final from your sub-tier                       |
| 767810-TRY-10017 | Unconditional Progressive thru 3/31/11 from sub-tier and CAM |
| 769710-sys-10005 | Unconditional Progressive thru 3/31/11 from sub-tier and CAM |

The attached Unconditional and Progressive releases must be used.

CAM's release for 767810 can be one release for the total you are being paid (1%) on all three 767810 jobs.

Frances McCombs  
Accounts Payable  
Mojave Electric  
(702) 798-2970  
fax (702) 798-3740

Frances McCombs

---

From: Frances McCombs  
Sent: Monday, April 25, 2011 9:26 AM  
To: 'Angelo Carvalho (angelo4nevada@aol.com)'  
Subject: checks  
Attachments: cam.pdf; 767810 U F.doc; 767810 U P.doc

Contacts: Angelo Carvalho

| Job #            | Release                                                      |
|------------------|--------------------------------------------------------------|
| 767810-GEN-10010 | Unconditional Final from your sub-tier                       |
| 767810-UPS-10011 | Unconditional Final from your sub-tier                       |
| 767810-TRY-10017 | Unconditional Progressive thru 3/31/11 from sub-tier and CAM |
| 769710-sys-10005 | Unconditional Progressive thru 3/31/11 from sub-tier and CAM |

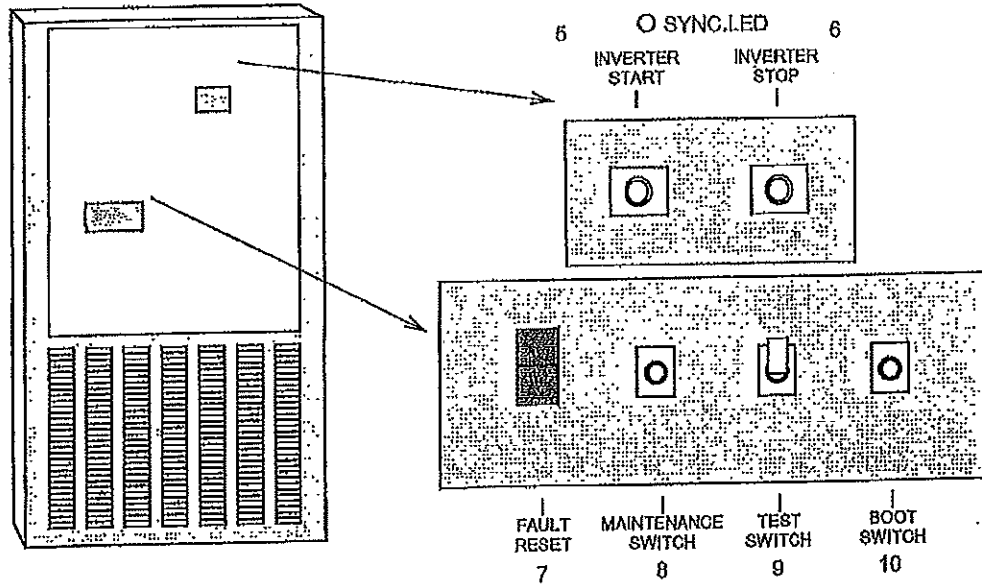
The attached Unconditional and Progressive releases must be used.

CAM's release for 767810 can be one release for the total you are being paid (1%) on all three 767810 jobs.

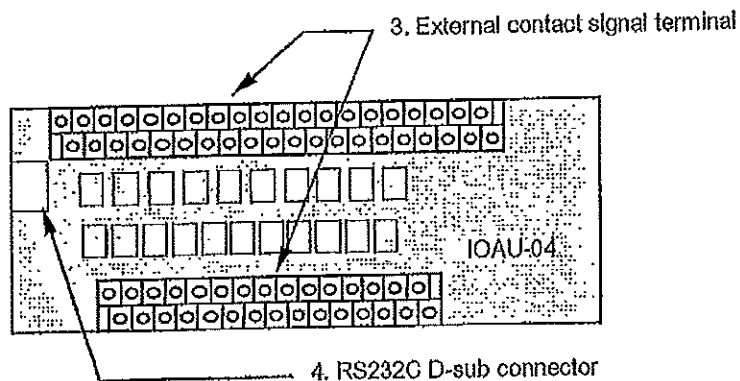
Frances McCombs  
Accounts Payable  
Mojave Electric  
(702) 798-2970  
fax (702) 798-3740

**FIGURE 1.5 UPS Parts Location (Continued)**

UPS module  
REAR OF FRONT DOOR (Right side)



**FIGURE 1.6 External I/F circuit PCB IOAU-04**



Description of Figures 1.4, 1.5, and 1.6:

1. CPM - Circuit protector for control power supply.
2. Grounding bar (G)
3. External contact signal terminal block (FIGURE 1.6) - Terminal block to connect contact signal input/output lines to and from the external devices. Refer to Figure 2.15 section 2.4 for details.
4. RS232C communication connector (FIGURE 1.6) - Refer to Figure 2.18 section 2.5 for details.
5. Inverter start switch - This switch is used to transfer the UPS from static bypass to inverter during maintenance purposes. Transfers will lock-out if the bypass voltage is more than +12%,-12% of nominal.  
*\* Uninterrupted switching is made at the time of synchronous operation. Switching is impossible at the time of asynchronous operation.*
6. "INVERTER STOP" switch - This switch is used to transfer the UPS from inverter to static bypass during maintenance purposes. Do not operate it under normal operation. Transfers will lock-out if the bypass voltage is more than +12%,-12% of nominal.  
*\* Uninterrupted switching is made at the time of synchronous operation. Switching is impossible at the time of asynchronous operation.*
7. "FAULT RESET" switch (FOR SERVICE PERSONNEL ONLY) - This switch resets errors resulting from alarm conditions. (Do not operate this switch while inverter and converter are in operation.)
8. Maintenance (Set) button (FOR SERVICE PERSONNEL ONLY) - This switch sets the UPS menu parameters.
9. "Test mode" switch (FOR SERVICE PERSONNEL ONLY) - This switch changes system operation to the test-mode. (This switch should not be operated by personnel other than an Authorized Service Engineer).
10. "BOOT" switch (FOR SERVICE PERSONNEL ONLY) - This switch boots the processor in the main control circuit resulting from alarm conditions. (Do not operate this switch while inverter and converter are in operation).

## 1.5 SPECIFICATIONS

The UPS name plate displays the rated kVA as well as nominal voltages and currents. The name plate is located on the inside of the UPS front door.

**TABLE 1.3 Power Specifications**

| Rated output<br>Power | Input voltage<br>3 phase / 3 wire | Bypass input voltage<br>3 phase / 4 wire | Output voltage<br>3 phase / 3 or 4 wire |
|-----------------------|-----------------------------------|------------------------------------------|-----------------------------------------|
| 100kVA / 80kW         | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 160kVA / 120kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 225kVA / 180kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 300kVA / 270kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 375kVA / 338kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 500kVA / 450kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |
| 750kVA / 675kW        | 480V                              | 480V or 600V                             | 480V or 600V                            |

**TABLE 1.4 UPS Module Information**

| UPS<br>[kVA] | Cable<br>Entry | Width<br>[in / mm] | Depth<br>[in / mm] | Height<br>[in / mm] | Weight<br>[lb / kg] | Heating<br>[kBTH / h] |
|--------------|----------------|--------------------|--------------------|---------------------|---------------------|-----------------------|
| 100          | BOTTOM         | 43.3 / 1100        | 29.8 / 758         | 79.7 / 2025         | 2061 / 935          | 19                    |
| 160          | BOTTOM         | 47.2 / 1200        | 29.8 / 758         | 79.7 / 2025         | 2579 / 1170         | 28                    |
| 225          | BOTTOM         | 55.1 / 1400        | 29.8 / 758         | 79.7 / 2025         | 3263 / 1480         | 43                    |
| 300          | TOP            | 76.8 / 1950        | 37.7 / 958         | 79.7 / 2025         | 4564 / 2070         | 59                    |
| 375          | TOP            | 76.8 / 1950        | 37.7 / 958         | 79.7 / 2025         | 4916 / 2230         | 73                    |
| 500          | TOP            | 114.2 / 2900       | 37.7 / 958         | 79.7 / 2025         | 6923 / 3140         | 89                    |
| 750          | TOP            | 129.9 / 3300       | 49.5 / 1258        | 79.7 / 2025         | 9193 / 4170         | 134                   |

**TABLE 1.5 Detail of Specifications**

|                                    |                                                                                                                                     |     |     |     |     |     |     |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|
| TABLE 1.5 Detail of Specifications |                                                                                                                                     |     |     |     |     |     |     |
| Rated Output kVA                   | 100                                                                                                                                 | 150 | 225 | 300 | 375 | 500 | 750 |
| Rated Output kW                    | 80                                                                                                                                  | 120 | 180 | 270 | 338 | 450 | 675 |
| AC INPUT                           |                                                                                                                                     |     |     |     |     |     |     |
| Configuration                      | 3 phase, 3 wire                                                                                                                     |     |     |     |     |     |     |
| Voltage                            | 277/480 V, 346/600 V +15% to -15%                                                                                                   |     |     |     |     |     |     |
| Frequency                          | 60 Hz +/-5%                                                                                                                         |     |     |     |     |     |     |
| Reflected Current THD              | 6% max. at 100% load; 9% max. at 50% load                                                                                           |     |     |     |     |     |     |
| STATIC BYPASS INPUT                |                                                                                                                                     |     |     |     |     |     |     |
| Configuration                      | 3 phase, 4 wire                                                                                                                     |     |     |     |     |     |     |
| Voltage                            | 277/480 V, 346/600 V +/-10%                                                                                                         |     |     |     |     |     |     |
| Frequency                          | 60 Hz                                                                                                                               |     |     |     |     |     |     |
| BATTERY                            |                                                                                                                                     |     |     |     |     |     |     |
| Type                               | Lead Acid                                                                                                                           |     |     |     |     |     |     |
| Ride Through                       | Application Specific                                                                                                                |     |     |     |     |     |     |
| Nominal Voltage                    | 480 Vdc                                                                                                                             |     |     |     |     |     |     |
| Minimum Voltage                    | 400 Vdc                                                                                                                             |     |     |     |     |     |     |
| Number of Cells                    | 240                                                                                                                                 |     |     |     |     |     |     |
| AC OUTPUT                          |                                                                                                                                     |     |     |     |     |     |     |
| Configuration                      | 3 phase, 4 wire                                                                                                                     |     |     |     |     |     |     |
| Voltage                            | 277/480 V, 346/600 V                                                                                                                |     |     |     |     |     |     |
| Voltage Stability                  | +/-1%                                                                                                                               |     |     |     |     |     |     |
| Frequency                          | 60 Hz                                                                                                                               |     |     |     |     |     |     |
| Frequency Stability                | +/-0.05% in free running mode                                                                                                       |     |     |     |     |     |     |
| Power Factor                       | 0.8 nominal   0.9 nominal                                                                                                           |     |     |     |     |     |     |
| Power Factor range                 | 0.8 to 1.0 lagging (within output kW rating)                                                                                        |     |     |     |     |     |     |
| Voltage THD                        | 2% maximum THD at 100% Linear Load<br>5% maximum THD at 100% non-linear load                                                        |     |     |     |     |     |     |
| Transient Response                 | +/-2% maximum at 100% load step<br>+/-1% maximum at loss/return of AC power<br>+/-6% maximum at load transfer to/from static bypass |     |     |     |     |     |     |
| Transient Recovery                 | Less than 20ms                                                                                                                      |     |     |     |     |     |     |
| Voltage Unbalance                  | 1% maximum at 100% unbalanced load                                                                                                  |     |     |     |     |     |     |
| Phase Displacement                 | 1deg. maximum at 100% load                                                                                                          |     |     |     |     |     |     |
| Inverter Overload                  | 125% for 10 minutes; 150% for 1 minute                                                                                              |     |     |     |     |     |     |
| System Overload                    | 1000% for 1 cycle (with bypass available)   600% for 1 cycle (with bypass available)                                                |     |     |     |     |     |     |
| Bypass Overload                    | 125% for 10 minutes                                                                                                                 |     |     |     |     |     |     |
| Withstand Rating                   | 85kA* * : with optional fuse                                                                                                        |     |     |     |     |     |     |
| ENVIRONMENTAL                      |                                                                                                                                     |     |     |     |     |     |     |
| Cooling                            | Forced Air                                                                                                                          |     |     |     |     |     |     |
| Operating Temperature              | 32° F to 104° F (0° C to 40° C).<br>Recommended : 68° F to 86° F (20° C to 30° C)                                                   |     |     |     |     |     |     |
| Relative Humidity                  | 5% ~ 95% Non Condensing                                                                                                             |     |     |     |     |     |     |
| Altitude                           | 0 to 9000 feet No Derating                                                                                                          |     |     |     |     |     |     |
| Location                           | Indoor (free from corrosive gases and dust)                                                                                         |     |     |     |     |     |     |
| Paint Color                        | Munsell 5Y7/1 (Beige)                                                                                                               |     |     |     |     |     |     |

**TABLE 1.6 Rating of Contactors and Fuses**

| NUMBER                    | APPLICATION                   | OUTPUT CAPACITY OF EQUIPMENT |                |                |                |                |                |                |                |                |                |                |                |
|---------------------------|-------------------------------|------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                           |                               | 100kVA<br>480V               | 150kVA<br>480V | 225kVA<br>480V | 300kVA<br>480V | 375kVA<br>480V | 500kVA<br>480V | 500kVA<br>500V | 500kVA<br>500V | 500kVA<br>500V | 500kVA<br>500V | 500kVA<br>500V | 500kVA<br>500V |
| CB1                       | AC input contactor            | 135A                         | 200A           | 350A           | 450A           | 600A           | 800A           | 900A           | 1200A          | 2000A          | 910A           |                |                |
| CB2                       | Battery disconnect breaker    | 225A                         | 350A           | 500A           | 700A           | 900A           | 1200A          | 2000A          | 910A           |                |                |                |                |
| CB3                       | STS contactor                 |                              |                |                |                |                |                |                |                |                |                |                |                |
| 52C                       | Inverter output contactor     | 135A                         | 200A           | 350A           | 450A           | 600A           | 800A           | 900A           | 1200A          | 2000A          | 910A           |                |                |
| 52S                       | Bypass contactor              | 135A                         | 200A           | 350A           | 450A           | 600A           | 800A           | 900A           | 1200A          | 2000A          | 910A           |                |                |
| 88RC                      | Control circuit contactor     |                              |                |                |                |                |                |                |                |                |                |                |                |
| FCU, FCV, FCW             | AC input fuse                 | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FDU, FDV, FDW             | DC arm fuse                   | 450A-690V                    | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      | 800A-690V      | 850A-690V      | 900A-690V      | 950A-690V      | 1000A-690V     |
| FDP, FDN                  | Control power fuse            | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FUA, FUB, FUC             | Bypass input ZNR fuse         | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| (OPTION)<br>FSU, FSV, FSW | Control power fuse            | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FZS1, 2, 3                | AC input ZNR fuse             | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FBS1, 2, 3                | Control power fuse            | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FZR1, 2, 3                | AC input ZNR fuse             | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |
| FPJ, FPV, FPW             | Parallel control circuit fuse | 200A-690V                    | 250A-690V      | 300A-690V      | 350A-690V      | 400A-690V      | 450A-690V      | 500A-690V      | 550A-690V      | 600A-690V      | 650A-690V      | 700A-690V      | 750A-690V      |

\*Rating would be changed.

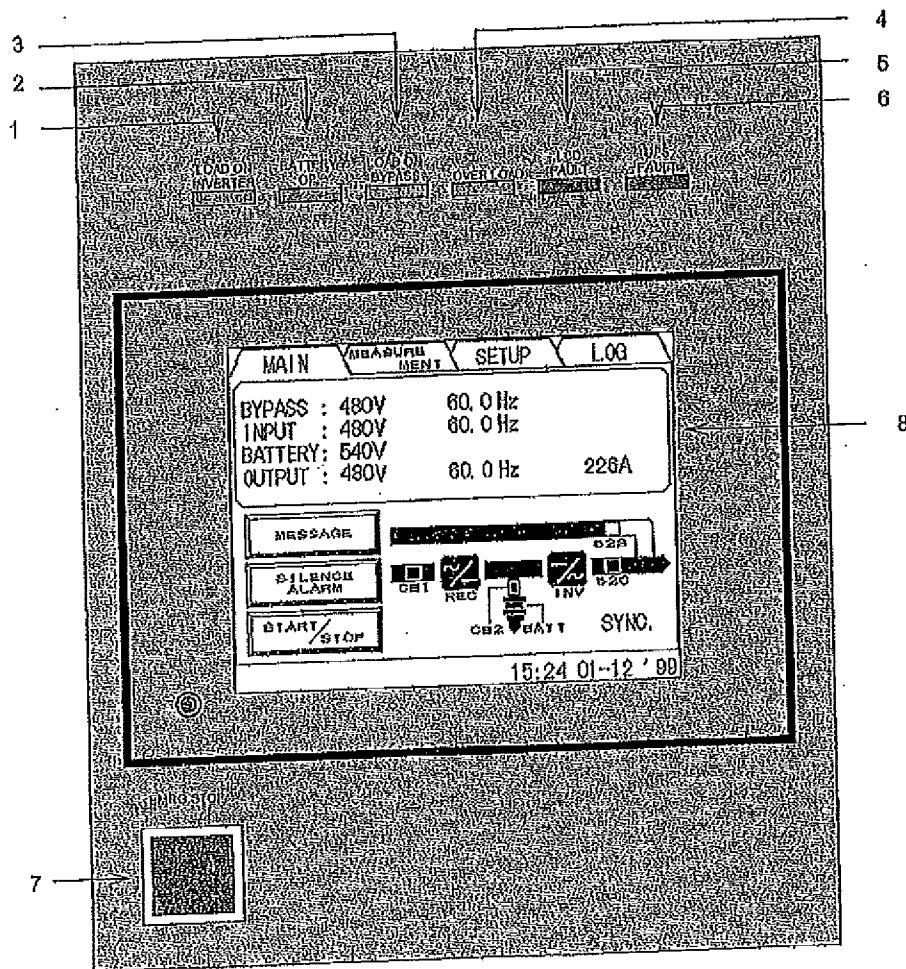
MITSUBISHI ELECTRIC 9800A SERIES UPS

## 2.0 OPERATOR CONTROLS AND INDICATORS

The 9800A Series operator controls and indicators are located as follows:

Circuit breakers and contactors: Inside the module  
UPS status indicators: Outside of front door

**FIGURE 2.1 Operation/Display Panel (Front panel)**



## 2.1 LED DISPLAY

- 1) Load on inverter [ LOAD ON INVERTER ](green)  
Illuminates when power is supplied from inverter to the critical load.  
(Indicates the state of inverter transfer switch "52C".)
- 2) Battery operation [ BATTERY OP. ](orange)  
Illuminates when power is supplied from batteries following a power failure.
- 3) Load on bypass [ LOAD ON BYPASS ](orange)  
Illuminates when power is supplied to load devices by static bypass.  
(Indicates the state of bypass transfer switch "52S".)
- 4) Overload [ OVERLOAD ](orange)  
Illuminates in overload condition.
- 5) LCD fault [ LCD FAULT ](red)  
Illuminates when an error occurs.
- 6) UPS fault [ UPS FAULT ](red) [Annunciator: intermittent or constant tones]  
Illuminates when an error occurs in the system. In this case, the details of the error are indicated on the display panel.

## 2.2 EPO BUTTON (Emergency Power Off button) (7)

When activated, the Emergency Power Off (EPO) function shuts down the UPS module. The critical load will lose power and also shutdown. The EPO function can be performed both locally or remotely.

## 2.3 LIQUID CRYSTAL DISPLAY (8)

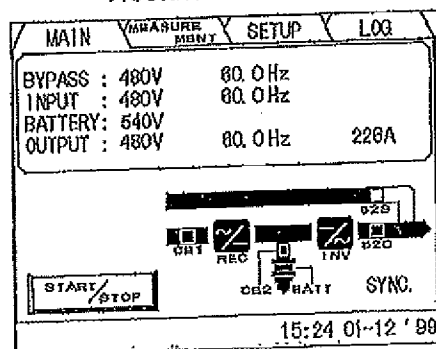
The Liquid Crystal Display (LCD) panel indicates power flow, measured values, operational guidance, data records and error messages. The LCD panel has a back-light which facilitates viewing in different ambient lighting conditions. The LCD will automatically clear and turn off, if the screen is not activated within 3 minute period. The LCD is turned back on when it is touched again. The ERROR indicator is cleared after 24 hours and can be reproduced by pressing any key on the panel.

### 2.3.1 MENU

#### A) MAIN MENU (FIGURE 2.2)

The LCD panel indicates power flow and measured values, while also operating the start/stop function. The LCD panel also allows the user to verify the status and operation of the UPS Module.

FIGURE 2.2 Main screen



The following will be displayed when the START/STOP key on the LCD panel is pressed:

#### 1) Start/Stop screen (FIGURE 2.3)

The display indicates the start and stop operations for the UPS system. If this operation is PIN protected, the user is required to enter the security PIN before the screen can be accessed. Refer to (FIGURE 2.4).

When in remote mode, the message "REMOTE operating model" will appear on this Screen. The user cannot operate the start and stop functions without changing the setup from remote mode to local mode.

When bypass voltage is abnormal, the message "Bypass voltage abnormal" will appear.

-Start: When the bypass voltage is abnormal, the LCD asks the operator if an interrupted transfer is acceptable (Load may be lost). (FIGURE 2.5)

-Stop: When the bypass voltage is abnormal, the user cannot transfer from inverter to bypass line.

FIGURE 2.3 Start/Stop screen

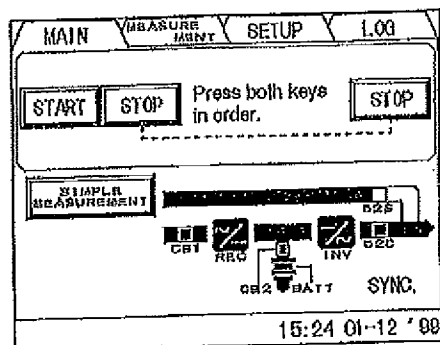


FIGURE 2.4 PIN protection screen

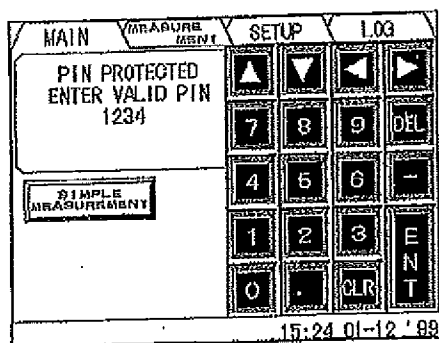
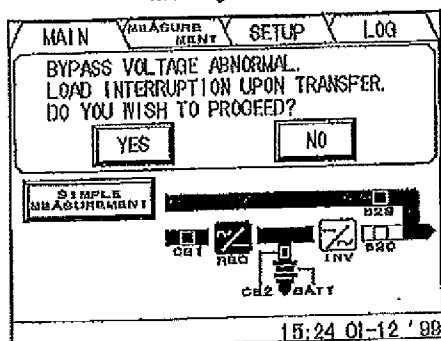


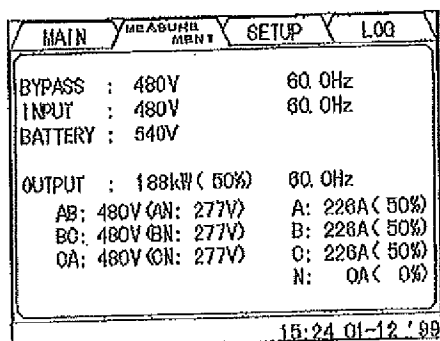
FIGURE 2.5 Bypass voltage abnormal message screen



#### B) MEASUREMENT MENU (FIGURE 2.6)

This screen shows details of measured values. Bypass voltage, input voltage, output line to line voltage and output frequency are displayed. Output currents are displayed as RMS values.

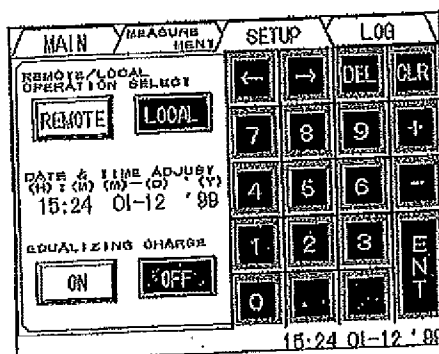
FIGURE 2.6 Measurement screen



**C) SETUP MENU (FIGURE 2.7)**

This screen prompts the user to select: (a) whether the start & stop operation will be performed by local or remote operation; (b) date & time adjustment; (c) battery equalizing charge. The battery equalizing charge operation key will appear when battery equalizing charge is set up (Setup is based on battery type).

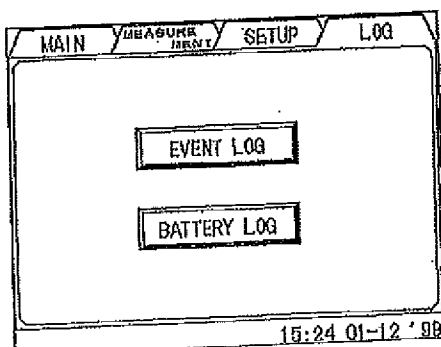
**FIGURE 2.7 Setup screen**



**D) LOG MENU (FIGURE 2.8)**

This menu shows operation / failure and battery discharge records.

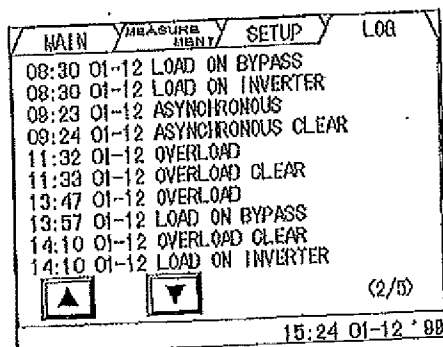
**FIGURE 2.8 Log select screen**



**1.) Event log (FIGURE 2.9)**

Operation and failure records are indicated. Maximum of 50 events are displayed.

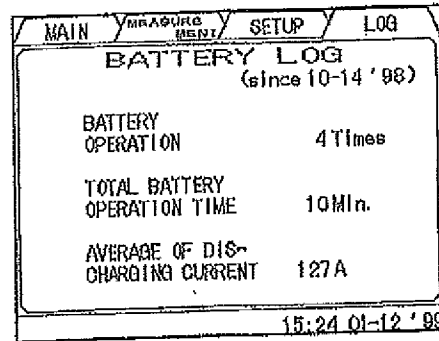
**FIGURE 2.9 Event log screen**



## 2.) Battery log (FIGURE 2.10)

This screen displays the cumulative battery discharging record.

FIGURE 2.10 Battery log screen



## 2.3.2 INPUT POWER FAILURE

During an Input Power Failure, the UPS Inverter will be powered by the UPS batteries. The following will be displayed on the main and measurement screen (Indication of battery operation and remaining battery life).

FIGURE 2.11 Main screen  
(Battery operation)

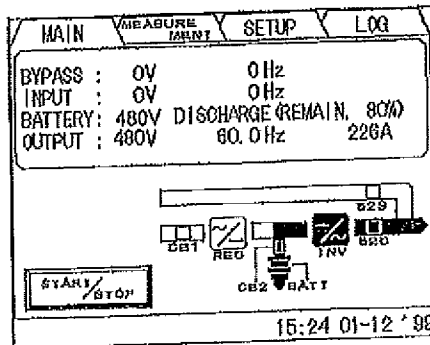
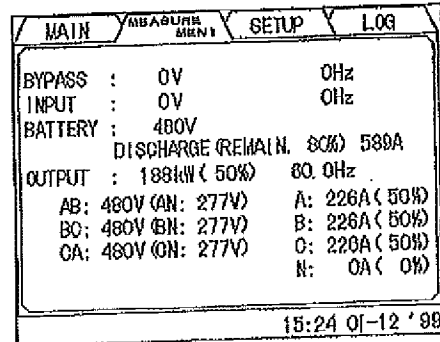


FIGURE 2.12 Measurement screen  
(Battery operation)

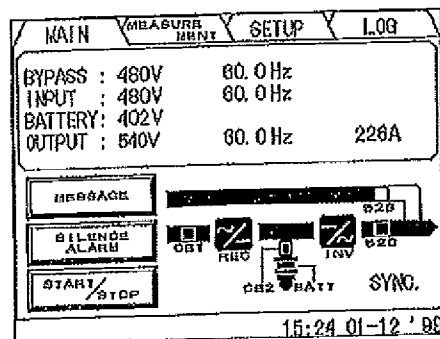


The LCD will display a battery low voltage message when the battery capacity is near depletion. The End of Battery Discharge announcement is displayed when the battery end voltage is reached. At this time, the Inverter will perform an electronic shutdown to prevent battery loss of life typical from extreme deep discharge conditions. When the input power is restored, the Inverter will automatically restart to power the load, and the batteries will be simultaneously recharged. The End of Battery announcement is shown at the bottom of the screen.

### 2.3.3 FAULT INDICATION (FIGURE 2.13)

"MESSAGE" and "SILENCE ALARM" buttons will appear on the main menu when UPS failure condition has occurred.

FIGURE 2.13 Main screen (Fault Indication)

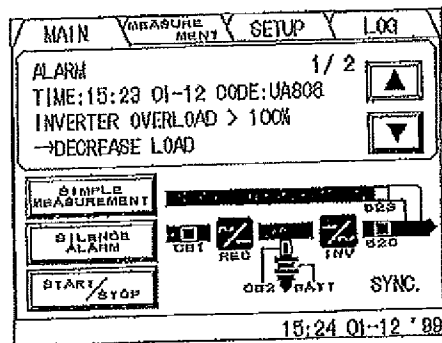


The following will be displayed when the message key on the LCD panel is pressed.

#### 1) Message (FIGURE 2.14)

The display shows a fault code, the description of the fault and a guidance of what action is to be taken by the user. A maximum of 10 faults is displayed at one time. If an input power failure occurs during a fault condition, the fault indication and input power failure announcement are alternatively displayed at 5 second intervals.

FIGURE 2.14 Message screen



#### 2) Silence alarm

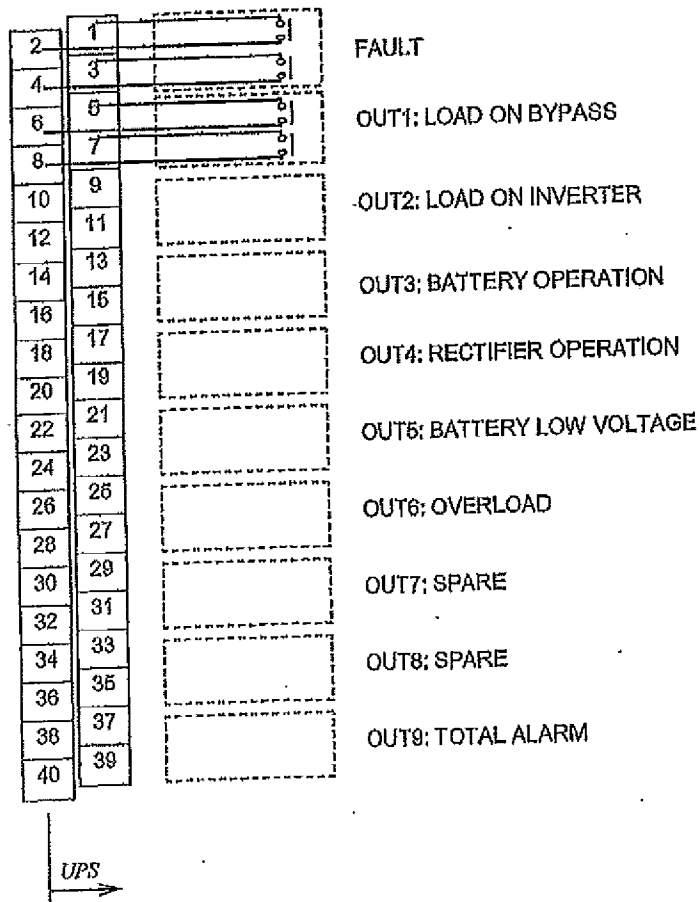
This key will appear when a failure occurs. The audible alarm (announcing the failure) can be silenced by pressing this key.

## 2.4 EXTERNAL SIGNAL TERMINAL BLOCK

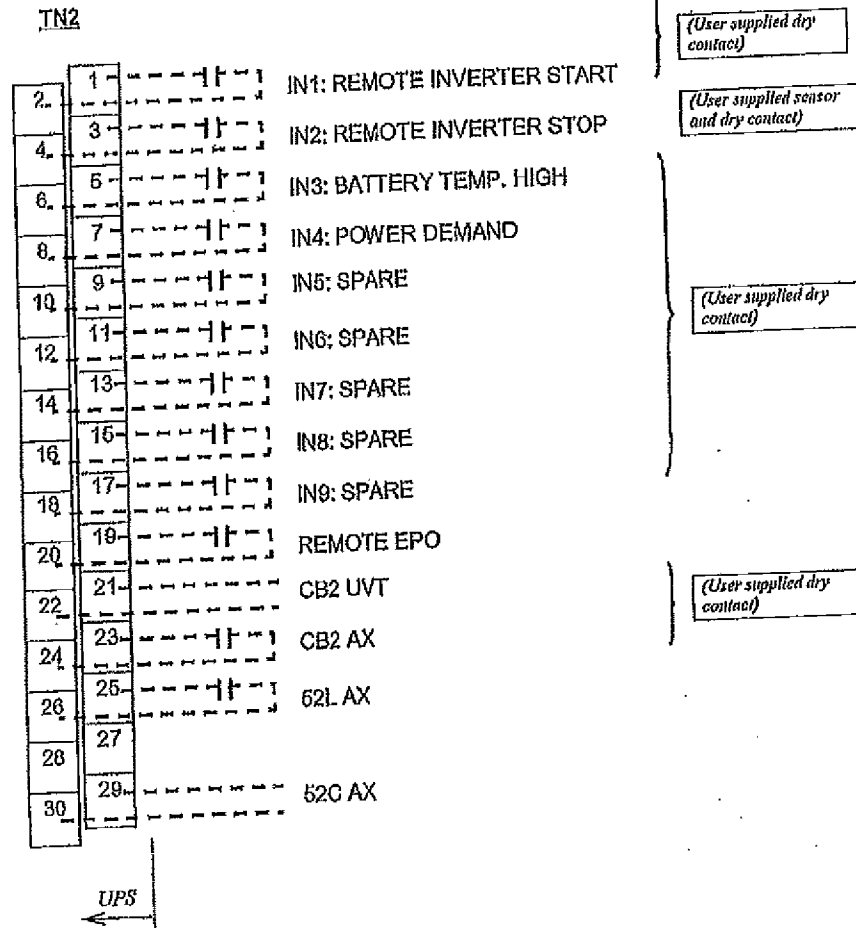
The UPS is equipped with a series of input/output terminals for external annunciation of alarms and for remote access of certain UPS functions. The layout of terminals is shown in Figure 2.15. with a functional description of the input/output port presented. OUT1 to OUT6 are user programmable, but are factory default set being also shown in Figure 2.15.

**FIGURE 2.15-1 External Signal Terminal Block (NEC Class2)**

**TN1**



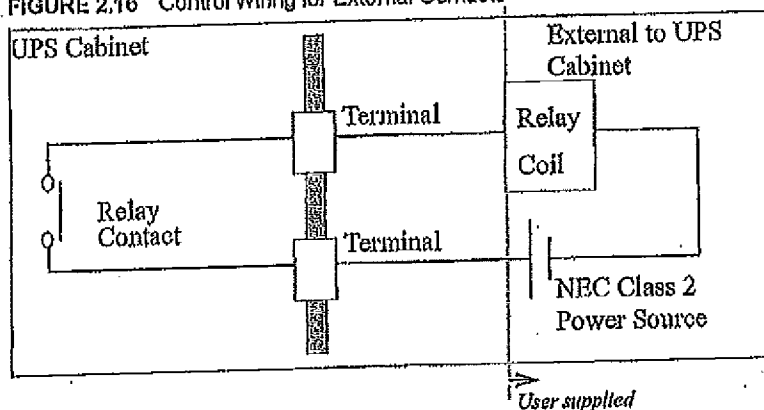
**FIGURE 2.15-2 External Signal Terminal Block (NEC Class2)**



**A) Output Contacts (for external alarm annunciation)**

Output contacts consist of form "A" dry type contacts. Rated capacity of all output contacts is NEC Class2 (30Vdc/1Adc). All dry contacts should be operated at their rated values or lower. Figure 2.16 illustrates a typical installation. The external relay can also be a lamp, LED, computer, etc.

**FIGURE 2.16 Control Wiring for External Contacts**



**Details of output alarm contacts : TN1**

Terminals 1 to 2, 3 to 4 "UPS failure" contact

Activated when a major fault has occurred with the system.

Terminals 5 to 6, 7 to 8 "Load on Bypass" contact (OUT1)

Activated when the power is supplied from the static bypass input.

Terminals 9 to 10, 11 to 12 "Load on Inverter" contact (OUT2)

Activated when the power is supplied by the inverter.

Terminals 13 to 14, 15 to 16 "Battery Operation" contact (OUT3)

Activated when the battery is operating following an AC power failure.

Terminals 17 to 18, 19 to 20 "Rectifier Operation" contact (OUT4)

Activated when the rectifier is operating.

Terminals 21 to 22, 23 to 24 "Battery Low Voltage" contact (OUT5)

Activated when the battery voltage drops below discharge end voltage level during inverter operation (i.e. During AC fail condition).

Terminals 25 to 26, 27 to 28 "Overload" contact (OUT6)

Activated when an overload has occurred to the system.

Terminals 29 through 36 "Spare" contact (OUT7 and OUT8)

Terminals 37 to 38, 39 to 40 "Total Alarm" contact (OUT9)

Activated when an alarm has output to the system.



**NOTE:** *The UPS is equipped with a selectable output contact feature. The above alarms are the default settings. Contact MITSUBISHI ELECTRIC POWER PRODUCTS, INC for setup information.*

**B) Input Contacts (for remote access of UPS)**

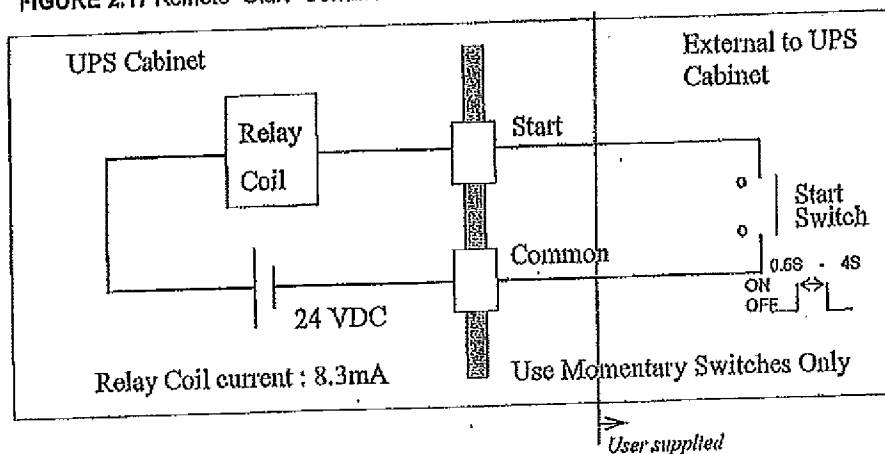
External contacts are provided by the user of the UPS system. Terminal voltage at the UPS is 24Vdc. Provide external dry contact accordingly.



**CAUTION:** *Do not apply voltages to remote access input terminals. Damage to UPS may result.*

Refer to Figure 2.17 for a typical wiring configuration. Although this figure applies to the remote start/stop terminals, the same wiring arrangement is used for emergency stop; battery liquid low; and battery temperature high.

**FIGURE 2.17 Remote "Start" Contact Connections**



**Details of Input contacts for remote access : TN2**

**Terminals 1 to 2 Remote "Inverter Start" input terminal (IN1)**

Used to start inverter from a remote location. UPS must be programmed for remote operation. Refer to Operations Menu for procedure.

**Terminals 3 to 4 Remote "Inverter Stop" input terminal (IN2)**

Used to stop inverter from a remote location. UPS must be programmed for remote operation. Refer to Operations Menu for procedure.

**Terminals 5 to 6 "Battery Temp. High" contact input (IN3)**

Input fed by a thermocouple that monitors battery temperature. The converter float voltage level is reduced for battery over-temperature conditions. External thermocouple is user supplied

**Terminals 7 to 8 "Power Demand Command" contact input (IN4)**

This contact is used to control the input power. Power demand is turned ON when the contact is closed, and power demand is turned OFF when the contact is open.

**Terminals 9 to 18 "Spare" contact input (IN5 through IN9)**

**Terminals 19 to 20 "Remote EPO" contact input**

Used to perform a remote UPS Emergency Power Off (EPO).

*The load will be dropped.*



**NOTE:** *The UPS is equipped with a selectable output contact item.  
The above items are the default settings. MITSUBISHI ELECTRIC  
POWER PRODUCTS, INC for setup information.*



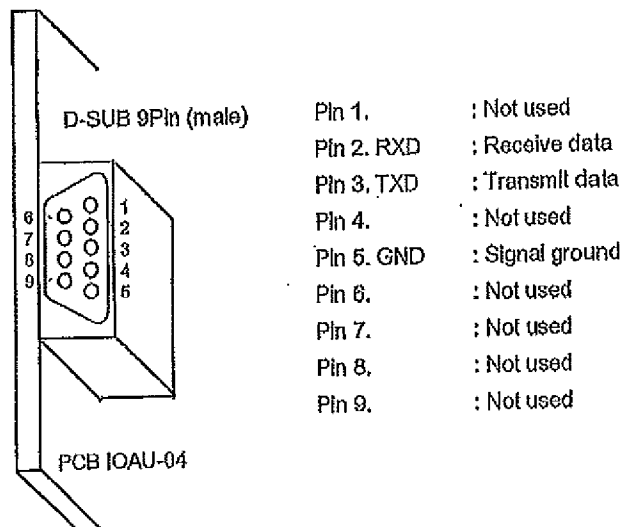
**CAUTION :** *In all cases, a switch having a protective cover is recommended  
in order to reduce the possibility of accidental operation.*

**2.5 EXTERNAL COMMUNICATION CONNECTOR**

This is an RS232C port for "DiamondLink" monitoring software.

The layout of connector is shown in Figure 2.18.

**FIGURE 2.18** External communication connector (NEC Class2)



*\* Consult MITSUBISHI ELECTRIC POWER PRODUCTS, INC for details on "DiamondLink" monitoring software and its capabilities.*

### 3.0 INSTALLATION AND OPERATION

#### 3.1 TRANSPORTATION AND INSTALLATION

**TABLE 3.1** How to transport and install the system

| Transportation                                                                      | Installation                                                                                                             |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Transport unit with forklift.<br>Carry with overhead crane using eyebolts provided. | Using the pre-drilled holes (4 - 24) in the UPS channel base, anchor the unit using appropriate hardware. (Not provided) |



**CAUTION :** *Do not transport in a horizontal position. Cabinets must be maintained upright within +/- 15° of the vertical during handling.*

#### 3.2 INSTALLATION PROCEDURE

- A) Note the load tolerance of the floor  
Refer to Table 3.2 for list of UPS weights.

**TABLE 3.2** List of UPS weights

| UPS Capacity (kVA) | 100   | 150   | 225   | 300   | 375   | 500   | 750   |
|--------------------|-------|-------|-------|-------|-------|-------|-------|
| Weight (lb.)       | 2,061 | 2,679 | 3,263 | 4,564 | 4,916 | 6,923 | 9,193 |

- B) Minimum clearance required for ventilation

Right side ..... 25 mm (not required when sidecars are used)  
Left side ..... 25 mm (not required when sidecars are used)  
Back side ..... 0.0 mm  
Top side ..... 800 mm (for air flow)

- C) Space requirement for routine maintenance

Allow for the following space at the time of installation.

Front ..... 1000 mm 100kVA, 150kVA, 225kVA  
                                  1075 mm 300kVA, 375kVA, 500kVA, 750kVA  
Sides ..... 0.0 mm  
Rear ..... 0.0 mm

**D) External Battery Supply**

Please refer to the following when installing and maintaining batteries:



1. The customer shall refer to the battery manufacturer's installation manual for battery installation and maintenance instructions.
2. The maximum permitted fault current from the remote battery supply, and the DC voltage rating of the battery supply over-current protective device are shown in Table 3.3.

**TABLE 3.3 Maximum Permitted Fault Current**

| UPS Capacity<br>(kVA) | DC Voltage<br>Rating (V) | Maximum Fault<br>Current Permitted (A) |
|-----------------------|--------------------------|----------------------------------------|
| 100                   | 480                      | 25,000                                 |
| 150                   | 480                      | 25,000                                 |
| 225                   | 480                      | 25,000                                 |
| 300                   | 480                      | 25,000                                 |
| 375                   | 480                      | 25,000                                 |
| 500                   | 480                      | 25,000                                 |
| 750                   | 480                      | 25,000                                 |

**3.3 PROCEDURE FOR CABLE CONNECTIONS \***

1. Confirm the capacity of the UPS being installed. Identify the input/output power terminal blocks as shown in the appropriate Figures 3.1 through 3.2-a~g, Figure 3.3.
2. Connect the internal control wire and power wire.
  - (1) Control wire Inter-connect
    1. CB2 NO Auxiliary to terminal TN2- 23, 24.
    2. CB2-UVT to terminal TN2- 21, 22.
  - (2) Power wire Inter-connect
    - a.) From user's distribution panel
      1. X1 (A-phase) to A bus bar in UPS rectifier section.
      2. X2 (B-phase) to B bus bar in UPS rectifier section.
      3. X3 (C-phase) to C bus bar in UPS rectifier section.

b.) DC Input to UPS

1. Positive cable to BP bus bar in UPS rectifier section.
2. Negative cable to BN bus bar in UPS rectifier section.

3. Connect the grounding conductor from the Input service entrance to the UPS ground bar.



4. Two (2) sources feeding the UPS:

- (1) Connect the rectifier input power cables from the Input service entrance to the rectifier input power terminals, identified as A, B, C in Figures 3.2-a~g. Input cables must be sized for an ampere rating larger than the maximum input drawn by the rectifier. (Refer to equipment nameplate for current ratings.) Confirm that an external bypass input circuit breaker (MCCB) is installed (refer to WARNING 4, page 1-4). Connect the bypass input power cables from the Input service entrance to the bypass input power terminals, identified as A40, B40, C40 and N40 in Figures 3.2-a~g. Bypass input cables must be sized for an ampere rating larger than the maximum output current capacity of the UPS. Refer to Table 3.4 for recommended cable sizes.

- (2) Connect the external signal terminal block as desired. Refer to section 2.4 and Figure 2.15 for functional description. 2mm<sup>2</sup>, or less, shielded conductor is recommended.

5. One (1) source feeding the UPS:

- (1) Confirm that an external input circuit breaker sized to protect both the rectifier input and the bypass line is installed. (Refer to equipment nameplate for current ratings.) Connect the bypass input power cables from the Input service entrance to the bypass input power terminals, identified as A40, B40, C40 and N40 in Figures 3.2-a~g. Input cables must be sized for an ampere rating larger than the maximum current capacity of the UPS. Refer to Table 3.4 for recommended cable sizes.

- (2) Using adequately sized conductors and referring to the appropriate figure identified in Figures 3.2-a~g, connect Jumper bypass terminals A40, B40, C40 to rectifier input power terminals A, B, C as identified in Figures 3.2-a~g.

- (3) Connect the external signal terminal block as desired. Refer to section 2.4 and Figure 2.16 for functional description. 2mm<sup>2</sup>, or less, shielded conductor is recommended.

**CAUTION:** 1. *Confirm that all UPS internal contactors (breakers) "CB1", "CB2", and "CB3" are open before energizing UPS.*



2. *UPS power terminals are supplied with stud type fittings.*

*It is recommended that compression lugs be used to fasten all input/output power cables.*

## 6. Procedure for Cable Connections for Parallel System

- (1) Confirm the number of units to be connected in parallel. Identify the input/output power terminal blocks and control wire connections for parallel systems as shown in the appropriate Figures 3.4a~c.

- (2) Connect the external control wire and power wire.

### a.) Control wire connection

Parallel configuration Wiring (Refer to Figure 3.4a~c)

- Critical Load Cabinet (CLC) TB1 to UPS-n IOAU-04, TN2.
- Parallel Control CN92, CN93, In, Out cables between UPS modules

### b.) Power wire connection

From UPS AC Output Terminals to CLC (Refer to Figure 3.4a~c)

TABLE 3.4 Recommended Cable Sizes

| kVA Capacity | Input Voltage | Output Voltage | Input Side *1,2     |                   | Output Side *1,2    |                   | Bypass Side *1,2    |                   | DC Input Side *1,2  |                   |
|--------------|---------------|----------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|
|              |               |                | Cable Size          | Torque in. lbs    | Cable Size          | Torque in. lbs    | Cable Size          | Torque in. lbs    | Cable Size          | Torque in. lbs    |
| 100kVA       | 480V          | 480V           | 1 AWG or larger     | 100 - 135 in. lbs | 1 AWG or larger     | 100 - 135 in. lbs | 1 AWG or larger     | 100 - 135 in. lbs | 3/0 AWG or larger   | 100 - 135 in. lbs |
|              | 600V          | 600V           | 2 AWG or larger     | 100 - 135 in. lbs | 2 AWG or larger     | 100 - 135 in. lbs | 2 AWG or larger     | 100 - 135 in. lbs | 3/0 AWG or larger   | 100 - 135 in. lbs |
|              | 480V          | 480V           | 3/0 AWG or larger   | 100 - 135 in. lbs | 3/0 AWG or larger   | 100 - 135 in. lbs | 3/0 AWG or larger   | 100 - 135 in. lbs | 350 MCM or larger   | 100 - 135 in. lbs |
| 150kVA       | 600V          | 600V           | 2/0 AWG or larger   | 100 - 135 in. lbs | 2/0 AWG or larger   | 100 - 135 in. lbs | 2/0 AWG or larger   | 100 - 135 in. lbs | 350 MCM or larger   | 100 - 135 in. lbs |
|              | 480V          | 480V           | 300 MCM or larger   | 100 - 135 in. lbs | 350 MCM or larger   | 100 - 135 in. lbs | 350 MCM or larger   | 100 - 135 in. lbs | 2x4/0 AWG or larger | 100 - 135 in. lbs |
|              | 600V          | 600V           | 250 MCM or larger   | 100 - 135 in. lbs | 250 MCM or larger   | 100 - 135 in. lbs | 250 MCM or larger   | 100 - 135 in. lbs | 2x4/0 AWG or larger | 100 - 135 in. lbs |
| 225kVA       | 480V          | 480V           | 2x4/0 AWG or larger | 347 - 469 in. lbs | 2x3/0 AWG or larger | 347 - 469 in. lbs | 2x3/0 AWG or larger | 347 - 469 in. lbs | 2x400 MCM or larger | 347 - 469 in. lbs |
|              | 600V          | 600V           | 2x3/0 AWG or larger | 347 - 469 in. lbs | 400 MCM or larger   | 347 - 469 in. lbs | 400 MCM or larger   | 347 - 469 in. lbs | 2x400 MCM or larger | 347 - 469 in. lbs |
|              | 480V          | 480V           | 3x500 MCM or larger | 347 - 469 in. lbs | 2x250 MCM or larger | 347 - 469 in. lbs | 2x250 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs |
| 300kVA       | 600V          | 600V           | 2x4/0 AWG or larger | 347 - 469 in. lbs | 2x3/0 AWG or larger | 347 - 469 in. lbs | 2x3/0 AWG or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs |
|              | 480V          | 480V           | 3x250 MCM or larger | 347 - 469 in. lbs | 2x400 MCM or larger | 347 - 469 in. lbs | 2x400 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 600V          | 600V           | 2x350 MCM or larger | 347 - 469 in. lbs | 2x300 MCM or larger | 347 - 469 in. lbs | 2x300 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
| 375kVA       | 480V          | 480V           | 3x500 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 600V          | 600V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 480V          | 480V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
| 500kVA       | 600V          | 600V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 480V          | 480V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 600V          | 600V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
| 750kVA       | 480V          | 480V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 600V          | 600V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |
|              | 480V          | 480V           | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x350 MCM or larger | 347 - 469 in. lbs | 3x500 MCM or larger | 347 - 469 in. lbs |

\*1 - The cables must be selected to be equal to or larger than the sizes listed in the table.

\*2 - Voltage drop across power cables not to exceed 2% of nominal source voltage.

\*3 - Allowable ampere-capacities based on 90 degree C insulation at ambient temperature of 30 degree C.  
Not more than 3 conductors in a raceway without de-rating.

Note: Copper conductors assumed.

**TABLE 3.5 Crimp Type Compression Lug**

| WIRE<br>SIZE<br>(CODE) | WIRE<br>STRAND<br>CLASS | RECOMMENDATION |          | CRIMP TOOL REQUIRED    |           |
|------------------------|-------------------------|----------------|----------|------------------------|-----------|
|                        |                         | VENDOR         | CAT. NO. | BURNDY TYPE Y36 OR Y48 | DIE INDEX |
| 1                      | B                       | BURNDY         | YA1C     | GREEN                  | 11 / 376  |
|                        | I                       | ILSCO          | CRA-1L   | GREEN                  | 11 / 376  |
|                        | I                       | BURNDY         | YA25-LB  | ---                    | 1019      |
| 1/0                    | B                       | BURNDY         | YA25     | PINK                   | 12 / 348  |
|                        | I                       | ILSCO          | CRA-1/OL | PINK                   | 12 / 348  |
|                        | I                       | BURNDY         | YA25-LB  | ---                    | 1020      |
| 2/0                    | B                       | BURNDY         | YA28     | BLACK                  | 13        |
|                        | I                       | ILSCO          | CRA-2/OL | BLACK                  | 13        |
|                        | I                       | BURNDY         | YA27-LB  | ---                    | 1021      |
| 3/0                    | B                       | BURNDY         | YA27     | ORANGE                 | 14 / 101  |
|                        | I                       | ILSCO          | CRB-3/OL | ORANGE                 | 14 / 101  |
|                        | I                       | BURNDY         | YA28-LB  | ---                    | 1022      |
| 4/0                    | B                       | BURNDY         | YA28     | PURPLE                 | 15        |
|                        | I                       | ILSCO          | CRB-4/OL | PURPLE                 | 15        |
|                        | I                       | BURNDY         | YA29-LB  | ---                    | 1023      |
| 250 MCM                | B                       | BURNDY         | YA29     | YELLOW                 | 16        |
|                        | I                       | ILSCO          | CRA-250L | YELLOW                 | 16        |
|                        | I                       | BURNDY         | YA30-LB  | ---                    | 1024      |
| 300 MCM                | B                       | BURNDY         | YA30     | WHITE                  | 17 / 298  |
|                        | I                       | ILSCO          | CRA-300L | WHITE                  | 17 / 298  |
|                        | I                       | BURNDY         | YA32-LB  | ---                    | 1028      |
| 350 MCM                | B                       | BURNDY         | YA31     | RED                    | 18 / 324  |
|                        | I                       | ILSCO          | CRA-360L | RED                    | 18 / 324  |
|                        | I                       | BURNDY         | YA34-LB  | ---                    | 1027      |
| 400 MCM                | B                       | BURNDY         | YA32     | BLUE                   | 19 / 470  |
|                        | I                       | ILSCO          | CRA-400L | BLUE                   | 19 / 470  |
|                        | I                       | BURNDY         | YA36-LB  | ---                    | 1027      |
| 600 MCM                | B                       | BURNDY         | YA34     | BROWN                  | 20 / 298  |
|                        | I                       | ILSCO          | CRA-500L | BROWN                  | 20 / 298  |
|                        | I                       | BURNDY         | YA38-LB  | ---                    | 1029      |

**NOTE:** When using crimp type lugs, the lugs should be crimped to the specifications given in the manufacturer's instructions for both crimp tool and lug.

**FIGURE 3.1 UPS Terminal Designation**

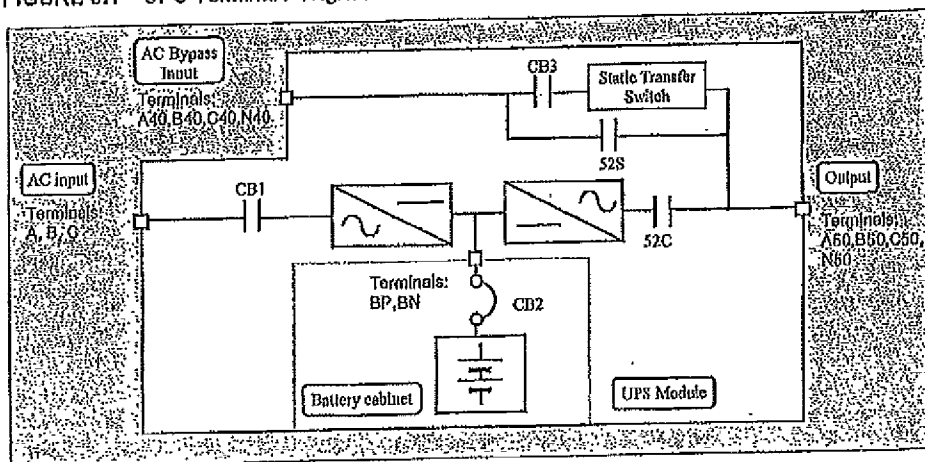
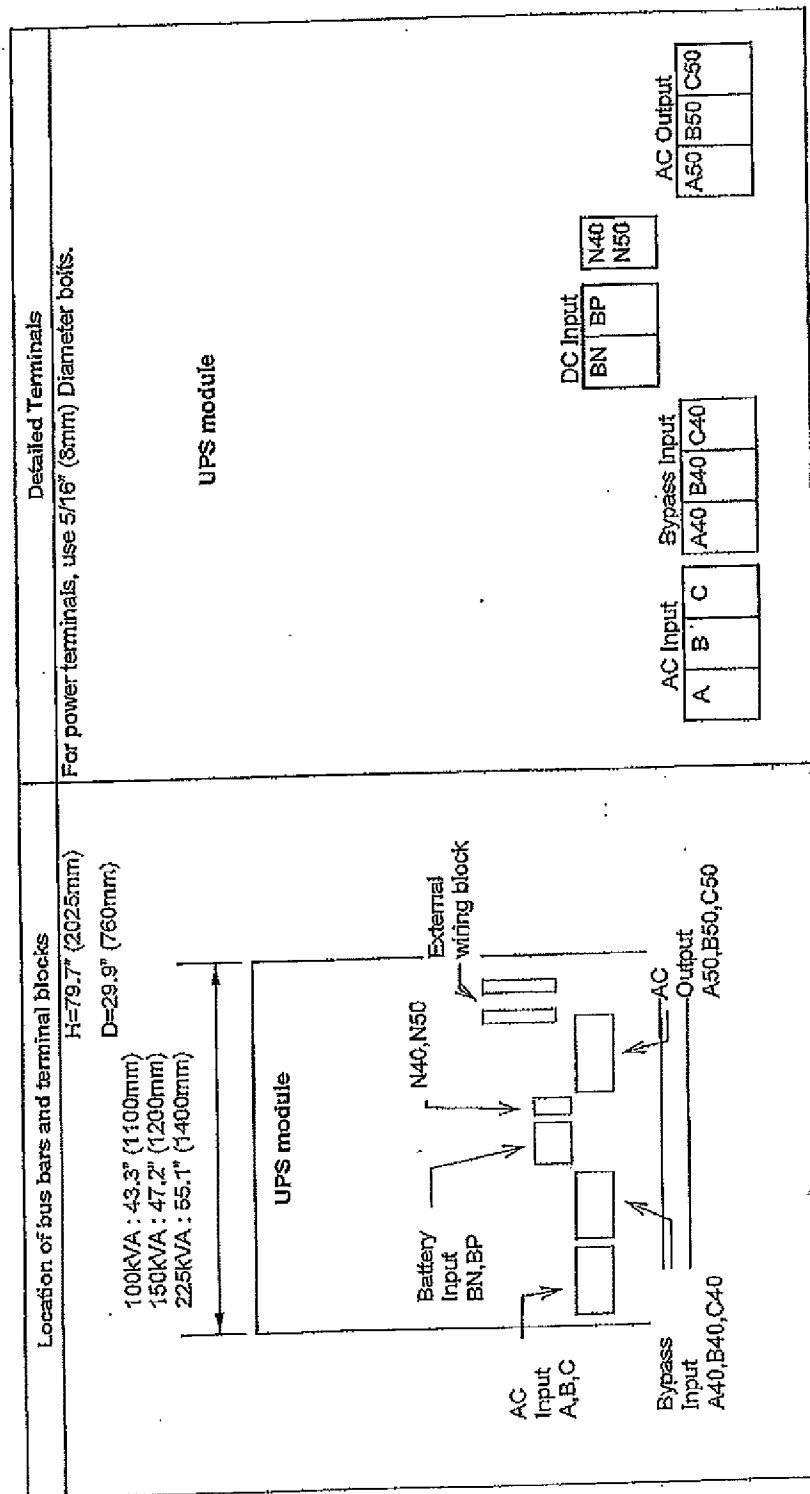
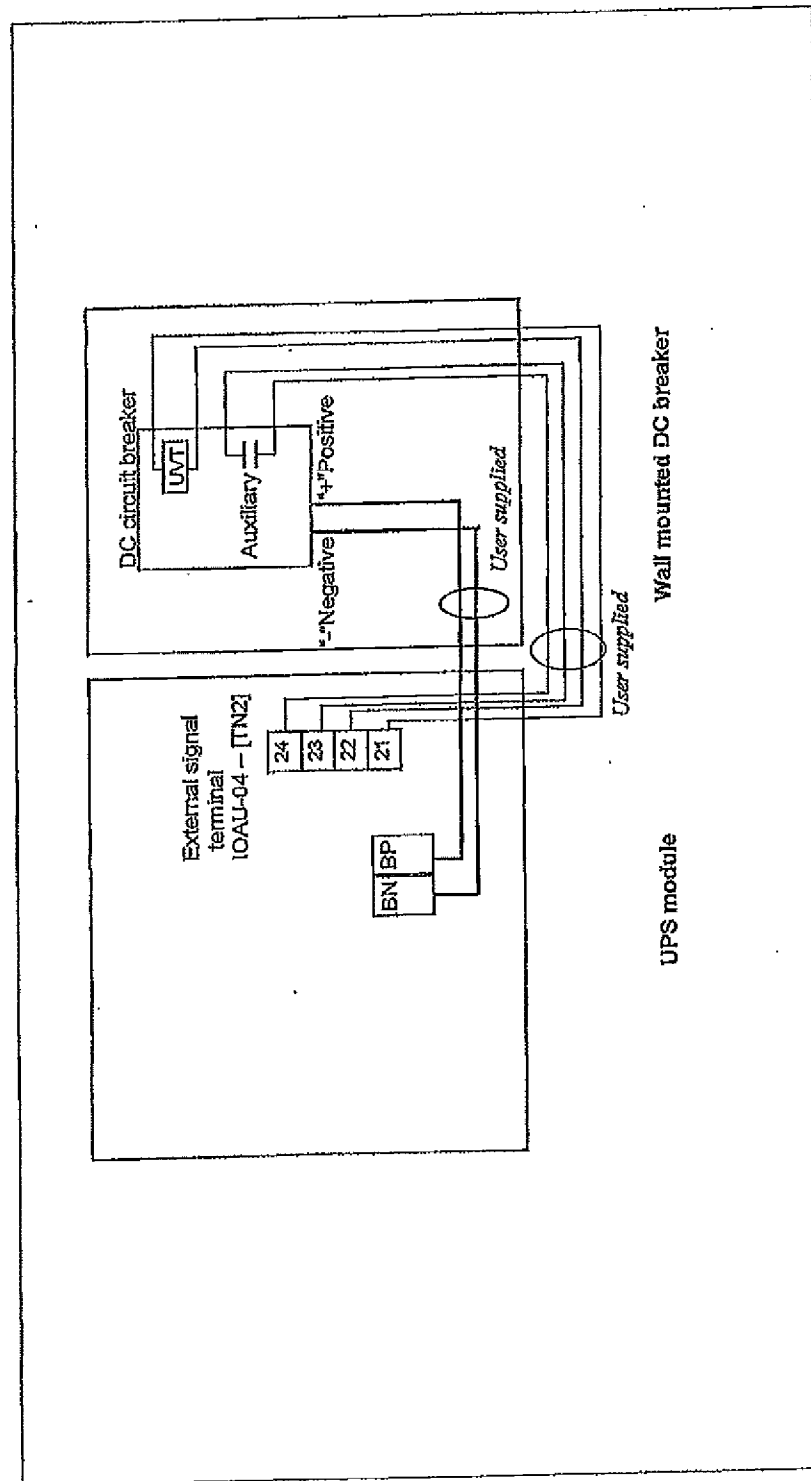


FIGURE 3.2-a-1 Diagram of input/output bus bars and terminal blocks (100kVA, 150kVA, 225kVA UPS, Input voltage 480VAc)



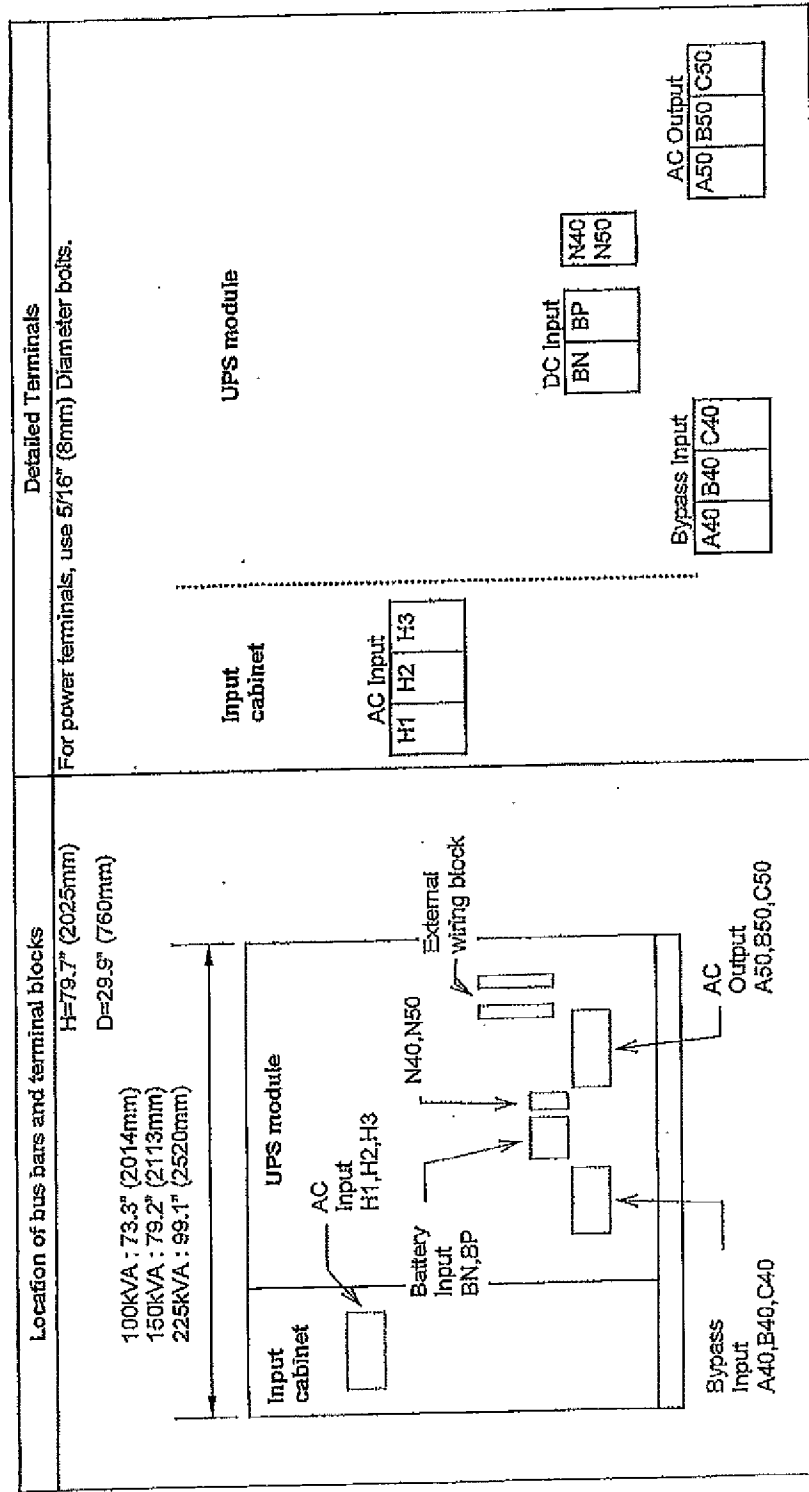
MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.2-a-2** Diagram of Power Wire & Control Wire Inter-Connect (100kVA, 150kVA, 225kVA UPS, Input voltage 480Vac)



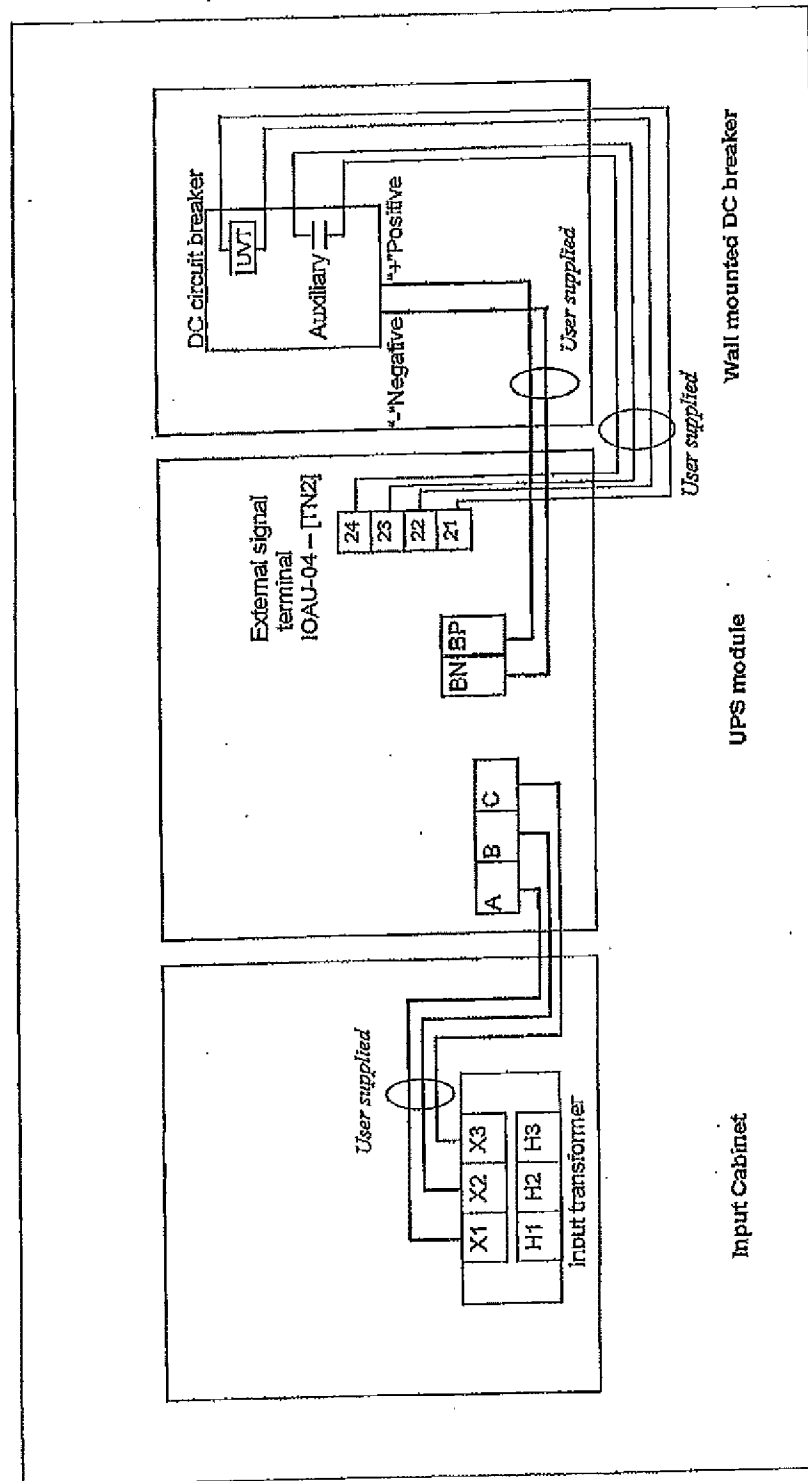
**mitsubishi electric 9800A series UPS**

**FIGURE 3.2-b-1** Diagram of input/output bus bars and terminal blocks (100kVA, 150kVA, 225kVA UPS, Input voltage 600Vac)



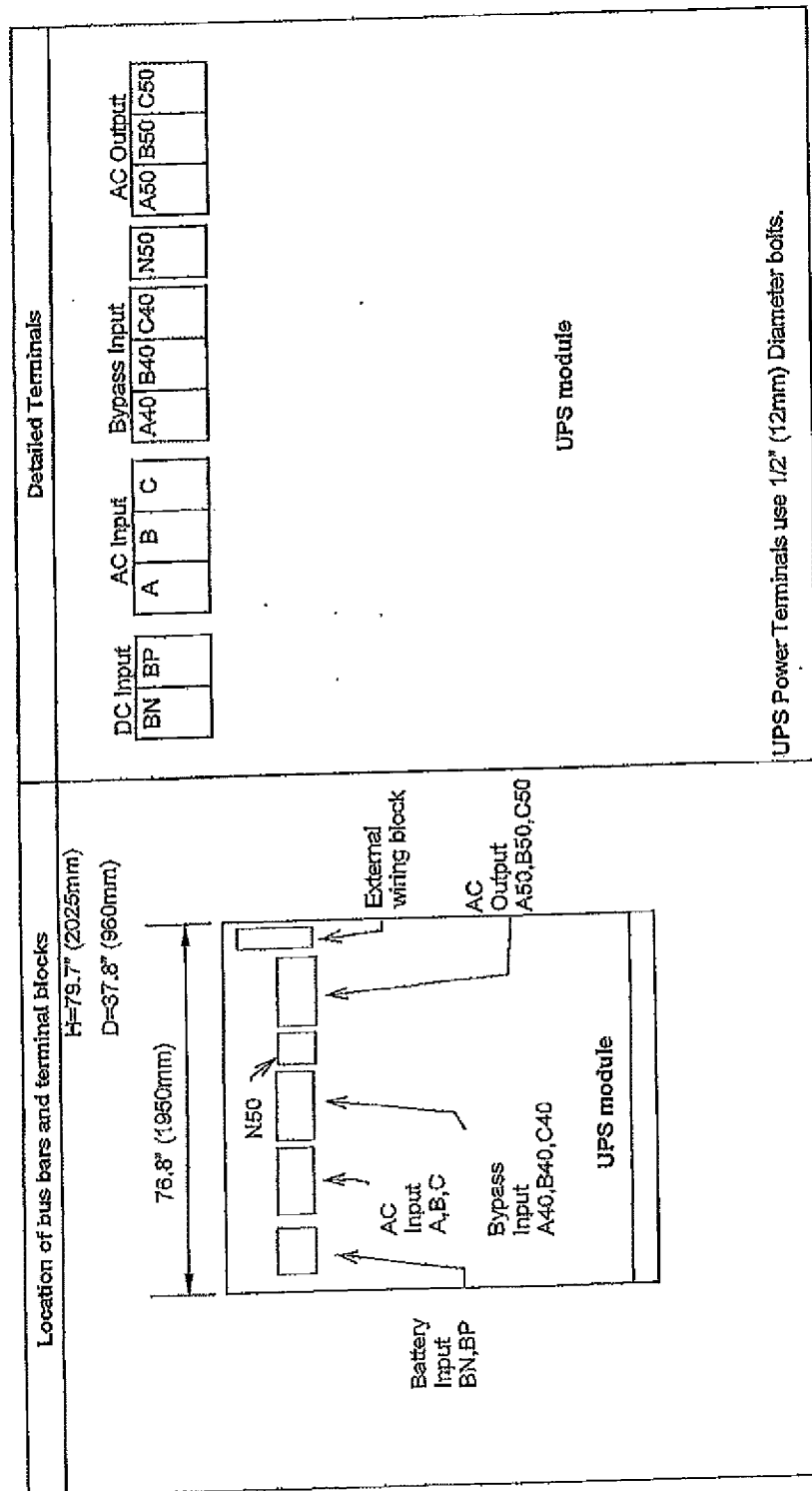
**MITSUBISHI ELECTRIC 9800A SERIES UPS**

FIGURE 3.2-b-2 Diagram of Power Wire & Control Wire Inter-Connect (100kVA, 150kVA, 225kVA UPS, Input voltage 600Vac)



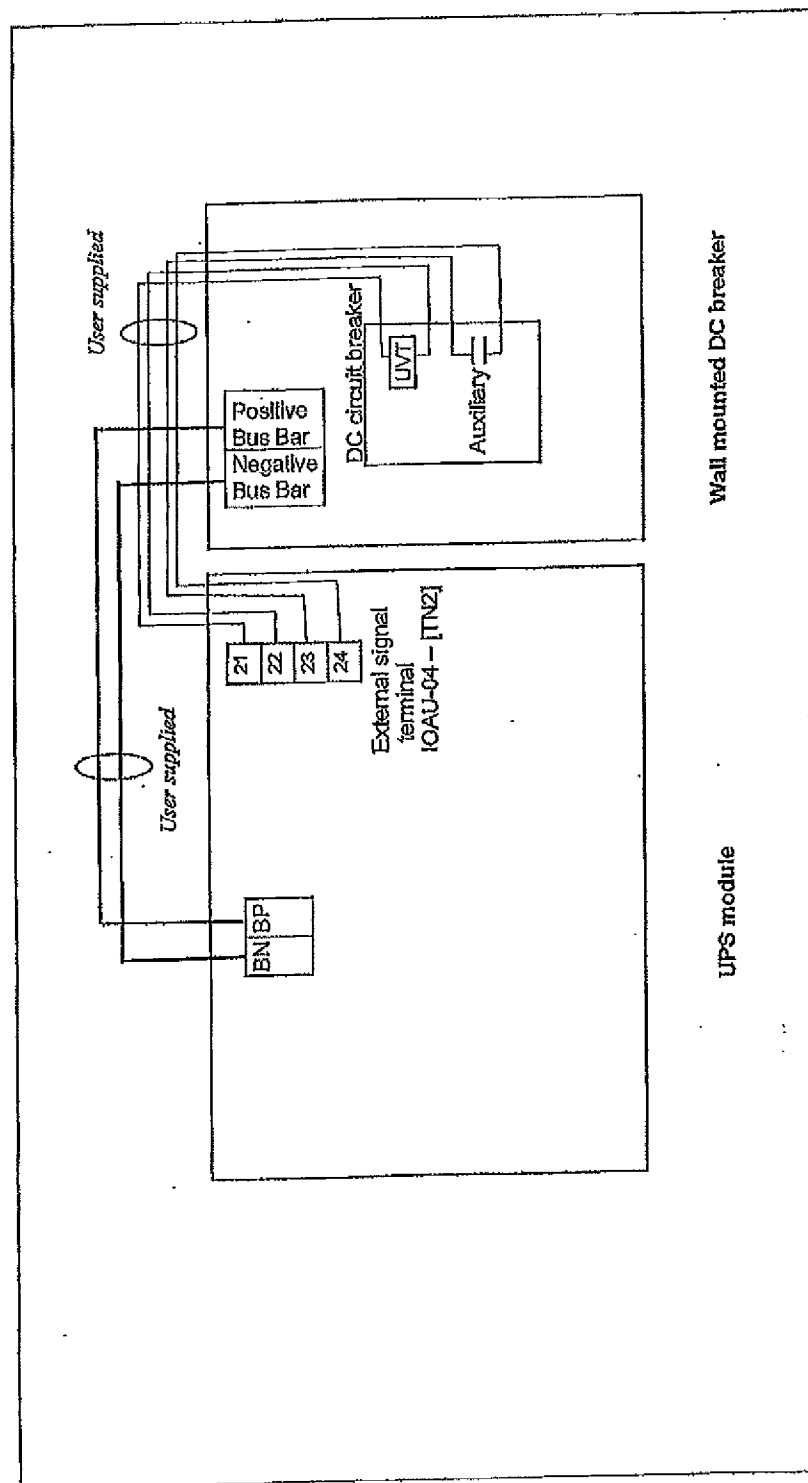
MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.2-c-1** Diagram of input/output bus bars and terminal blocks (300kVA, 375kVA UPS, Input voltage 480Vac)



**MITSUBISHI ELECTRIC 9800A SERIES UPS**

**FIGURE 3.2-c-2** Diagram of Power Wire & Control Wire Inter-Connect (300kVA, 375kVA UPS, Input voltage 480Vac)



MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.2-d-1** Diagram of input/output bus bars and terminal blocks (300kVA, 375kVA UPS, Input voltage 600Vac)

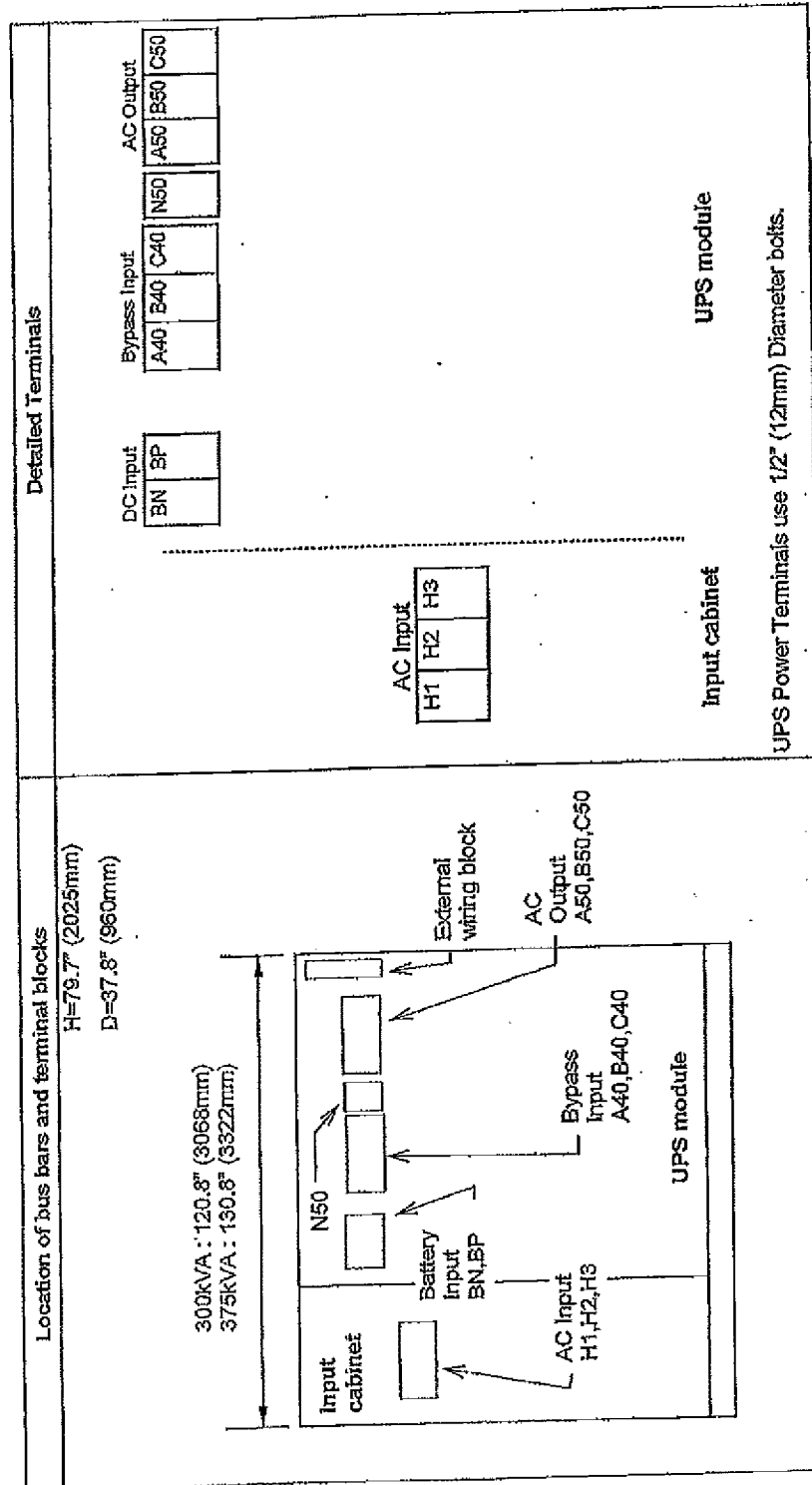
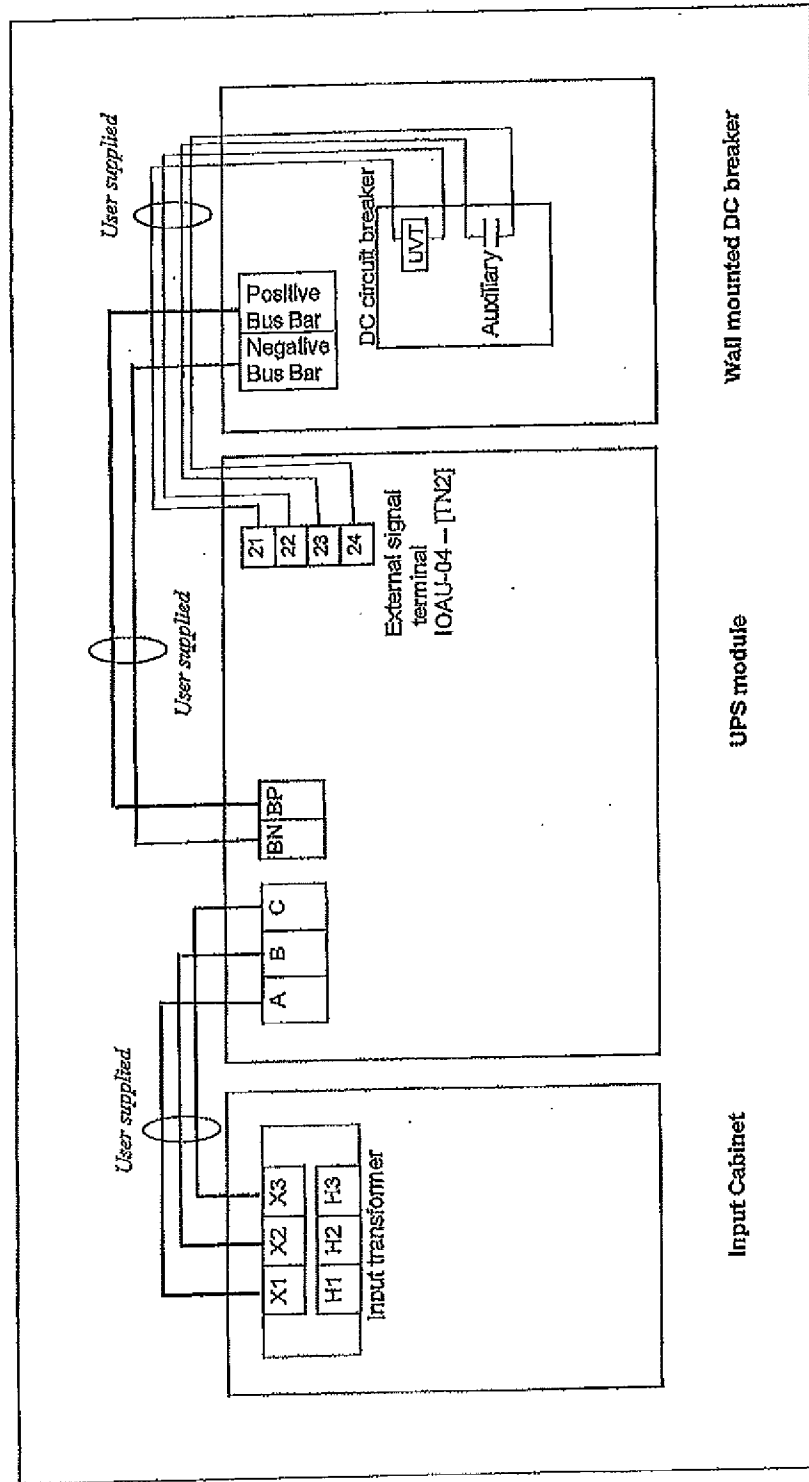
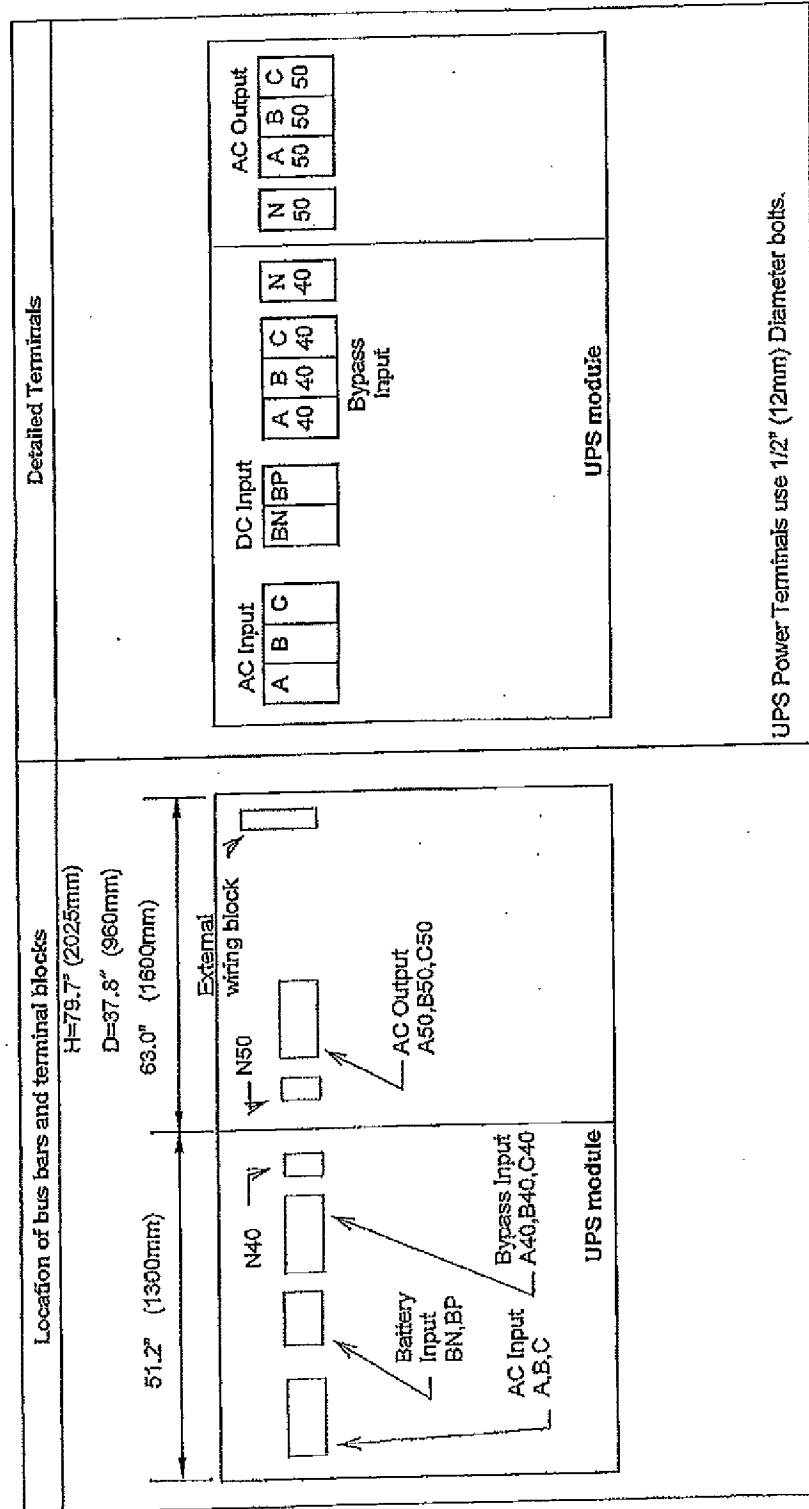


FIGURE 3.2-d-2 Diagram of Power Wire & Control Wire Inter-Connect (300KVA, 375kVA UPS, Input voltage 600Vac)



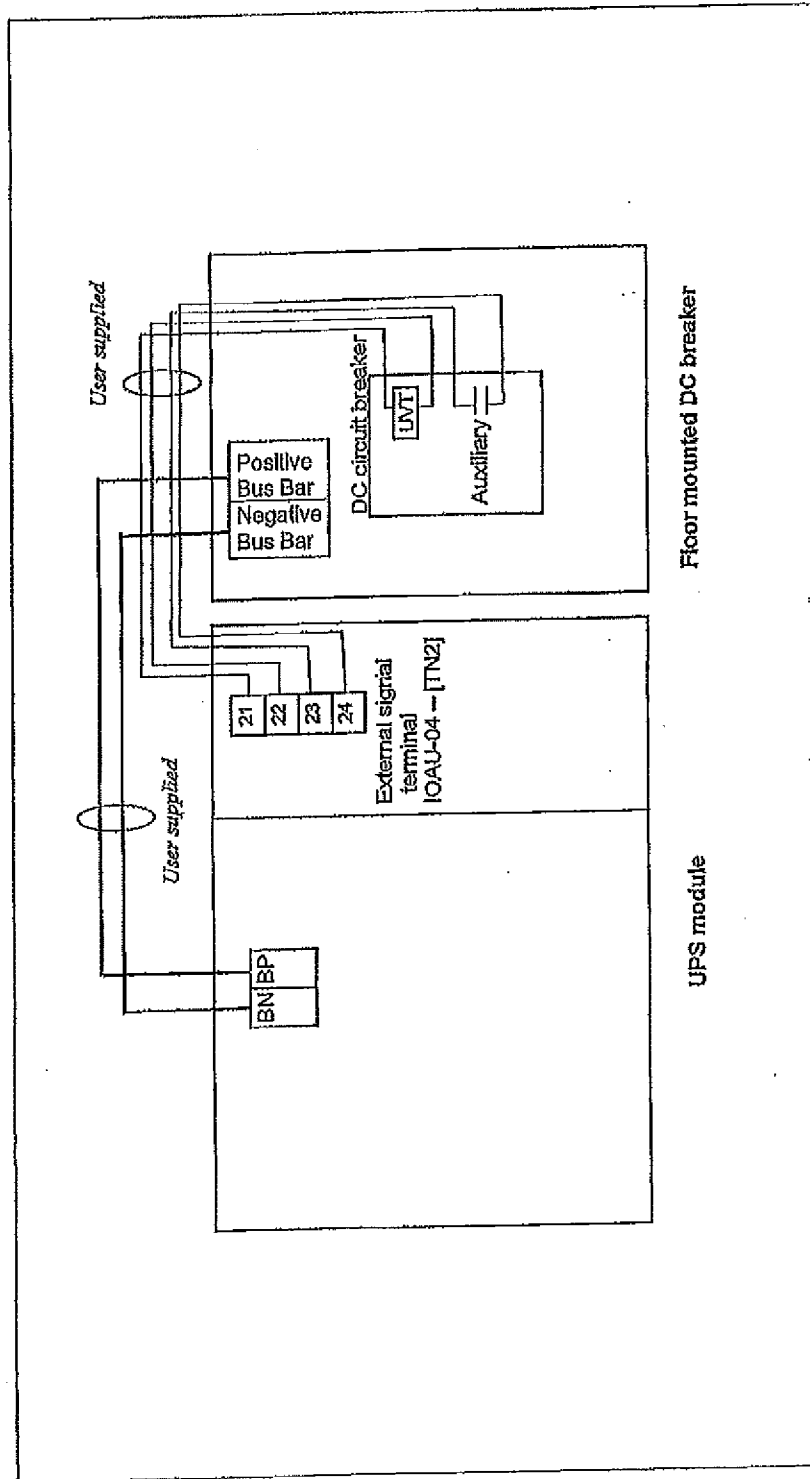
MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.2-e-1** Diagram of input/output bus bars and terminal blocks (500KVA, 750KVA UPS, Input voltage 480Vac)



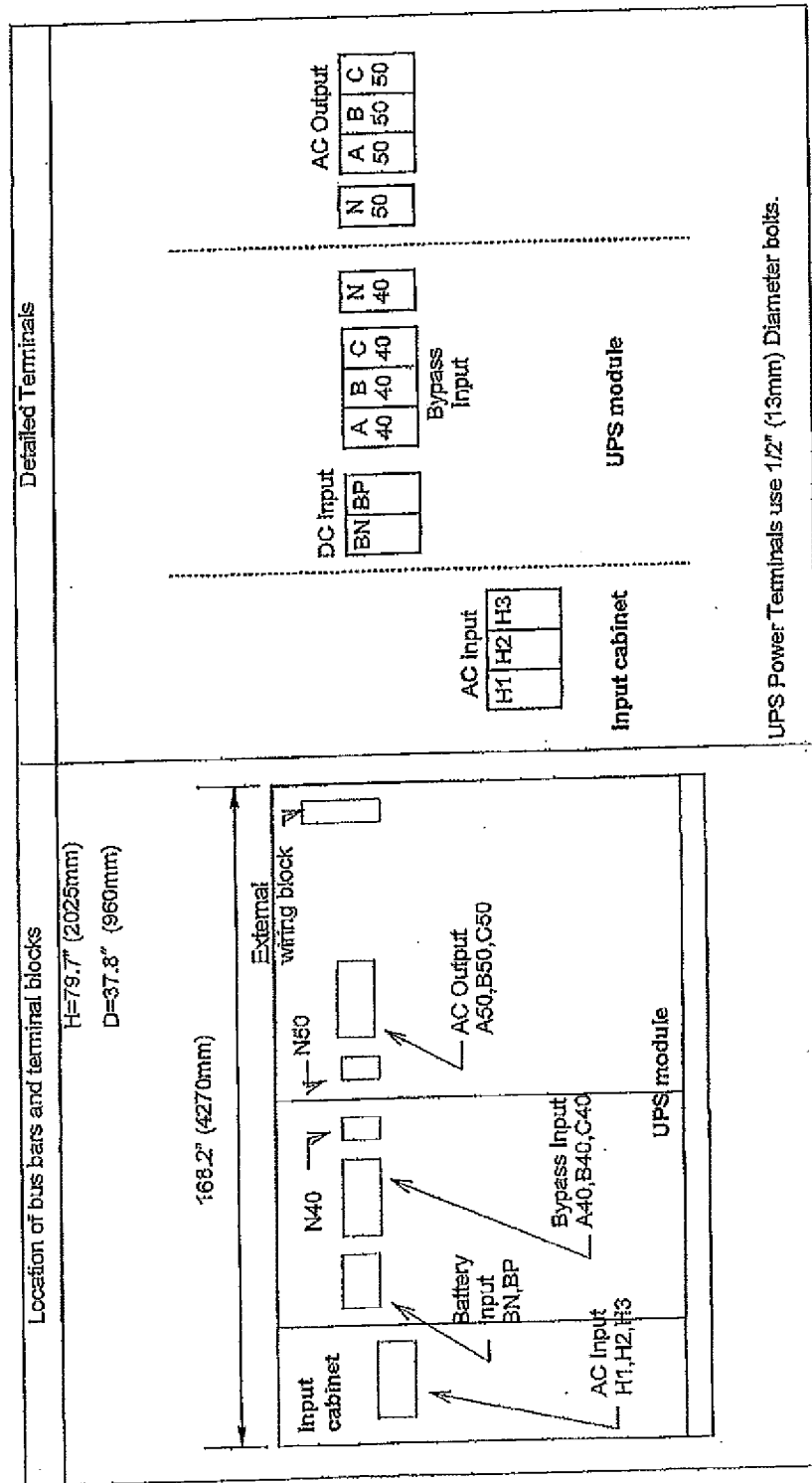
MITSUBISHI ELECTRIC 9800A SERIES UPS

FIGURE 3.2-e-2 Diagram of Power Wire & Control Wire Inter-Connect (500KVA, 750KVA UPS, Input voltage 480Vac)



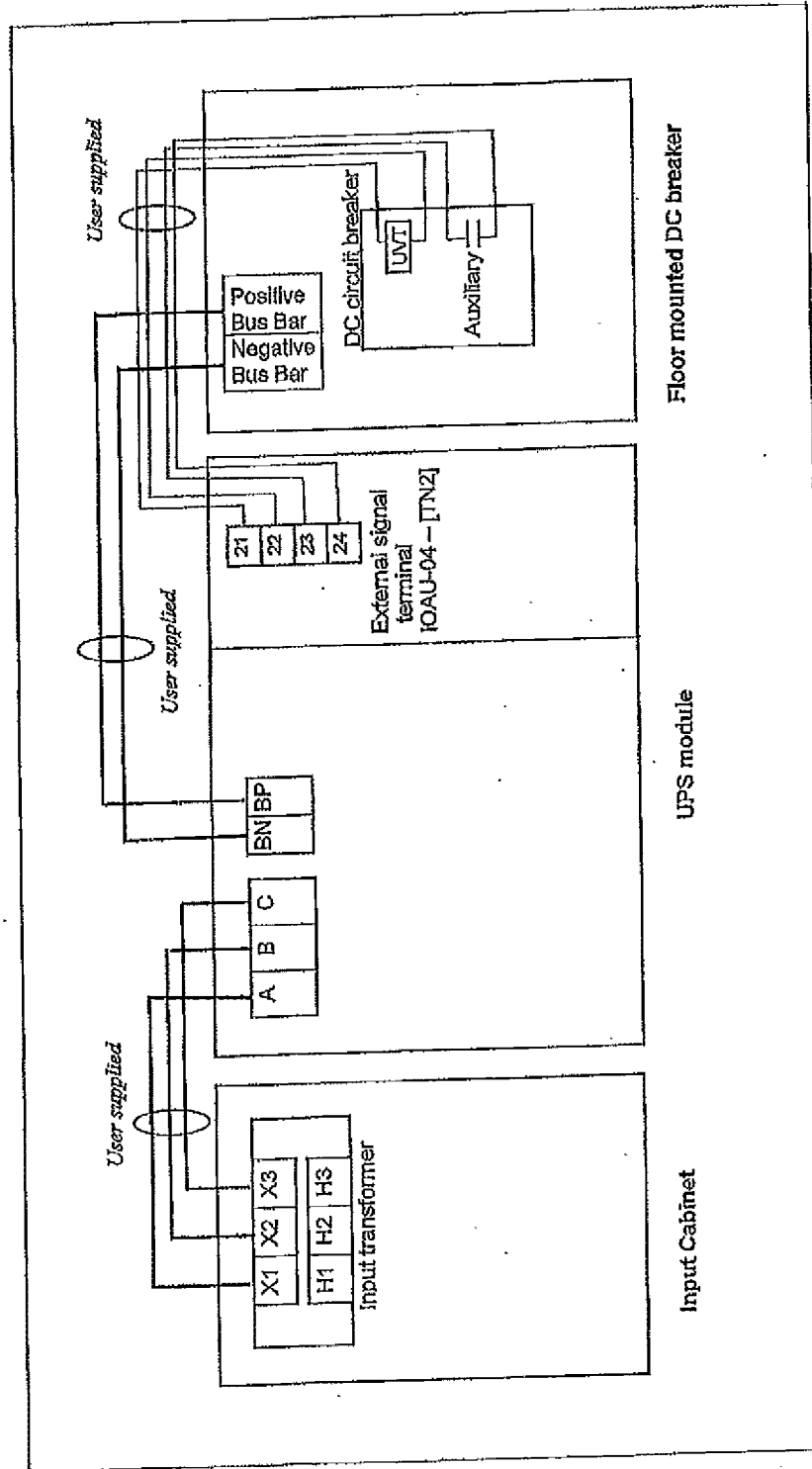
mitsubishi ELECTRIC 9800A SERIES UPS

FIGURE 3.2-4-1 Diagram of input/output bus bars and terminal blocks (500KVA, 750KVA UPS, Input voltage 600Vac)



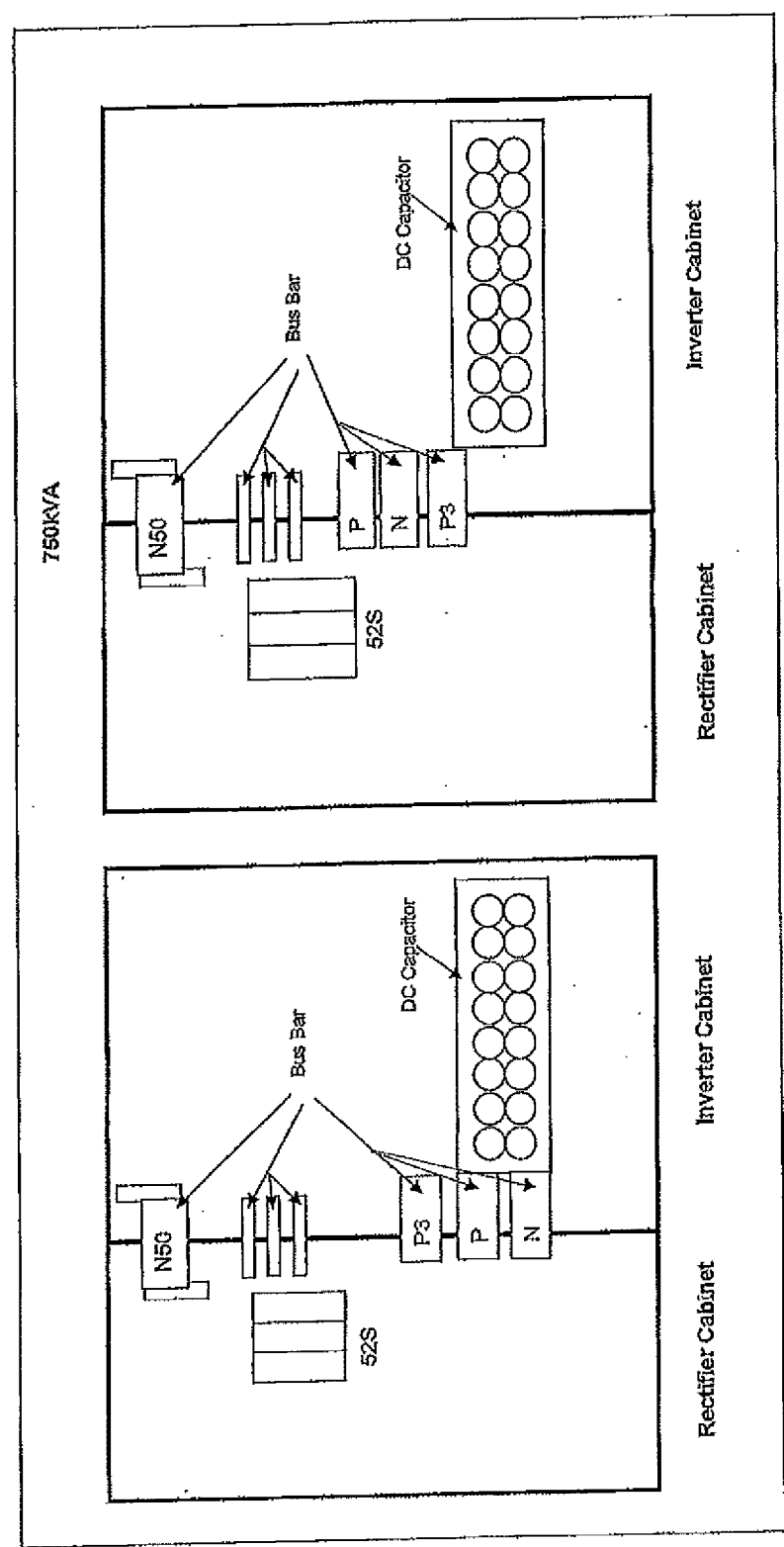
MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.2-f-2** Diagram of Power Wire & Control Wire Inter-Connect (500KVA, 750KVA UPS, Input voltage 600Vac)



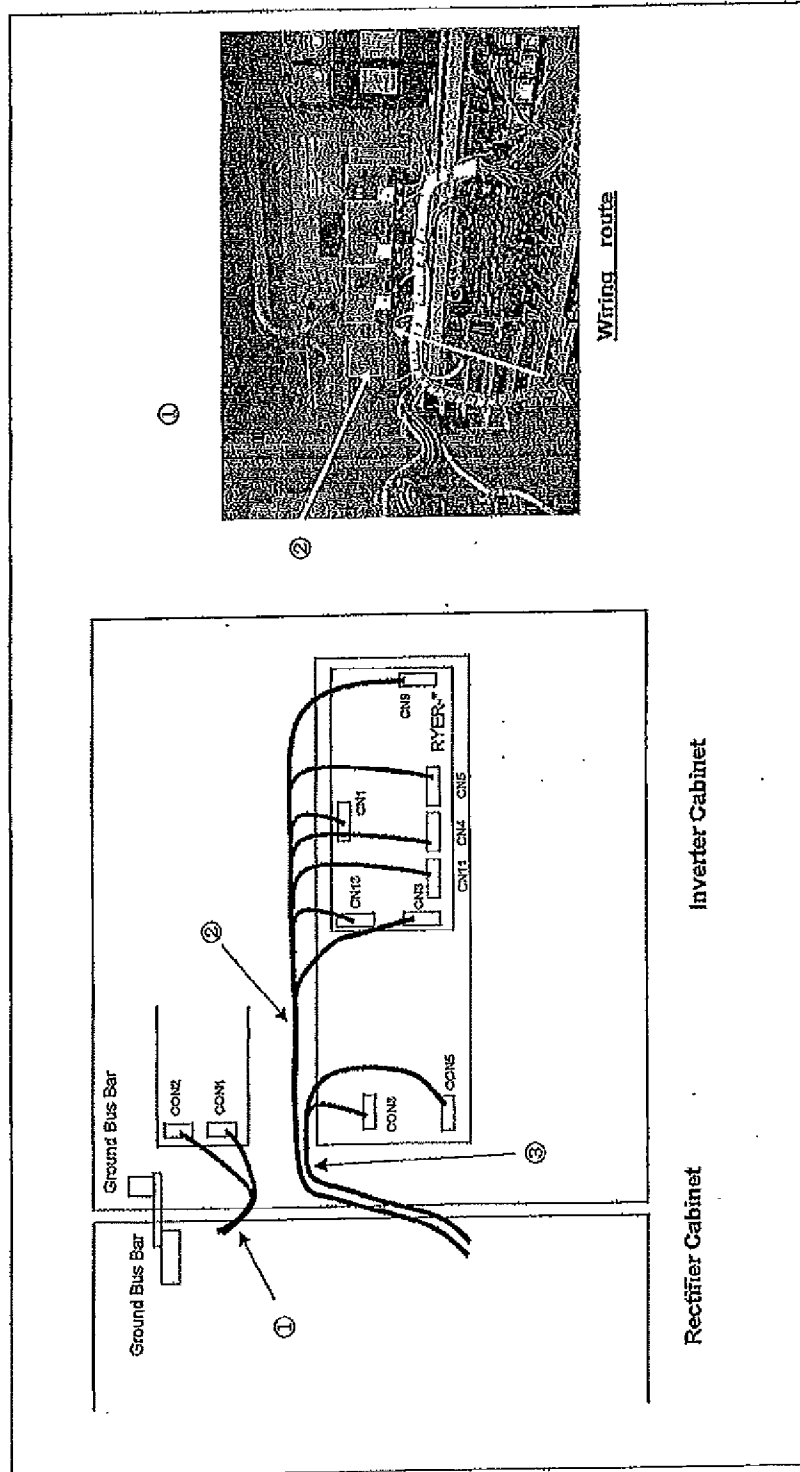
MITSUBISHI ELECTRIC 9800A SERIES UPS

**FIGURE 3.3-a** Diagram of Rectifier Cabinet & Inverter Cabinet Inter-Connect 1 (500kVA, 750kVA UPS)



**MITSUBISHI ELECTRIC 9800A SERIES UPS**

FIGURE 3.3-b Diagram of Rectifier Cabinet & Inverter Cabinet Inter-Connect 2 (500KVA, 750KVA UPS)



MITSUBISHI ELECTRIC 9800A SERIES UPS

### 3.4 OPERATING PROCEDURES

For MMS, Refer to section "D) MMS Start-up Procedure".

#### A) Start-up Procedure

- Verify that the External Bypass Input Circuit Breaker for each unit is closed  
(Breaker is user supplied.)
- If a dual source is feeding the UPS, close the External AC Rectifier Input Circuit Breaker manually (user supplied).

#### Start-up of UPS

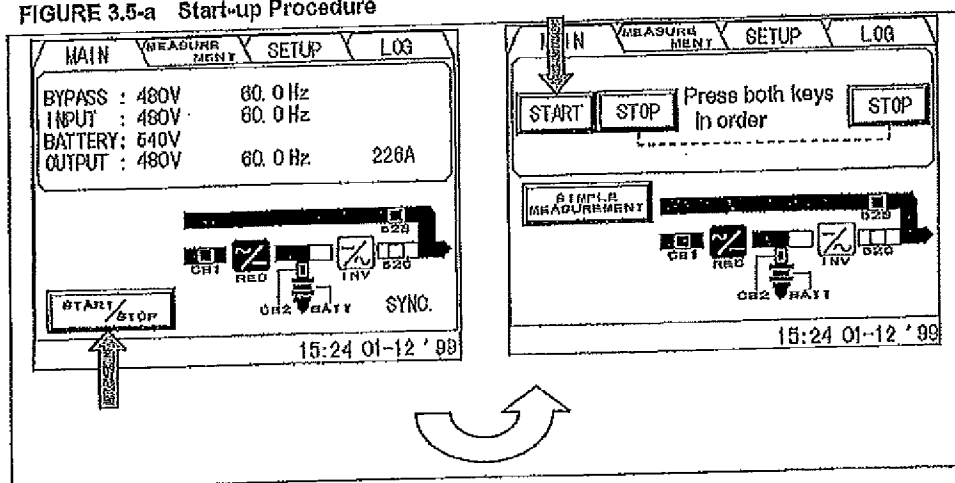
- Verify that Control Circuit Breakers (CPM) is closed.  
(When Inverter is stopped, the Control Circuit Breaker is not normally opened)
- The pre-charging cycle will begin and Input Contactor (CB1) will close automatically.
- Close Battery Disconnect Circuit Breaker (CB2).
- The Inverter can now be started.



*Note: When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start operation is required (at the UPS), select "LOCAL" in "Remote/Local" selection in setup page. Select "LOCAL" mode for the purpose of this start up procedure.*

- On the LCD panel, select "START/STOP MENU" and press the "START" key.
- The Inverter will start within 5 seconds. Start up is complete.

FIGURE 3.5-a Start-up Procedure



### B) Shut-down Procedure

If a total UPS shutdown is required, verify that the critical load is OFF.

#### Shut-down of UPS

1. Press the "START/STOP MENU" from the Main Menu on the LCD.



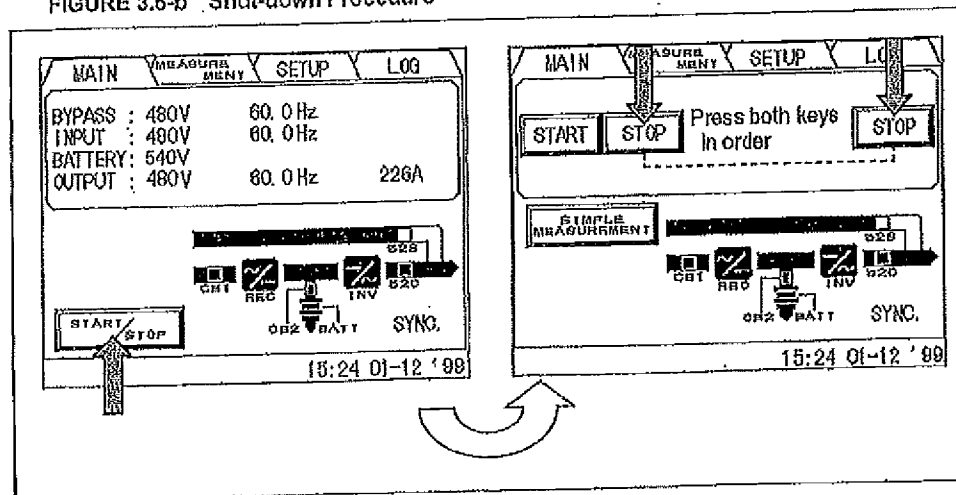
**Note:** When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter stop operation can only be performed remotely. If local inverter stop operation is required (at the UPS), select "LOCAL" in "Remote/Local" selection in setup page. Select "LOCAL" mode for the purpose of this stop procedure.

2. Press both "STOP" keys in order on the LCD.  
(First press "STOP" key on the left, then press "STOP" key on the right.)
3. In general, only the Inverter will be stopped and the Rectifier will remain energized to charge the batteries.

Opening the user supplied External Input AC Circuit Breaker (if dual source used), the External Bypass Input Circuit Breaker and the DC Disconnect Circuit Breaker, CB2, will shut down the load.

4. If stopping both the Rectifier and Charger is required, open the Battery Disconnect circuit breaker (CB2) manually.
5. If a dual source is feeding the UPS, open the External AC Rectifier Input Circuit Breaker (user supplied) manually.
6. If turning off all power to the critical load is desired, open the External Bypass Input Circuit Breaker (user supplied) manually.

**FIGURE 3.5-b Shut-down Procedure**



## C) Bypass Operation Procedure

## UPS

1. Check for "SYNC" on the LCD.
2. Press the "START/STOP MENU" from the LCD Main Menu.
3. Press the "STOP" key on the LCD.

\*\* Transfer from bypass to inverter.

## UPS

1. Press the "START/STOP MENU" from the LCD Main Menu.
2. Press the "START" key on the LCD.



Note: When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start or stop operation can only be performed remotely. If local inverter start or stop operation is required (at the UPS), select "LOCAL" in "Remote/Local" selection in setup page. Select "LOCAL" mode for the purpose of this stop procedure.

**D) MMS Start-up Procedure**

- a) Verify that Critical Load Cabinet (CLC) Circuit Breaker SMB is closed.
- b) Verify that CLC System Output Circuit Breaker 52L is open
- c) Verify that CLC UPS Circuit Breakers 52L1, 52L2...and 52Ln are closed.

**Start-up of UPS-1**

1. Verify that Control Circuit Breakers (CPM) is closed.  
(When Inverter is stopped, the Control Circuit Breaker is not normally opened)
2. The pre-charging cycle will begin and Input Contactor (CB1) will close automatically.
3. Close Battery Disconnect Circuit Breaker (CB2).
4. The Inverter can now be started.



*Note: When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start operation is required (at the UPS), select "LOCAL" in "Remote/Local" selection in setup page. Select "LOCAL" mode for the purpose of this start up procedure.*

5. On the LCD panel, select "START/STOP MENU" and press the "START" key.
6. The Inverter will start within 5 seconds. Start up is complete.

**Start-up of next UPS**

1. The next UPS can be started in the same way as UPS-1.
2. When all UPS in MMS are started, the MMS system UPSs will simultaneously transfer from UPS MMS Bypass Operation to UPS MMS Inverter Operation.
3. Verify there are no alarms on each UPS LCD and CLC LCD (if available)  
Any steps to verify correct UPS MMS Inverter Operation.

**Transfer from UPS MMS Inverter Operation To UPS MMS Bypass Operation**

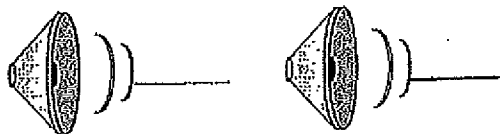
1. Transfer MMS system to UPS MMS Bypass Operation on CLC LCD (if available)  
or Transfer each UPS to bypass individually

**Transfer of Load From Maintenance Bypass To Inverter**

1. Verify UPS MMS system is in UPS MMS Bypass Operation.
2. Transfer load from CLC Maintenance Bypass Circuit Breaker (SMB) to system Output Circuit Breaker (52L) per MMS CLC Maintenance Mode Interlock Operating Procedure, Part B.
3. Transfer from UPS MMS Bypass Operation to UPS MMS Inverter Operation from CLC LCD "System Bypass Operation Screens" if available or by starting each Individual UPS from UPS LCD, select "START/STOP MENU" and press "START" key.
4. After all UPS are ready to transfer to inverter all UPSs will simultaneously transfer from internal bypass to inverter.

#### 4.0 RESPONSE TO UPS FAILURE

UPS FAULT



Annunciator Silence

Depress "SILENCE ALARM" key on MAIN menu.

Recording of Fault

Refer to the list of fault codes in section 6.0 for error description.

Primary Action

Take necessary action according to display guidance.

Information to Service Center

When faults happen, contact the Authorized Mitsubishi Service Representatives or call Mitsubishi at 1-800-887-7830.



##### Note

The error code indicated on the LCD display panel when an UPS alarms is very important.  
In order to reduce repair time, please include this information, along with the operation and load status for all correspondence to Mitsubishi field service group.

## 5.0 PARTS REPLACEMENT

Contact Mitsubishi Electric Power Products, Inc. or its authorized service representatives on all issues regarding the replacement of parts.

### A) Battery

Battery lifetime may vary according to the frequency of use and the average ambient operating temperature. The end of battery life is defined as the state of charge resulting in an ampere-hour capacity less than, or equal to, 80% of nominal capacity. Replace battery if its capacity is within this percentage.

### B) UPS Component Parts

Contact Mitsubishi Electric Power Products, Inc. or its authorized service representatives for a complete parts replacement schedule. Recommended replacement time interval varies with operating environment.

Contact Mitsubishi Electric Power Products, Inc. or its authorized service representatives for application specific recommendations.

## 6.0 FAULT CODES

This section covers fault codes, their description and required action.

At time of error:

- A) Verify and record the occurrence of the alarm. Note details of alarm message displayed on the LCD display panel.

*Contact Mitsubishi Electric Power Products, Inc. at 1-800-887-7830.*

- B) If a circuit breaker (MCCB) has tripped, depress the toggle to reset the breaker before closing it again.

**Failure Code List**
**Table 6.1 Fault Code**

| Failure Code | Failure Name                   | Failure Description                                                                | Recommended Action    | Frequency | Severity     | Effect  |
|--------------|--------------------------------|------------------------------------------------------------------------------------|-----------------------|-----------|--------------|---------|
| UF003        | CONVERTER ABNORMAL             | Preliminary charge impossible                                                      | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF006        | CONVERTER ABNORMAL             | Mixed operation (60 minutes)                                                       | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF066        | CONVERTER ABNORMAL             | Mixed operation (1 minute)                                                         | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF069        | INPUT CIRCUIT ABNORMAL         | Input circuit abnormality                                                          | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF102        | DC OVERVOLTAGE                 | Over voltage of DC voltage                                                         | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF103        | DC UNDERVOLTAGE                | Low voltage of DC voltage                                                          | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF108        | CHOPPER OVERCURRENT            | Chopper output overcurrent                                                         | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF109        | DC VOLTAGE UNBALANCED          | DC voltage unbalanced between positive and negative                                | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |
| UF161        | DC VOLTAGE ABNORMAL            | Does not return to float voltage after power supply is resumed (24 hours)          | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF162        | DC VOLTAGE ABNORMAL            | Does not return to equalizing voltage after power supply is resumed                | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF163        | CB2 ABNORMAL                   | Battery disconnect circuit breaker CB2 has tripped.                                | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF166        | CB2 TRIPPED(BATTERY OVERTEMP.) | Battery temperature abnormality (UF167) lasted a long time (Note 6)                | CHECK BATTERY         | [1]       | Minor        | Flicker |
| UF167        | BATTERY OVERTEMPERATURE        | Battery temperature abnormality                                                    | CHECK BATTERY         | [1]       | Minor Note 4 | Flicker |
| UF161        | CB2 TRIPPED(DC VOLT. ABNORMAL) | Does not return to float voltage after power supply is resumed (48 hours) (Note 6) | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF162        | BATTERY ABNORMAL               | Battery abnormal detected by battery self test                                     | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF163        | BATTERY VOLTAGE ABNORMAL       | Battery voltage abnormality                                                        | CALL SERVICE ENGINEER | [1]       | Minor        | Flicker |
| UF165        | GATE FAULT (CHOPPER)           | IGBT module (Chopper) damaged                                                      | CALL SERVICE ENGINEER | [2]       | Major        | Lit on  |

|       |                               |                                                                      |                       |     |       |         |
|-------|-------------------------------|----------------------------------------------------------------------|-----------------------|-----|-------|---------|
| UF166 | GATE FAULT (A-UNIT)           | IGBT module (A-Unit) damaged                                         | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF167 | GATE FAULT (B-UNIT)           | IGBT module (B-Unit) damaged                                         | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF168 | GATE FAULT (C-UNIT)           | IGBT module (B-Unit) damaged                                         | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF170 | VDB SENSOR ABNORMAL           | Battery voltage sensor abnormality                                   | CALL SERVICE ENGINEER | [1] | Minor | Flicker |
| UF201 | INVERTER OVERVOLTAGE          | Output overvoltage during Inverter power supply (+18%)               | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF202 | INVERTER UNDERVOLTAGE         | Output low voltage during Inverter supply (-15%)                     | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF203 | INVERTER OVERCURRENT          | Inverter output overcurrent                                          | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UP204 | OUTPUT CIRCUIT ABNORMAL       | Cross current fell out of 30%                                        | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF209 | 52C ABNORMAL                  | 52C not turned ON                                                    | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF210 | 52C ABNORMAL                  | 52C not turned OFF                                                   | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF213 | INV. OR CONV. OVERTEMPERATURE | Overheating of main circuit parts                                    | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF214 | COOLING FAN ABNORMAL          | Abnormality of cooling fan inside panel                              | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF255 | 52C ABNORMAL                  | 52C turned OFF during Inverter power supply                          | CALL SERVICE ENGINEER | [1] | Minor | Flicker |
| UF256 | OUTPUT VOLTAGE ABNORMAL       | Inverter output voltage fell out of $\pm 6\%$                        | CALL SERVICE ENGINEER | [1] | Minor | Flicker |
| UF257 | 52C ABNORMAL                  | 52C not turned OFF when manual transfer                              | CALL SERVICE ENGINEER | [1] | Minor | Flicker |
| UF258 | LOAD ABNORMAL                 | More than 4 overcurrents for 10 minutes                              | CHECK LOAD            | [1] | Minor | Flicker |
| UF259 | Output voltage bus abnormal   | Inverter output voltage bus abnormality                              | CALL SERVICE ENGINEER | [1] | Minor | Flicker |
| UF260 | LOAD SHORT                    | After UA810 occurred, Bypass Abnormal occurred within 1 second. (#1) | CHECK LOAD            | [1] | Minor | Flicker |
| UF301 | UPS CONTROL CIRCUIT ERROR     | Control microcomputer abnormality                                    | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF302 | UPS CONTROL CIRCUIT ERROR     | Control microcomputer abnormality                                    | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF303 | UPS CONTROL CIRCUIT ERROR     | Control microcomputer abnormality                                    | CALL SERVICE ENGINEER | [2] | Major | Lit on  |
| UF304 | UPS CONTROL CIRCUIT ERROR     | Parallel control circuit abnormality                                 | CALL SERVICE ENGINEER | [2] | Major | Lit on  |

|       |                               |                                                                              |                          |     |       |         |
|-------|-------------------------------|------------------------------------------------------------------------------|--------------------------|-----|-------|---------|
| UF305 | UPS CONTROL CIRCUIT ERROR     | Control clock abnormally                                                     | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF306 | UPS CONTROL CIRCUIT ERROR     | Control power source circuit abnormality                                     | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF309 | INVERTER VOLTAGE ABNORMAL     | Inverter output voltage abnormally before inverter power supply              | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF316 | UPS CONTROL CIRCUIT ERROR     | Control clock lost                                                           | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF352 | CONTROL POWER SUPPLY ABNORMAL | Control circuit abnormally                                                   | CALL SERVICE ENGINEER    | [1] | Minor | Flicker |
| UF402 | 52S ABNORMAL                  | 52S not turned OFF, or 52S turned OFF without any command                    | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF403 | CB3 ABNORMAL                  | CB3 not turned OFF (Note 7)                                                  | CALL SERVICE ENGINEER    | [2] | Major | Lit on  |
| UF461 | 52S ABNORMAL                  | 52S not turned ON, or 52S turned ON without any command when manual transfer | CALL SERVICE ENGINEER    | [1] | Minor | Flicker |
| UF452 | CB3 ABNORMAL                  | CB3 open                                                                     | CALL SERVICE ENGINEER    | [1] | Minor | Flicker |
| UF453 | 52L OPERATION ERR.            | 52L operated abnormally                                                      | CHECK 52L                | [2] | Major | Lit on  |
| UA801 | AC INPUT VOLTAGE OUT OF RANGE | AC input voltage fell out of +/- 15% range                                   | CHECK INPUT POWER SOURCE | [1] | Alarm | -       |
| UA806 | INVERTER OVERLOAD > 100%      | Overload exceeded 100% (Note 7)                                              | WARNING : DECREASE LOAD  | [1] | Alarm | -       |
| UA808 | INVERTER OVERLOAD > 125%      | Overload exceeded 125% (Note 7)                                              | WARNING : DECREASE LOAD  | [1] | Alarm | -       |
| UA809 | INVERTER OVERLOAD > 150%      | Overload exceeded 150% (Note 7)                                              | WARNING : DECREASE LOAD  | [1] | Alarm | -       |
| UA810 | INVERTER OVERLOAD             | Momentary over-current during inverter power.                                | WARNING : DECREASE LOAD  | [1] | Alarm | -       |
| UA811 | OVERLOAD TRANS.               | Overload transfer                                                            | -                        | [1] | Alarm | -       |
| UA812 | BYPASS VOLTAGE OUT OF RANGE   | Bypass voltage fell out of +/- 20% range                                     | CHECK BYPASS INPUT       | [1] | Alarm | -       |
| UA813 | BYPASS PHASE ROTATION ERROR   | Phase rotation is inverted when bypass voltage is normal                     | CHECK BYPASS INPUT       | [1] | Alarm | -       |
| UA814 | BYPASS FREQUENCY OUT OF RANGE | Bypass frequency fell out of inverter synchronization follow-up range        | CHECK BYPASS INPUT       | [1] | Alarm | -       |

|       |                                  |                                                                        |                          |     |       |   |
|-------|----------------------------------|------------------------------------------------------------------------|--------------------------|-----|-------|---|
| UA017 | EMERGENCY STOP<br>ACTIVATED      | Emergency stop applied                                                 | -                        | -   | Alarm | - |
| UA019 | REMOTE START<br>BUTTON ABNORMAL  | There is an error with the remote<br>start switch.                     | CALL SERVICE<br>ENGINEER | [1] | Alarm | - |
| UA020 | REMOTE STOP BUTTON<br>ABNORMAL   | There is an error with the remote<br>stop switch.                      | CALL SERVICE<br>ENGINEER | [1] | Alarm | - |
| UA024 | CB2 OPEN                         | Battery disconnect circuit breaker<br>CB2 turned OFF                   | TURN ON CB2              | [1] | Alarm | - |
| UA031 | EMERGENCY BYPASS<br>SWITCH ON    | Emergency bypass switch turned<br>to <Emergency>                       | -                        | [1] | Alarm | - |
| UA034 | BATTERY DEPLETED<br>INV. STOPPED | DC voltage dropped below<br>discharge end during inverter<br>operation | -                        | -   | Alarm | - |
| UA041 | CONVERTER OPE.<br>PROHIBITION    | Converter operation interlock<br>applied                               | -                        | -   | Alarm | - |
| UA042 | OUTPUT CIRCUIT<br>ABNORMAL       | Load bus voltage sensor<br>abnormally                                  | -                        | -   | Alarm | - |

#1: Output circuit may be shorted.  
#2: Check the CB3 and Bypass Thyristors.

(Note 1) Audible annunciator: [1] intermittent sound, [2] continuous sound.

(Note 2) 1) "Major" is defined as major failure. Inverter transferred to the static bypass line;  
2) "Minor" is defined as a minor failure. UPS continues to operate normally, but cause of alarm must be identified;

(Note 3) Indicates one of two possible LED illumination patterns - continuously on (lit) or intermittent (flicker).

(Note 4) External send-out possible by option setting.

(Note 5) Trips the battery breaker CB2.

(Note 6) For other than sealed-type battery.

(Note 7) If the specified time elapses, will transfer to the bypass power supply.

(Note 8) Shows only when corresponding option settings are made.

(Note 9) Code indication means:

|               |                           |
|---------------|---------------------------|
| UA+++         | Alarm                     |
| UF+++         | Failure                   |
| U%0++         | Rectifier circuit failure |
| U%1++         | DC circuit failure        |
| U%2++         | Inverter circuit failure  |
| U%3++         | Control circuit failure   |
| U%4++         | Bypass system failure     |
| U%8++         | Alarm                     |
| U%+00 - U%+49 | Major failure             |
| U%+60 - U%+99 | Minor failure             |

\*) "+" denotes any numeral from 0 to 9

\*) "%" denotes either "A" or "F"

## 7.0 WARRANTY & OUT OF WARRANTY SERVICE

The Mitsubishi Electric UPS Division Service Department has many Authorized Service Centers place strategically throughout the US, Canada and Latin America. For both in warranty and out of warranty service, please contact Mitsubishi Electric Power Products, Inc. at (724) 772-2555. To register your UPS for warranty purposes, please complete the warranty registration form and fax it to the Mitsubishi Electric UPS Division Service Department fax line shown on the registration form. (Next page)

For warranty purposes, it is essential that any and all service work that may be required on your Mitsubishi brand UPS equipment is performed by a Mitsubishi Electric Authorized Service Center. The use of non-authorized service providers may void your warranty.



Mitsubishi Electric Power Products, Inc.  
UPS Division Service Department

530 Keystone Drive,  
Warrendale, PA 15086, USA  
Phone: (724) 772-2555  
Fax: (724) 778-3146



Mitsubishi Electric Power Products, Inc.  
UNINTERRUPTIBLE POWER SUPPLIES  
630 Keystone Drive, Warrendale, PA 15006

Phone: (724) 772-2555, Fax: (724) 778-3146

## UPS Warranty Registration

☐ Register UPS for Warranty

☐ Address Change

To validate the Warranty on your UPS this form must be filled out completely by Customer and returned.

| CUSTOMER INFORMATION   |                                                   |                   |
|------------------------|---------------------------------------------------|-------------------|
| Your Name:             |                                                   | Job Title:        |
| Company Name:          |                                                   |                   |
| Division / Department: |                                                   |                   |
| Address:               |                                                   |                   |
| City:                  | State:                                            | Zip Code:         |
| Country:               |                                                   | Province:         |
| Business Phone:        | Ext:                                              | Fax:              |
| E-Mail:                |                                                   | Internet Address: |
| UPS Model #:           | Capacity (kVA):                                   | UPS Serial #:     |
| Start-Up Date:         | Authorized Mitsubishi Service Company (if known): |                   |
| Signature:             | Date:                                             |                   |

Which ONE of These Best Describes Your Organization's Primary Business Classification?

Number of Employees at This Location Is:

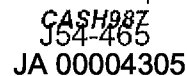
|                                                  |                                                                   |                                                            |                                       |                                       |
|--------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> {Energy Producer}       | <input type="checkbox"/> Education/Univ. Service (Service)        | <input type="checkbox"/> 1 - 19                            | <input type="checkbox"/> 100 - 249    | <input type="checkbox"/> 1000 or more |
| <input type="checkbox"/> Utility                 | <input type="checkbox"/> Consulting                               | <input type="checkbox"/> 20 - 49                           | <input type="checkbox"/> 250 - 499    |                                       |
| <input type="checkbox"/> Alternate Energy        | <input type="checkbox"/> Engineering                              | <input type="checkbox"/> 50 - 99                           | <input type="checkbox"/> 500 - 999    |                                       |
| <input type="checkbox"/> {Manufacturing Co.}     | <input type="checkbox"/> Outsourcing                              | Overall how was Start-Up performed:                        |                                       |                                       |
| <input type="checkbox"/> OEM                     | <input type="checkbox"/> Financial/Legal/Insurance (Expectations) | <input type="checkbox"/> Unsatisfactory                    | <input type="checkbox"/> Satisfactory | <input type="checkbox"/> Exceeded     |
| <input type="checkbox"/> Process                 | <input type="checkbox"/> (Government)                             | Would you like to receive future product updates and news? |                                       |                                       |
| <input type="checkbox"/> Consumer Goods          | <input type="checkbox"/> Military                                 | <input type="checkbox"/> Yes                               | <input type="checkbox"/> No           |                                       |
| <input type="checkbox"/> Electronics             | <input type="checkbox"/> Municipal                                |                                                            |                                       |                                       |
| <input type="checkbox"/> Power Quality Equipment | <input type="checkbox"/> Federal/State/Local                      |                                                            |                                       |                                       |
| <input type="checkbox"/> Commercial Business     | <input type="checkbox"/> Communications                           |                                                            |                                       |                                       |
| <input type="checkbox"/> Electrical Contractor   | <input type="checkbox"/> Distributors/Reps                        |                                                            |                                       |                                       |
| <input type="checkbox"/> Healthcare              | <input type="checkbox"/> Other                                    |                                                            |                                       |                                       |
| <input type="checkbox"/> Internet                |                                                                   |                                                            |                                       |                                       |

After Start-Up has been done Fax completed Form to:  
(724) 778-3146

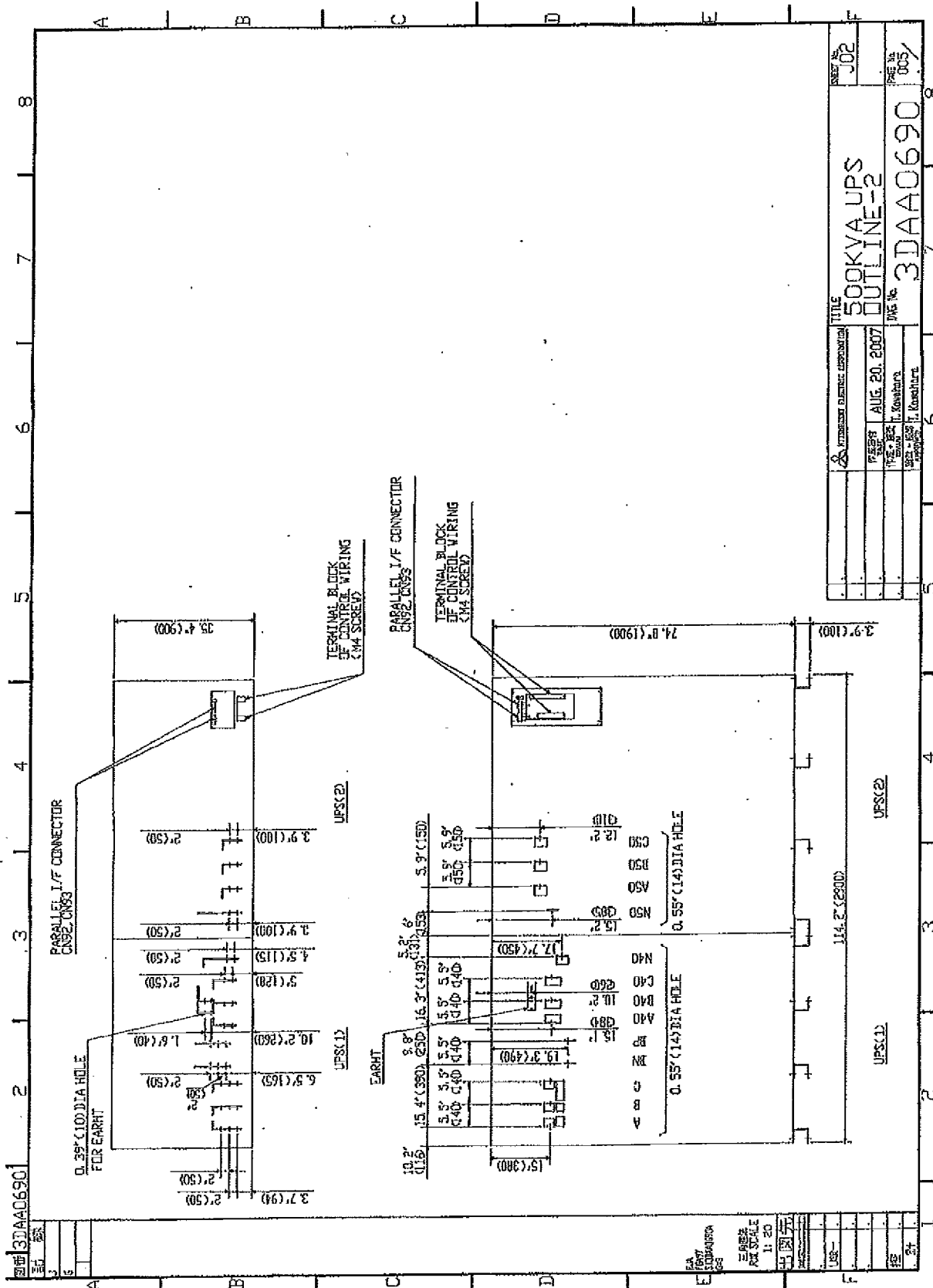
CASH984  
J54-462  
JA 00004302



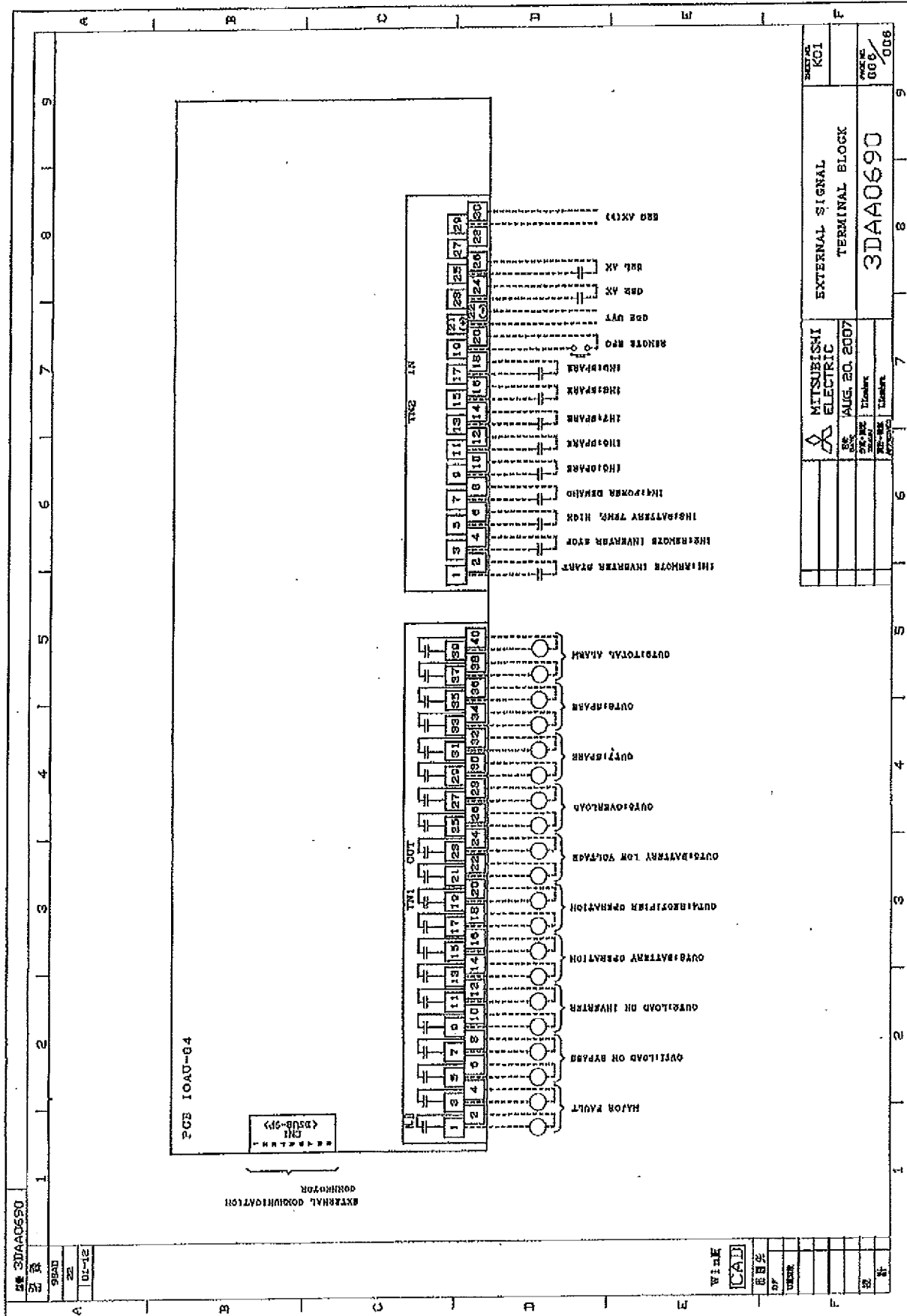






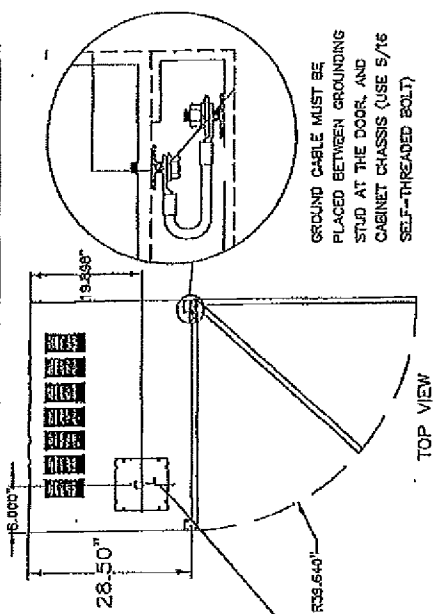


|             |                         |
|-------------|-------------------------|
| PROJECT NO. | J02                     |
| TITLE       | 500KVA UPS<br>OUTLINE-2 |
| DATE        | AUG 20, 2007            |
| DESIGNED BY | W. K. K. K.             |
| CHECKED BY  | W. K. K. K.             |
| APPROVED BY | W. K. K. K.             |
| DATE        |                         |
| PROJECT NO. | 3DAAD690                |
| DATE        |                         |



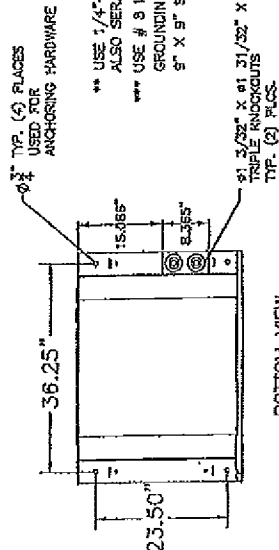
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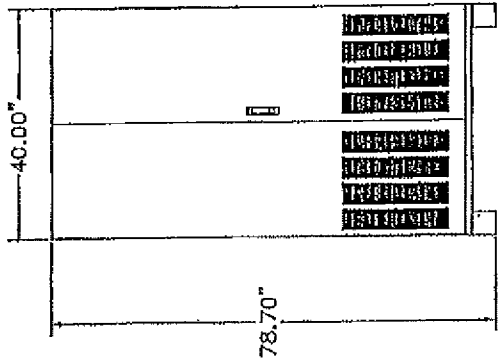


USE 1/4"-20 ELEVATOR BOLT (HIN-0213) FOR GROUNDING  
ALSO SEPARATED NUT (HIN-0214) AS SHOWN  
USE # 8 LD STAR LOCK WASHERS FOR  
GROUNDING UNDER HEAD OF SCREW  
5" X 5" SQUARE PLATE

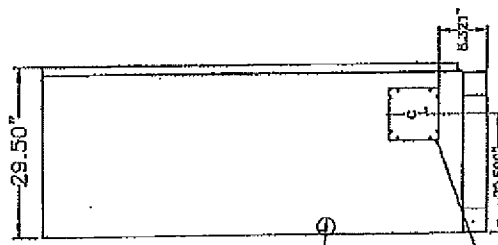
SEE NOTE \*\*\*



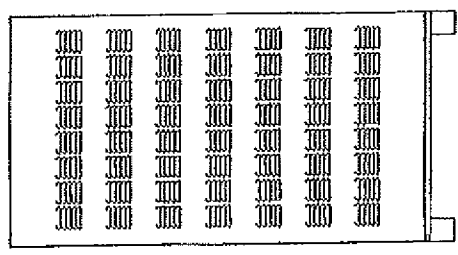
BOTTOM VIEW



FRONT VIEW



SIDE VIEW



BACK VIEW

MITSUBISHI MC5 MATCHING BATTERY CABINET EXCLUSIVE TO MITSUBISHI

CABINET NOTES:

- 1). NEMA 1 ENCLOSED BATTERY CABINET.
- 2). BATTERY CABINETS ARE UL LISTED 1778.
- 3). CABINETS ARE SEISMIC RATED FOR UBC ZONE 4.
- 4). CABINET FRAME IS 10 GAUGE SHEET STEEL.
- 5). CABINET BATTERY RAILS ARE 10 GAUGE SHEET STEEL.
- 6). DOORS AND REAR PANEL ARE 16 GAUGE SHEET STEEL.
- 7). PAINT IS MITSUBISHI BEIGE MUNSELL Y-571-M (S77/1) POWDER COAT, OVEN BAKED FOR CHIP & CORROSION RESISTANT FINISH.
- 8). BATTERIES ARE FRONT AND REAR ACCESSIBLE.

|                           |      |                            |          |
|---------------------------|------|----------------------------|----------|
| PAGE 1 OF 2               |      | DATE                       | 04/05/08 |
| REVISIONS                 |      | BY                         | DATE     |
| 1                         | DATE | BY                         | DATE     |
| 2                         | DATE | BY                         | DATE     |
| 3                         | DATE | BY                         | DATE     |
| 4                         | DATE | BY                         | DATE     |
| 5                         | DATE | BY                         | DATE     |
| 6                         | DATE | BY                         | DATE     |
| 7                         | DATE | BY                         | DATE     |
| 8                         | DATE | BY                         | DATE     |
| POWER                     |      | POWER BATTERY COMPANY INC. |          |
| BATTERY SYSTEM LAYOUT FOR |      | 1MC5 CABINET               |          |
| DRAWING NO.               |      | 1MC5-LAYOUT                |          |

# TYPICAL CABINET WEIGHTS

| PART NUMBER (8000) | HEIGHT (LBS.) |
|--------------------|---------------|
| 1MCS-P100-KVA      | 3,571         |
| 1MCS-P150-KVA      | 4,024         |
| 1MCS-P150-KVA      | 4,792         |

## BATTERY TERMINALS & TORQUE SPECS.

| BATTERY MODEL         | TERMINAL TYPE                  | TORQUE       |
|-----------------------|--------------------------------|--------------|
| PRC/TC-12100S, 12120S | 1/4"-20 x 5/8" THREADED STUD   | 70 IN.-LBS.  |
| PRC/TC-12150C         | 1/4"-20 THREADED COPPER INSERT | 120 IN.-LBS. |

## TYPICAL BREAKER SIZING (FOR 1 OR 2 CABINET SYSTEMS)

| 9500 SERIES UPS SIZE | 100 KVA        | 150 KVA        | 225 KVA     |
|----------------------|----------------|----------------|-------------|
| BREAKER SIZE AMPS    | 225 A.         | 350 A.         | 500 A.      |
| BREAKER FRAME TYPE   | ABB-S5         | ABB-S5         | ABB-S6      |
| I.C. RATING, 480VAC  | 25,000         | 35,000         | 50,000      |
| INPUT LUG SIZE       | (1)-40A-300MCM | (2)-3/0-250MCM | (3)-2/0-400 |
| OUTPUT LUG SIZE      | (1)-40A-300MCM | (1)-250-500MCM | (3)-2/0-400 |
| UVR, ALARM & AUX.    | YES            | YES            | YES         |
| 9500 SERIES UPS SIZE | 300 KVA        | 475 KVA        | 750 KVA     |
| BREAKER SIZE AMPS    | 500 A.         | 550 A.         | 500 A.      |
| BREAKER FRAME TYPE   | ABB-S6         | ABB-S6         | SEE NOTE A  |
| I.C. RATING, 480VAC  | 50,000         | 50,000         | 50,000      |
| INPUT LUG SIZE       | (3)-2/0-400    | (3)-2/0-400    | SEE NOTE A  |
| OUTPUT LUG SIZE      | (3)-2/0-400    | (3)-2/0-400    | SEE NOTE A  |
| UVR, ALARM & AUX.    | YES            | YES            | SEE NOTE A  |

\* 2 CABINET SYSTEM REQUIRED, BREAKERS SIZED PER STRING WITH NO REDUNDANCY.  
NOTE A: SEE FREE STANDING FLOOR MOUNTED DC DISCONNECT.

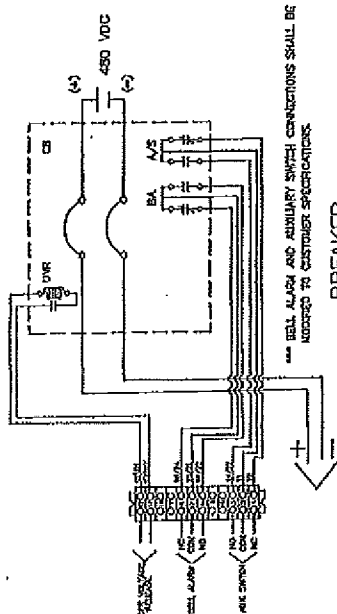
## IMPORTANT NOTES

THE CUSTOMER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING THIS EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS WHEN HANDLING, KEEP UPRIGHT WITHIN +/- 15 DEGREES.

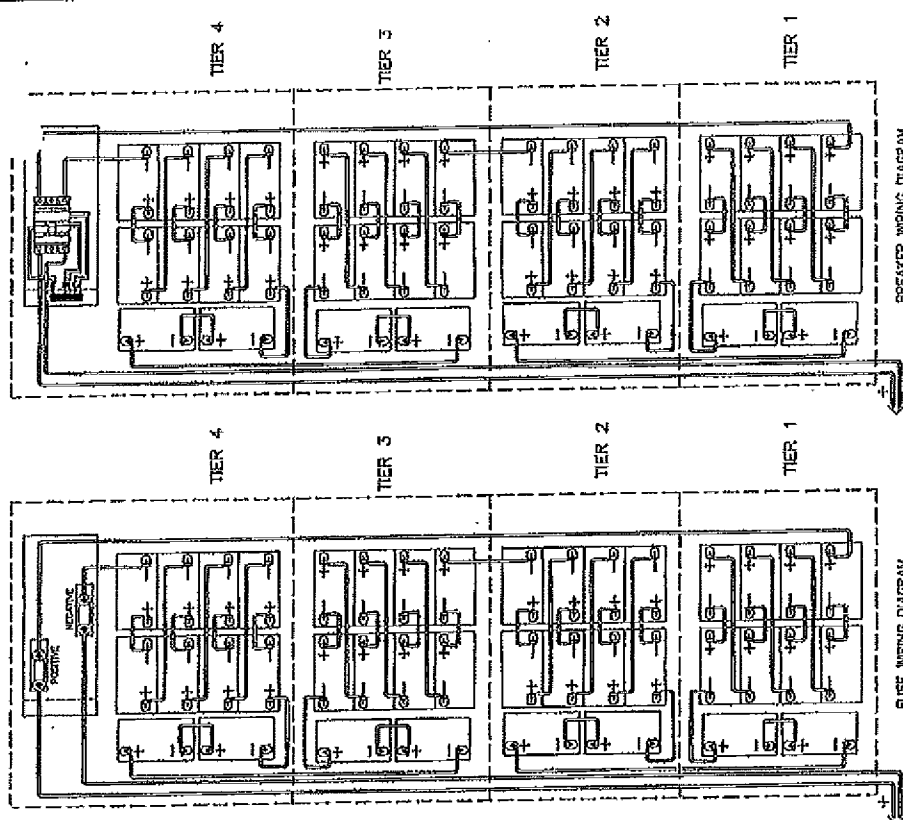
## INSTALLATION AND MAINTENANCE

CAUTION: REFER TO INSTALLATION INSTRUCTIONS (IIS-1) PRIOR TO INSTALLING CABINET.

- ALL RECOMMENDED CUSTOMER'S CABLE GAUGES ARE BASED ON TABLE 3/0-16 OF N.E.C. USING 75 C AMBIENT. WIRE GAUGES.
- INTERNAL BREAKER IS FOR OVERCURRENT PROTECTION ONLY.
- BREAKER LUG MOUNTING TORQUE VALUE: 110 IN.-LBS.  
BREAKER WIRE LUG TORQUE VALUE: 375 IN.-LBS.  
FUSE LUG MOUNTING TORQUE VALUE: N/A
- USE INSULATED TOOLS FOR CABINET INSTALLATION. DO NOT ALLOW TOOLS OR CABLES TO REST ON BATTERIES.



BREAKER ELECTRICAL SCHEMATIC

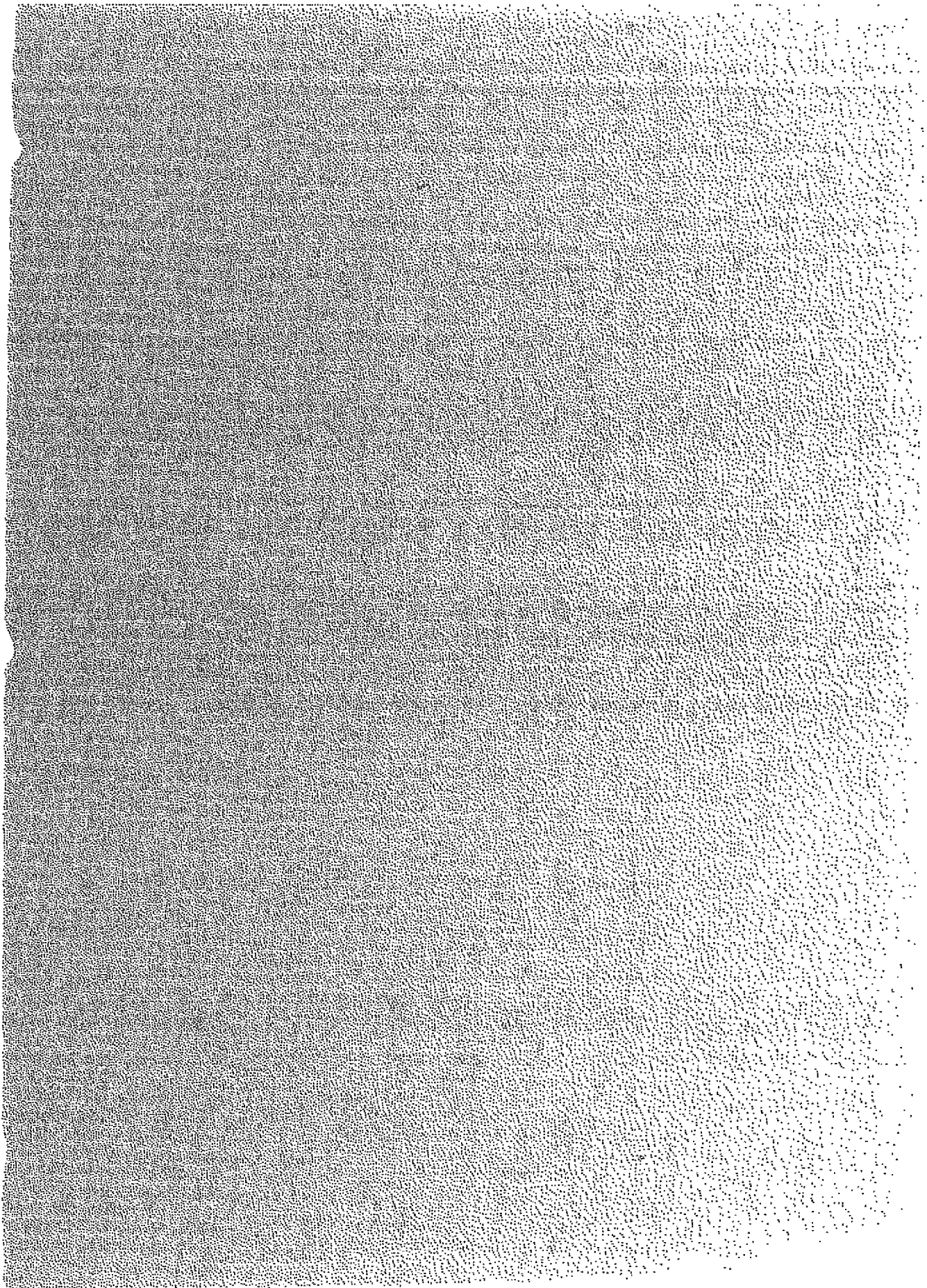


- ELECTRICAL NOTES:
- ALL INTERNAL WIRING IS UL LISTED ENCLOSED MTW 105C BODY.
  - FUSES USED ARE FERRAZ SHAWMUT UL APPROVED, AUT SERIES DUAL ELEMENT/TIME DELAY.
  - BREAKER TYPE ABB UL APPROVED.
  - CABINETS WITH BREAKERS ARE SHIPPED WITH THE BREAKER IN THE OFF/OPEN POSITION.
  - CABINETS ARE SHIPPED WITH THE BATTERY JUMPER REMOVED TO BREAK STRONG VOLTAGE FOR ADDED SAFETY DURING SHIPPING.
  - CABLES FROM BATTERY CABINET TO UPS ARE TO BE SUPPLIED BY THE CUSTOMER.
  - CABINET GROUND CONNECTION IS A 1/2"-20 THREADED STUD.

PAGE 2 OF 2  
REVISIONS: 04/05/06

| NO. | DATE | BY | DESCRIPTION               |
|-----|------|----|---------------------------|
| 1   |      |    | SHOWN ON                  |
| 2   |      |    | ANTO                      |
| 3   |      |    | NOT VALID UNLESS APPROVED |
| 4   |      |    | DATE: 04/05/06            |
| 5   |      |    |                           |

**POWER**  
POWER BATTERY COMPANY, INC.  
BATTERY SYSTEM LAYOUT FOR  
1MCS CABINET (480 V.) WITH  
(40) 12 V. BATTERIES  
SHOWN ON: 1MCS-LAYOUT



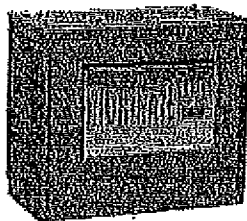
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JA 00004312

**POWER**  
Power for a World of Applications

**HIGH-RATE** Series

**FRC-12150C**  
and  
**TC-12150C**

IMPROVED  
HIGH-RATE  
PERFORMANCE



**VALVE REGULATED  
LEAD ACID BATTERY (V.R.L.A.)**



**ABSORBED GLASS MAT  
TECHNOLOGY (A.G.M.)**



**10 YEAR DESIGN FOR UPS AND  
STANDBY APPLICATIONS**



### Features and Benefits

- Ten year design life in float service.
- A recognized component of U.L.
- Valve regulated lead acid battery (VRLA).
- Absorbed glass mat technology (AGM) with gas recombination greater than 99%.
- Operates at a low internal pressure.
- Never needs watering; minimal maintenance.
- Shock absorbent thick wall polypropylene plastic, case and cover.
- Advanced lead tin calcium alloy, reduces grid corrosion and promotes long battery life.
- Cold forged nonporous terminal bushings; eliminate post leakage.
- Thermally welded case to cover bond; eliminates both acid and electrical leaks.
- Over-sized, through the partition inter-cell welds for minimal power loss.
- Flame arresting, low pressure safety release venting system for individual cells, recognized per U.L. 924.
- Measured high vacuum acid fill, reduces electrical variability between cells.
- 100% recyclable materials.

### Specifications

|                                              |                                                                                 |
|----------------------------------------------|---------------------------------------------------------------------------------|
| Cells / Volts                                | 6 cells / 12 volts                                                              |
| Terminal type                                | Threaded copper insert, 1/4"                                                    |
| Maximum discharge current                    | 805 amps                                                                        |
| Short circuit current                        | 5454 amps                                                                       |
| Impedance @ 25°C/77°F                        | 2.2 milliohms                                                                   |
| Electrolyte (S.G.)                           | 1.300                                                                           |
| Capacity @ 25°C/77°F                         | 136 AH @ 20 hrs                                                                 |
| to 1.75 V.P.C.                               | 128 AH @ 8 hrs                                                                  |
| Operating temperature range:                 | -40°C/-40°F to 60°C/140°F                                                       |
| Charging voltage / current:                  | 2.27 to 2.30 volts per cell, constant voltage at a maximum current of C/4 amps. |
| Temperature compensation:                    | Subtract 3mV/°C/cell or 1.7 mV/°F/cell, above 25°C/77°F.                        |
| Apply for temperature range of               | Add 3 mV/°C/cell or 1.7 mV/°F/cell, below 25°C/77°F.                            |
| 0°C/32°F to 40°C/104°F                       |                                                                                 |
| Storage time from a fully charged condition: | 6 months at 25°C/77°F. For each 9°C/15°F rise, reduce the storage time by half. |
| AC ripple from charging source               | 1.5% peak to peak of float                                                      |
| Overall dimensions                           | 10.75" H x 13.50" L x 6.81" W                                                   |
| (inches, mm)                                 | 273mm H x 343mm L x 173mm W                                                     |
| Weight lbs / kgs                             | 106 / 48.1                                                                      |

### Options

- The TC-12150C battery has a flame retardant case and cover compliant with U.L. 1778; with an oxygen index greater than 25%.
- Terminal covers and custom inter-connecting battery cables.

### No transport restrictions

- Surface transport. Classified as non-hazardous material as relates to DOT-CFR Title 49 parts 171-189.
- Maritime transport. Classified as non-hazardous material as relates per IMDG amendment 27.
- Air transport. Complies with IATA / ICAO, special provision A67.

### DISCHARGE SPECIFICATIONS

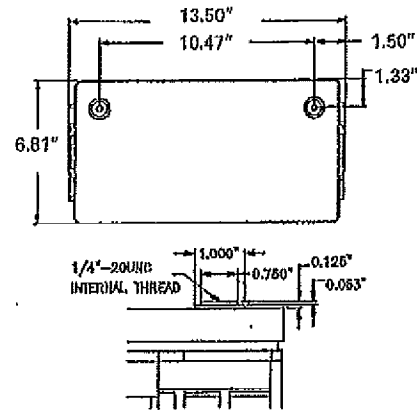
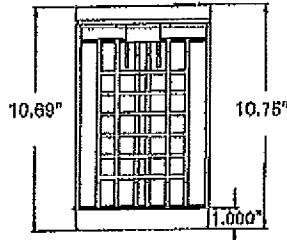
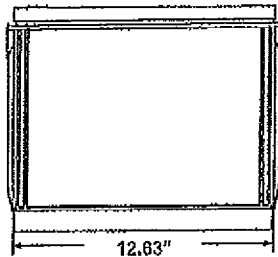
| Constant power ratings, Watts per battery @ 77°F (25°C) in minutes |      |      |      |      |      |      |      |      |      |     |
|--------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|-----|
| Final V.P.C.                                                       | 5    | 10   | 15   | 20   | 30   | 40   | 45   | 50   | 60   | 90  |
| 1.60                                                               | 5673 | 3975 | 3065 | 2543 | 1843 | 1490 | 1359 | 1267 | 1108 | 715 |
| 1.67                                                               | 5480 | 3900 | 3030 | 2520 | 1830 | 1480 | 1350 | 1260 | 1102 | 712 |
| 1.70                                                               | 5398 | 3871 | 3011 | 2505 | 1823 | 1476 | 1346 | 1257 | 1101 | 707 |
| 1.75                                                               | 5117 | 3643 | 2902 | 2458 | 1807 | 1462 | 1334 | 1245 | 1092 | 706 |

Rates in blue are new and improved.

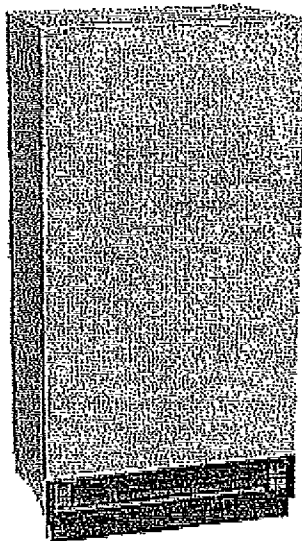
**POWER**  
Power for a World of Applications

**HIGH-RATE** Series

**PRC-12150C**  
and  
**TC-12150C**



COPPER INSERTED TERMINAL DETAIL



CR4 Cabinet

POWER BATTERY offers an extensive line of pre-wired and fused battery cabinets that are UL and CUL approved. Custom DC voltages, breakers and chargers are also available.

| Battery Cabinet Systems (pre-wired with P1012P2-1500 batteries) |                        |                      |          |           |                 |
|-----------------------------------------------------------------|------------------------|----------------------|----------|-----------|-----------------|
| Battery cabinet model                                           | Maximum # of batteries | Dimensions           |          |           | Weight lbs /kgs |
|                                                                 |                        | inches / millimeters |          |           |                 |
|                                                                 |                        | W                    | D        | H         |                 |
| KS5                                                             | 2                      | 15.0/381             | 25.0/635 | 15.75/400 | 267/116         |
| KS6                                                             | 4                      | 16.0/406             | 34.5/876 | 17.75/451 | 499/226         |
| KS7                                                             | 8                      | 16.0/406             | 34.5/876 | 37.25/946 | 998/453         |
| CR1                                                             | 12                     | 24.0/610             | 32.5/826 | 43.0/1092 | 1532/695        |
| CR3                                                             | 20                     | 40.0/1016            | 32.5/826 | 43.0/1092 | 2446/1110       |
| CR6                                                             | 30                     | 40.0/1016            | 32.5/826 | 60.0/1524 | 3622/1643       |
| CR4                                                             | 40                     | 40.0/1016            | 32.5/826 | 77.0/1956 | 4798/2176       |

| Constant current ratings, Amperes @ 77°F (25°C) in hours |      |      |      |      |      |      |      |      |      |      |
|----------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|
| Final VPC                                                | 1    | 2    | 3    | 4    | 5    | 6    | 8    | 10   | 12   | 20   |
| 1.75                                                     | 95.0 | 47.2 | 34.4 | 27.0 | 23.5 | 18.9 | 16.0 | 14.0 | 10.2 | 6.80 |
| 1.80                                                     | 80.1 | 46.9 | 34.0 | 26.5 | 21.9 | 18.6 | 14.5 | 11.9 | 10.1 | 6.40 |
| 1.85                                                     | 76.9 | 45.4 | 32.8 | 25.6 | 21.1 | 18.1 | 14.0 | 11.5 | 9.70 | 6.20 |
| 1.90                                                     | 70.7 | 42.5 | 30.8 | 24.2 | 19.9 | 17.0 | 13.0 | 10.6 | 8.90 | 6.70 |

Notes in blue are new and improved.

**U.S.A.**  
Power Battery Company, Inc.  
25 McLean Blvd.  
Paterson, N.J. 07614-1507  
Phone: (973) 523-8530  
Fax: (973) 523-3023  
E-mail: sales@powbat.com  
Website: www.powerbattery.com

**CANADA**  
Power Battery (Iberville) Ltd.  
770 Thomas Ave.  
Iberville, Quebec, J2X 6E7  
Phone: (450) 346-3273  
Fax: (450) 346-8003  
E-mail: powerbat@sympatco.ca  
Website: www.powerbattery.com

**UK**  
Power Batteries Ltd.  
Preston Way, Abbey Park Industrial Estate  
Romsey, Hampshire, SO51 9AQ  
Phone: +44 (0)1794 835900  
Fax: +44 (0)1704 835910  
E-mail: sales@powbat.co.uk  
Website: www.powbat.co.uk

**ITALY**  
Power Battery Srl  
Via Locatelli 105  
20046 Bissone MI - ITALY  
Phone: +39 039 2324571  
Fax: +39 039 2490200  
E-mail: calberli@powbat.it  
Website: www.powbat.it

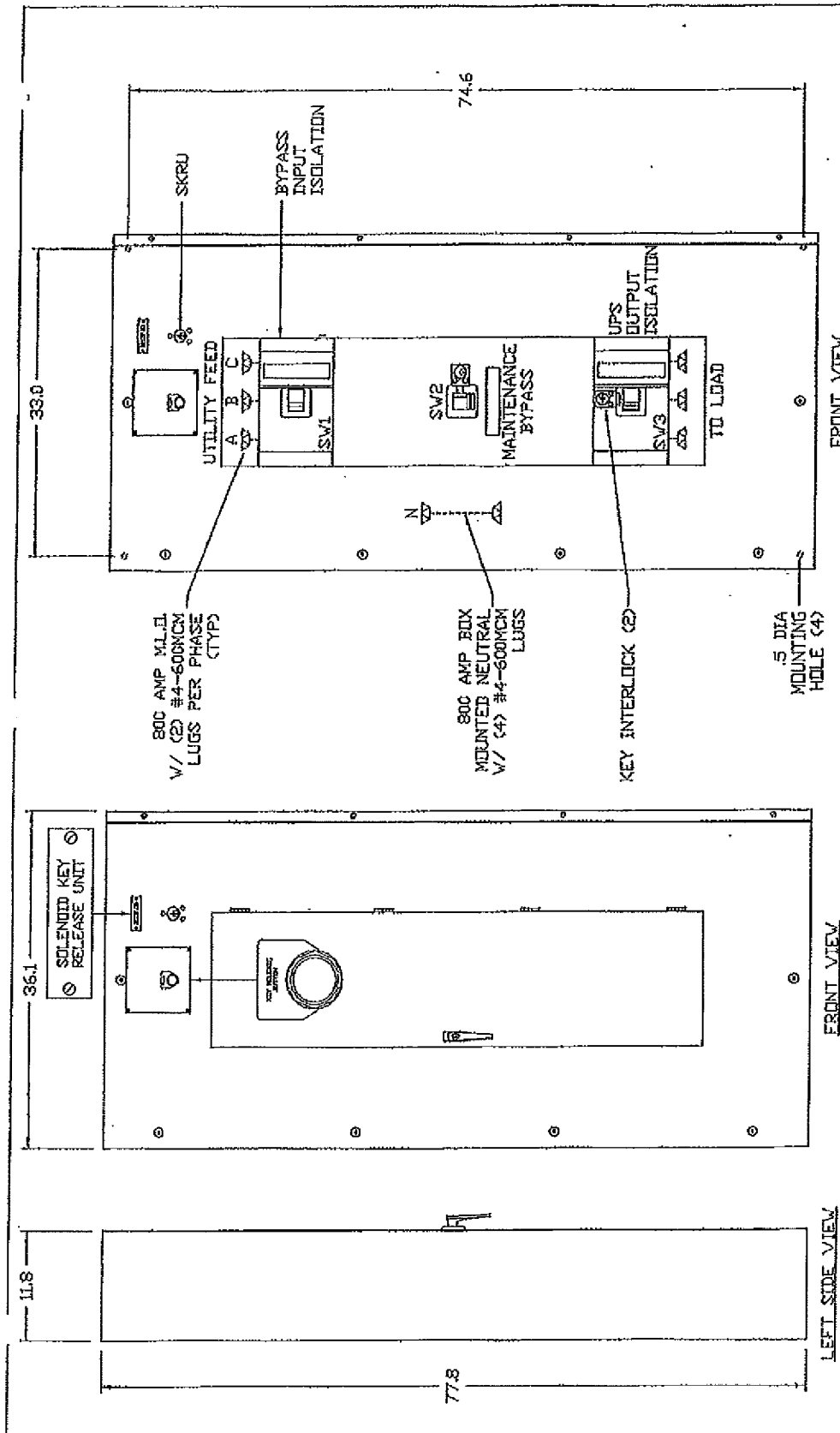
**CHINA**  
Power Battery (Guangdong) Ltd.  
Unit 1, 23/Floor, Wealthy Plaza  
138 Sau Kei Wan Road  
Sai Wan Ho, Hong Kong  
Phone: ++852 2-500-2222  
Fax: ++852 2-967-8157  
E-mail: info@newiglobal.com  
Website: www.powerbattery.com

CASH996  
J54-474

JA 00004314

CASH997  
J54-475  
JA 00004315

CASH998  
J54-476  
JA 00004316



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|                                                        |  |                                                      |  |
|--------------------------------------------------------|--|------------------------------------------------------|--|
| <b>MITSUBISHI ELECTRIC</b><br>VERNON HILLS, ILLINOIS   |  | PART NO.: SEE TABLE                                  |  |
| DESCRIPTION: 3 BREAKER MBP PANEL - 800 AMP MAX W/ SKRU |  | MEAU APPROVED: <i>RMQ</i> KINNEY APPROVED: <i>RM</i> |  |
| DATE: 11-26-2003                                       |  | REV: *                                               |  |
| DRAWN BY: TA                                           |  | SHEET:                                               |  |
| MEWXXX0800A06                                          |  | DRAWING NO.:                                         |  |
| M0000201                                               |  | 1 OF 2                                               |  |

### 3 BREAKER MAINTENANCE BYPASS PANEL (MBP) 400-800 AMPERES

| PART NUMBER        | UPS SERIES | KVA | BREAKER TYPE | AMPERES | SERVICE  | A. I. C. RATING |
|--------------------|------------|-----|--------------|---------|----------|-----------------|
| VB973-CBP-800-208K | 9700/9800  | 225 | MDL          | 800     | 208/120V | 65,000          |
| VB973-CBP-800-480K | 9700/9800  | 500 | MDL          | 800     | 480/277V | 50,000          |
|                    |            |     |              |         |          |                 |
|                    |            |     |              |         |          |                 |

| A. I. C. RATING | 208/120V | RATING CODE | 480/277V | RATING CODE |
|-----------------|----------|-------------|----------|-------------|
| 65,000          | MDL      | --          | HMDL     | H           |
| 100,000         | HMDL     | H           | --       | --          |

KINNEY PANEL TYPE: GDP (UL 67 LISTED INTERIOR)  
 SERVICE: SEE TABLE ABOVE.  
 ENCLOSURE: NEMA 1 (UL 50 LISTED ENCLOSED)  
 BOX: 12 GAUGE PAINTED STEEL, NO KNOCKOUTS.  
 TRIM: 12 GAUGE PAINTED STEEL, HELD TO BOX WITH ADJUSTABLE TRIM CLAMPS - SURFACE MOUNTING.  
 DOOR: EQUIPPED WITH ONE 3 X 5 DIRECTORY CARDHOLDER, CORBIN 1000 VAULT HANDLE LOCK AND THREE POINT CATCH.  
 FINISH: MITSUBISHI BEIGE POLYESTER POWDERCOAT APPLIED TO SURFACES TREATED WITH AN IRON PHOSPHATE AND CHROME FREE SEALER.  
 BUS: ELECTROLYTIC COPPER OF 98% CONDUCTIVITY, BASED IN 1000 AMPS PER SQUARE INCH DENSITY.  
 WIRE BENDING CUTTER: MEETS OR EXCEEDS NEC TABLES 373-6(a), 373-6(b).  
 BREAKERS: WESTINGHOUSE THERMAL-MAGNETIC, 800 AMP FRAME, 3 POLE, TRIP AS INDICATED.  
 SEE TABLE ABOVE FOR BREAKER TYPE, AMPERES, AND A. I. C. RATING.  
 BREAKER TERMINAL LUG: (2) 500-750MCM PER PHASE.  
 KEY INTERLOCKS: KIRK TYPE FL, BREAKERS ARE INTERLOCKED IN THE OPEN POSITION.  
 SOLENOID KEY RELEASE: KIRK TYPE SKRU, 110V COIL.

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#### REVISIONS

| PART NO.:                                              | SEE TABLE                   |
|--------------------------------------------------------|-----------------------------|
| DESCRIPTION: 3 BREAKER MBP PANEL - 800 AMP MAX W/ SKRU |                             |
| MEAU APPROVED: <i>JWA</i>                              | KINNEY APPROVED: <i>RFM</i> |
| DATE: 11-26-2003                                       | DRAWING NO.: SHEET:         |
| DRAWN BY: TA                                           | MBWXXX0800A06; M0000201     |
|                                                        | 2 OF 2                      |

#### PART NUMBER:

VB973-X X X-800-208K

A.I.C. RATING OPTION  
 ACCESSORY OPTION 1  
 ACCESSORY OPTION 2

#### A.I.C. RATING CODES:

H - HIGH INTERRUPTING

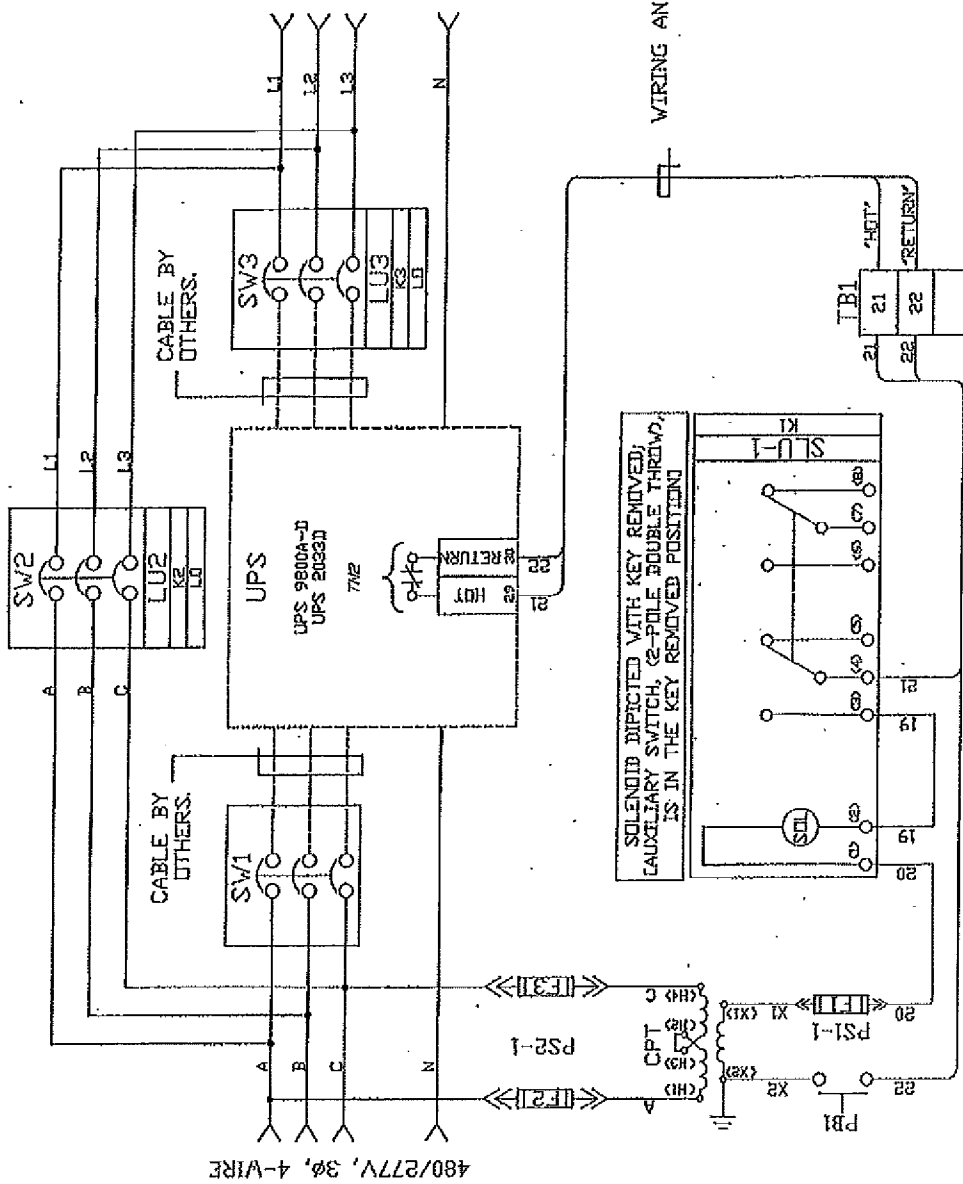
#### ACCESSORY CODES:

- 1 - 1a/1b AUXILIARY SWITCH
- 2 - 2a/2b AUXILIARY SWITCH
- 3 - 24VDC UNDER VOLTAGE RELEASE
- 4 - 1a/1b ALARM/LOCKOUT SWITCH
- 5 - 1a/1b AUXILIARY & 1a/1b ALARM SWITCH

#### NOTES:

- 1 ACCESSORIES NORMALLY INSTALLED ON SV2.
- 2 PUT LATEST CODE IN OPTION 1, I.e. 12, 24.

MITSUBISHI ELECTRIC  
 VERNON HILLS, ILLINOIS



|                                                                                                                                                                                                                                |                                     |                                                                            |                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------|-------------------------------------|
| This Document Contains Proprietary and Confidential Information. Duplication, reproduction or use of this document or its contents in any form other than as expressly permitted by Kinney Electrical Mfg. Co., is prohibited. |                                     | PART NO.:<br>DESCRIPTION: 480V Type "E" Interlock (Factory Installed SKRU) |                                     |
| 1                                                                                                                                                                                                                              | Added 2033D & modified description. | MEAU APPROVED: <i>[Signature]</i>                                          | KINNEY APPROVED: <i>[Signature]</i> |
|                                                                                                                                                                                                                                |                                     | DATE: 12-17-2004                                                           | CAD FILE: WIRXXXXSKRU06             |
|                                                                                                                                                                                                                                |                                     | DRAWN BY: RFM                                                              | DRAWING NO.: M0000232               |
|                                                                                                                                                                                                                                |                                     |                                                                            | REV.: 1                             |
|                                                                                                                                                                                                                                |                                     |                                                                            | SHEET: 1 OF 2                       |

LEGEND:

UPS  
F1  
P31  
SKRU  
TB1  
F2, F3  
PS2-1  
PS1-1  
OPT

UNINTERRUPTIBLE POWER SUPPLY, BY OTHERS  
FUSE, GEULD CAT. #AT82-8/10, 2-8/10A, 600VAC, FAST ACTING, 200KAL.R.  
PUSHBUTTON, CUTLER-HAMMER CAT. #10250T23B, NON-ILLUMINATED MOMENTARY, FLUSH  
WITH QD-NE CONTACT, BLACK  
SOLENOID KEY RELEASE UNIT, KIRK KEY INTERLOCK CAT. #SKRU11E, 110V COIL  
TERMINAL BLOCK, CONNECTOR CAT. #NFT3  
FUSE, FERRAZ-SHAWMUT CAT. #AT82L 1A, 600VAC, TIME DELAY, 200KAL.R.  
PULLOUT SWITCH, BOLTSWITCH CAT.#PCC261, 2 POLE, 30A, 600VAC  
PULLOUT SWITCH, BOLTSWITCH CAT.#PCC161, 1 POLE, 30A, 600VAC  
CONTROL POWER TRANSFORMER, WESTINGHOUSE CAT. #1F0894, 240/480-120V, 200VA

SOLENOID LOCK UNIT (SLU) DESCRIPTION:

1. IF SOLENOID IS ENERGIZED, KEY CAN BE TURNED AND REMOVED
2. AFTER KEY IS REMOVED, AUX. SWITCH CONTACTS CHANGE POSITION,  
SOLENOID IS DE-ENERGIZED AND CONTACT 3-4 IS OPEN
3. TO RESET, SCHEMATIC KEY MUST BE INSERTED AND TURNED TO THE LOCK POSITION
4. AFTER KEY IS TURNED, IT CAN NOT BE REMOVED AS LONG AS SOLENOID IS DE-ENERGIZED.

NOTE:

KEYS 'K1', 'K2' AND 'K3' ARE IDENTICAL.

3LINE DIAGRAM

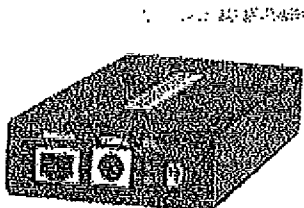
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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------|--------------------------------------------|
| <p>Document Contains Proprietary and Confidential Information.<br/>                 Reproduction or use of this document or its contents in any form<br/>                 other than as expressly permitted by Kinney Electrical Mfg. Co., is prohibited.</p> |  | <p>MITSUBISHI ELECTRIC<br/>                 VERNON HILLS, ILLINOIS</p> |                                            |
| <p>REVISIONS</p>                                                                                                                                                                                                                                              |  | <p>PART NO.:</p>                                                       |                                            |
| <p>Changed CPT,F1,F2,F3 7/22/05</p>                                                                                                                                                                                                                           |  | <p>DESCRIPTION: 480V Type "E" Interlock (Factory Installed SKRU)</p>   |                                            |
| <p>Modified description</p>                                                                                                                                                                                                                                   |  | <p>MEAU APPROVED: <i>[Signature]</i></p>                               | <p>KINNEY APPROVED: <i>[Signature]</i></p> |
|                                                                                                                                                                                                                                                               |  | <p>DATE: 12-17-2004</p>                                                | <p>REV: 2</p>                              |
|                                                                                                                                                                                                                                                               |  | <p>DRAWN BY: RFM</p>                                                   | <p>DRAWING NO.: SHEET:</p>                 |
|                                                                                                                                                                                                                                                               |  | <p>WIRING DIAGRAM</p>                                                  | <p>2 OF 2</p>                              |

CASH1003  
J54-481  
JA 00004321

## UPS Monitoring Equipment & Software

DiamondLink is an advanced, user-customizable power monitoring, management, and shutdown software designed to provide information about the power conditions of the UPS system. DiamondLink will monitor the health and status of your UPS system and, when critical events occur, will notify you and perform a graceful, unattended shutdown. DiamondLink can be configured to perform appropriate actions when an event is detected. The user configurable actions include:

- Broadcasting – Send event messaging to managers on your system
- E-mail – Send e-mails or pages as events occur with your UPS system
- SNMP Messaging – Send SNMP messaging to NMS managers
- Operating System Shutdown – Shutdown your servers when power is running low



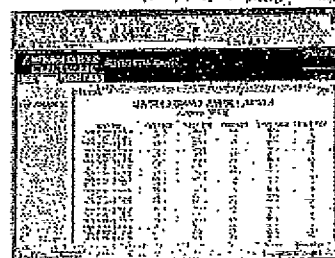
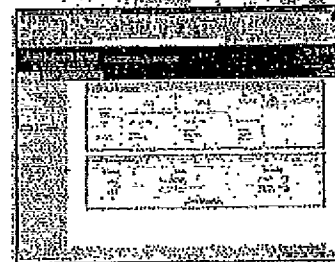
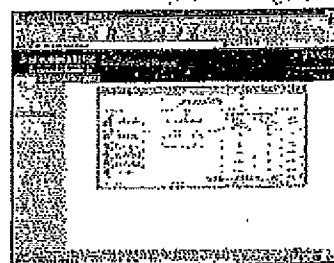
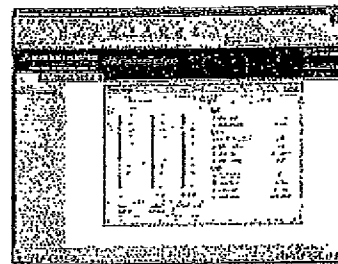
*The NetCom works with all major NMS systems on Ethernet – NetCom works with the most widely used Network Management Systems: HP OpenView, Novell ManageWise, Sun NetManager, IBM NetView, and many more.*

The NetCom hardware SNMP/Web adapter runs an embedded Simple Network Management Protocol (SNMP) software agent. This powerful and intelligent unit is designed for the rigorous task of managing the UPS systems that protect equipment and the critical data residing throughout the network. The NetCom features:

- Remote UPS status monitoring – Monitor a remote UPS system using an RS-232 Cable to the NetCom for one UPS system to a remote workstation (NMS) through an Ethernet connection
- Web Card – Assign an IP address to your UPS system to monitor and control the UPS system from anywhere around the world
- SNMP Adapter – Turn the UPS system's protocol into an SNMP software agent and enable SNMP traps
- SNMP Viewer – Unique Mitsubishi design that color coordinates SNMP messages that inform the NMS about all current UPS alarms
- Send Shutdown Signal to Networked Servers – Send a shutdown signal to servers connected via the Ethernet network
- Battery and Service Monitoring – Monitor the battery life and servicing details of the UPS
- E-mail – Send the Administrator an e-mail when an event occurs

### ModBus Communications for Building Management Systems

The MUCM card allows the customer to integrate Mitsubishi Electric UPS systems into their current Building Management Solution. The MUCM is a user-programmable protocol converter, or data concentrator, that is DIN-rail mountable, with 2 serial ports: One RS-232, one RS-485, and over 2,048 internal mailbox registers. Through the ModBus protocol converter, the UPS system's variables can be monitored through various Building Management System vendors' software.



CASH1005  
J54-483  
JA 00004323

# TEST REPORT

Appellation : 1 x 500 kVA UPS

Customer : mitsubishi electric power products , inc.

End User : \_\_\_\_\_

Serial No. : 07-7M72043-01

Mitsubishi

Working No. : 7M72043 EG 0001

Date of Test: Nov. 30, 2007

Approved by H. Uemura  
H. Uemura

Inspected by Y. Kakado  
Y. Kakado

Tested by J. Ikeda  
J. Ikeda

ALI-E71228

MITSUBISHI ELECTRIC CORPORATION  
Energy Systems Center  
Power Electronics Systems Dep.  
Quality Assurance Section  
Kobe, JAPAN

TEST REPORT FOR U. P. S.

( RATING )

TYPE : UP9833A-E504DU-4

SERIAL No. 07-7M72043-01

INPUT : AC 480 V + 15 % , - 15 %

DC 480 V ( 400 V ~ 545 V )

OUTPUT : 500 kVA Continuous

Overload : 125 % 10-MIN. , 150 % 60 SEC.

AC 480 V  $\pm$  1.0 % , 60 Hz  $\pm$  0.03 Hz

P.F. 90 % ( 70 % ~ 100 % lagging )

1. INSPECTION OF CONSTRUCTION

MECHANICAL AND APPEARANCE

Result: GOOD

2. CHECKING OF WIRING

CONTINUITY TEST

Result: GOOD

WIRE IDENTIFICATION PER DRAWING

Result: GOOD

3. GROUNDING CONTINUITY

CONTINUITY TEST :

1) Between front-door and the ground terminal.

Result: GOOD

2) Between handle on the front-door and the ground terminal.

Result: GOOD

3) Between the mounting plate for control components on the  
rear side of the front-door and ground terminal.

Result: GOOD

4) Between each enclosure and the ground terminal.

Result: GOOD

5) Between the plate for cooling-fan and the ground terminal.

Result: GOOD

6) Between each mounting chassis attached on the  
main-frame and the ground terminal.

Result: GOOD

# TEST REPORT FOR U. P. S.

## 4. INSURATION TEST

Temperature : 18 °C

Humidity : 60 %

| Applied Parts                                              | Insulation resistance<br>(500 V meggar) | AC withstand voltage test<br>( 1 minute ) | Result |
|------------------------------------------------------------|-----------------------------------------|-------------------------------------------|--------|
| Main circuit Auxiliary circuit<br>- Control circuit Ground | 100 MΩ                                  | 2500 VAC.<br>60 Hz                        | GOOD   |
| Auxiliary circuit<br>- Control circuit Ground              | 100 MΩ                                  | 1500 VAC.<br>60 Hz                        | GOOD   |
| Control circuit Ground<br>- Ground                         | 100 MΩ                                  | —                                         | GOOD   |

## 5. CONTROL CIRCUIT OPERATION TEST

Verify that the control circuit operates to specifications.

(5-1) Verification of control power voltage

Result : GOOD

(5-2) Check of the protection circuit operation

Result : GOOD

| Items                        | Value     | Specification                                            | Note |
|------------------------------|-----------|----------------------------------------------------------|------|
| AC input failure<br>detector | 397.5 VAC | 81 % to 85 % of rated<br>AC input voltage ( 480 VAC )    |      |
| Inverter overload            | 105.0 %   | 102 % to 108 % of rated<br>AC output current ( 60I AAC ) |      |
| Inverter overload            | 125.0 %   | 122 % to 128 % of rated<br>AC output current ( 60I AAC ) |      |
| Battery final voltage        | 399.3 VDC | 392 VDC to 408 VDC                                       |      |
| DC overvoltage               | 900.3 VDC | 882 VDC to 918 VDC                                       |      |

## TEST REPORT FOR U. P. S.

## 6. MEASUREMENT OF STEADY STATE CHARACTERISTICS

| Test condition  |                      | AC input  |             |             | DC input |             | AC output   |         |         |         |         |         |         |         |       |       | Output Voltage distortion factor |          |                |         |         |
|-----------------|----------------------|-----------|-------------|-------------|----------|-------------|-------------|---------|---------|---------|---------|---------|---------|---------|-------|-------|----------------------------------|----------|----------------|---------|---------|
| No              | DC circuit condition | Load      | Voltage (V) | Current (A) | P.F. (%) | Voltage (V) | Current (A) | Voltage |         |         |         |         |         | Current |       |       | Freq. (Hz)                       | P.F. (%) | A-B (%)        | B-C (%) | C-A (%) |
|                 |                      |           |             |             |          |             |             | A-B (V) | B-C (V) | C-A (V) | A-N (V) | B-N (V) | C-N (V) | A (A)   | B (A) | C (A) |                                  |          |                |         |         |
| 1               | Floating             | No-Load   | 478         | 129         | —        | 546         | 0           | 479.3   | 480.2   | 480.3   | 277.5   | 276.6   | 277.1   | 0       | 0     | 0     | 80.00                            | —        | 0.7            | 0.7     | 0.6     |
| 2               | Final Discharge      | Full-Load | —           | —           | —        | 400         | 1306        | 477.7   | 478.0   | 478.8   | 276.1   | 276.2   | 276.1   | 599     | 600   | 605   | 80.00                            | 90.1     | 0.9            | 0.8     | 0.7     |
| 3               | Floating             | Ditto     | 472         | 582         | 99.5     | 545         | 0           | 478.2   | 478.7   | 479.3   | 276.4   | 276.4   | 276.3   | 600     | 601   | 606   | 80.00                            | 90.0     | 1.0            | 0.8     | 0.8     |
| 4               | Rated                | Ditto     | —           | —           | —        | 467         | 1021        | 477.8   | 478.2   | 478.9   | 276.0   | 276.1   | 276.1   | 600     | 601   | 606   | 80.00                            | 90.1     | 0.8            | 0.8     | 0.6     |
| Specified value |                      |           |             |             |          |             |             | 475.2V  | ~       | 484.8V  | —       | —       | —       | —       | —     | —     | 59.97Hz ~ 60.03Hz                | —        | Less than 2.0% |         |         |

| Test Condition No. | AC (DC) Input power (kW) | Output power (kW) | AC/AC Efficiency (%) | DC/AC Efficiency (%) | Output phase Displacement (Degree) |
|--------------------|--------------------------|-------------------|----------------------|----------------------|------------------------------------|
| 1                  | 10.4                     | 0.0               | —                    | —                    | —                                  |
| 3                  | 477.4                    | 450.1             | 94.3                 | —                    | 119.7 ~ 120.2                      |
| 4                  | 477.0                    | 449.9             | —                    | 94.3                 | —                                  |
| Specified value    |                          |                   |                      |                      |                                    |
| Result: GOOD       |                          |                   |                      |                      |                                    |

# TEST REPORT FOR U. P. S.

## 7. MEASUREMENT OF TRANSIENT CHARACTERISTICS

| No | Test item                                                  | Test condition                                                                              | Output voltage fluctuation                 |                                              | OSC No. | Result |
|----|------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------|---------|--------|
|    |                                                            |                                                                                             | Specified value                            | Measured value                               |         |        |
| 1  | Transient response test<br>for a step load                 | Load 0 % $\rightarrow$ 100 %<br>Applied load: 500 kVA, P.F. 100 %                           | $\Delta V$ : +2.0 %, - 2.0 %<br>T: 1 cycle | $\Delta V$ : +0.0 %, - 0.5 %<br>T: 0.0 cycle | 1       | GOOD   |
| 2  | Transient response test<br>for AC input voltage<br>failure | 480 VAC $\rightarrow$ 0 VAC<br>( 545 VDC $\rightarrow$ 480 VDC )<br>Load 500 kVA, P.F. 90 % | $\Delta V$ : +1.0 %, - 1.0 %<br>T: 0 cycle | $\Delta V$ : +0.0 %, - 0.2 %<br>T: 0.0 cycle | 2<br>3  | GOOD   |

## 8. OVERLOAD TEST

We checked that U.P.S. was normal under the following overload conditions after 1 hour operation with rated load

- a) 125 % for 10 minutes
- b) 150 % for 60 seconds

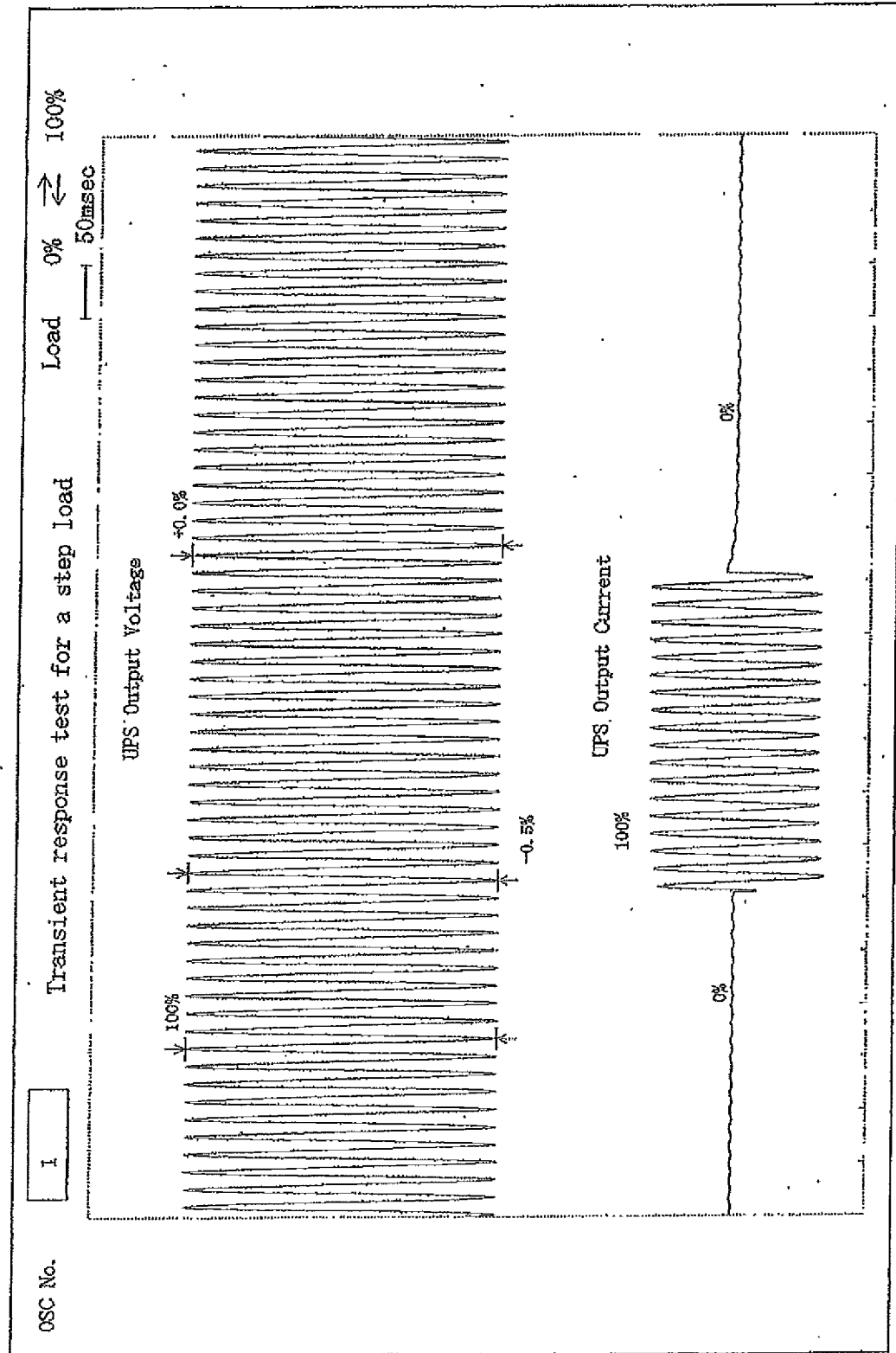
Result : GOOD

# TEST REPORT FOR U. P. S.

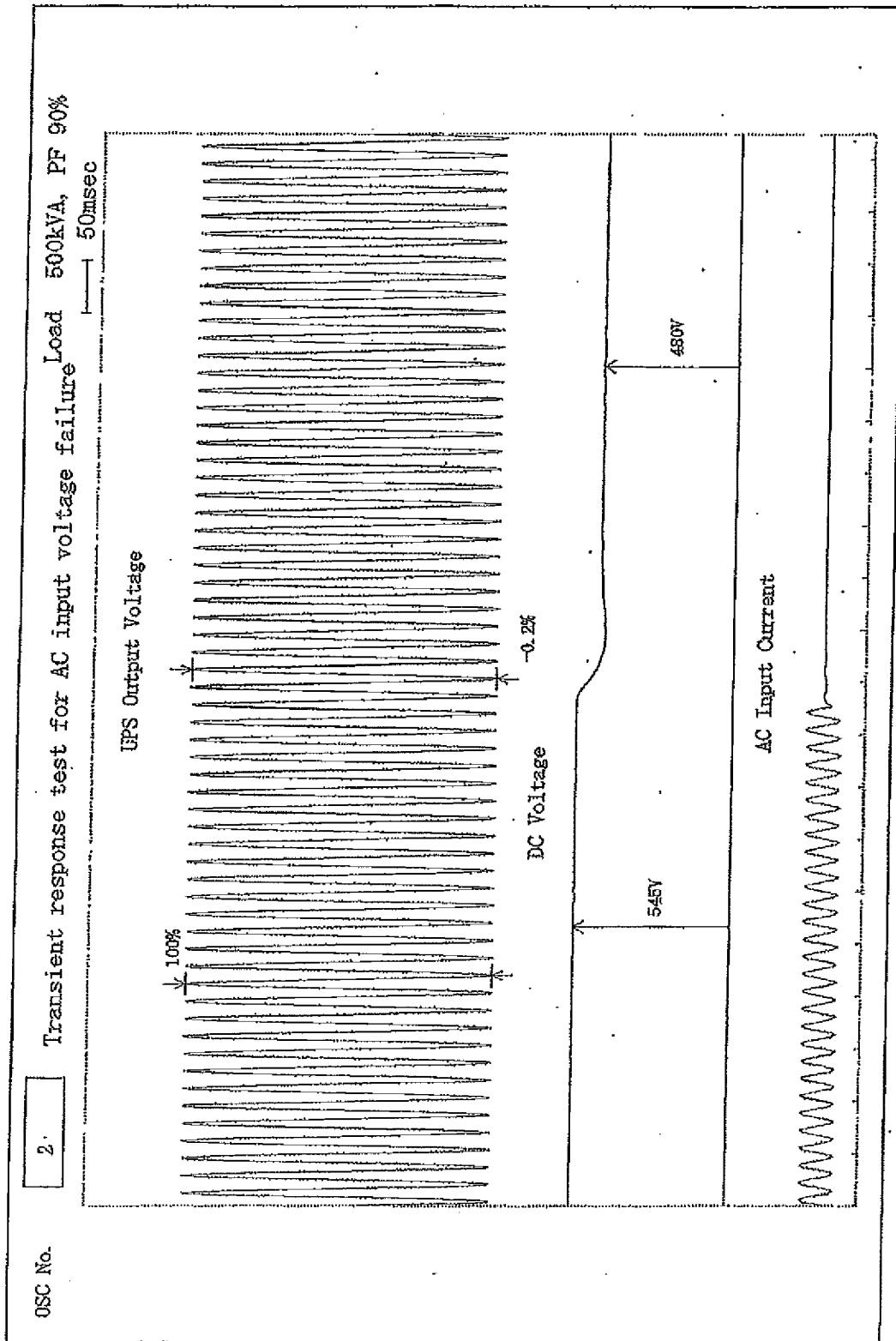
## 9. TRANSFER SWITCH OPERATION TEST

| No | Test item                                                          | Test condition             | Output voltage fluctuation or interruption time                |                                                            | OSC No. | Result |
|----|--------------------------------------------------------------------|----------------------------|----------------------------------------------------------------|------------------------------------------------------------|---------|--------|
|    |                                                                    |                            | Specified value                                                | Measured value                                             |         |        |
| 1  | Manual synchronous transfer<br>( Inverter → Bypass )               | Load 500 kVA, P.F. 90 %    | Zero break                                                     | Zero break                                                 | K-1     | GOOD   |
| 2  | Manual synchronous transfer<br>( Bypass → Inverter )               | Load 500 kVA, P.F. 90 %    | Zero break<br>* $\Delta V$ : + 5.0 %<br>* $\Delta V$ : - 5.0 % | Zero break<br>$\Delta V$ : + 0.1 %<br>$\Delta V$ : - 1.8 % | K-2     | GOOD   |
| 3  | Automatic synchronous transfer<br>( Inverter → Bypass )            | Load 500 kVA, P.F. 90 %    | Zero break                                                     | Zero break                                                 | K-3     | GOOD   |
| 4  | Automatic synchronous transfer<br>( Inverter → Bypass → Inverter ) | Load 100 % → 130 % → 100 % | Zero break                                                     | Zero break                                                 | K-4     | GOOD   |
|    |                                                                    |                            |                                                                |                                                            |         |        |

\* At the time of rating voltage



( 6 / 12 )



< 7 / 12 >

OSC No.

3

Transient response test for AC input voltage failure Load 500kVA, PF 90%

2.0sec

UPS Output Voltage

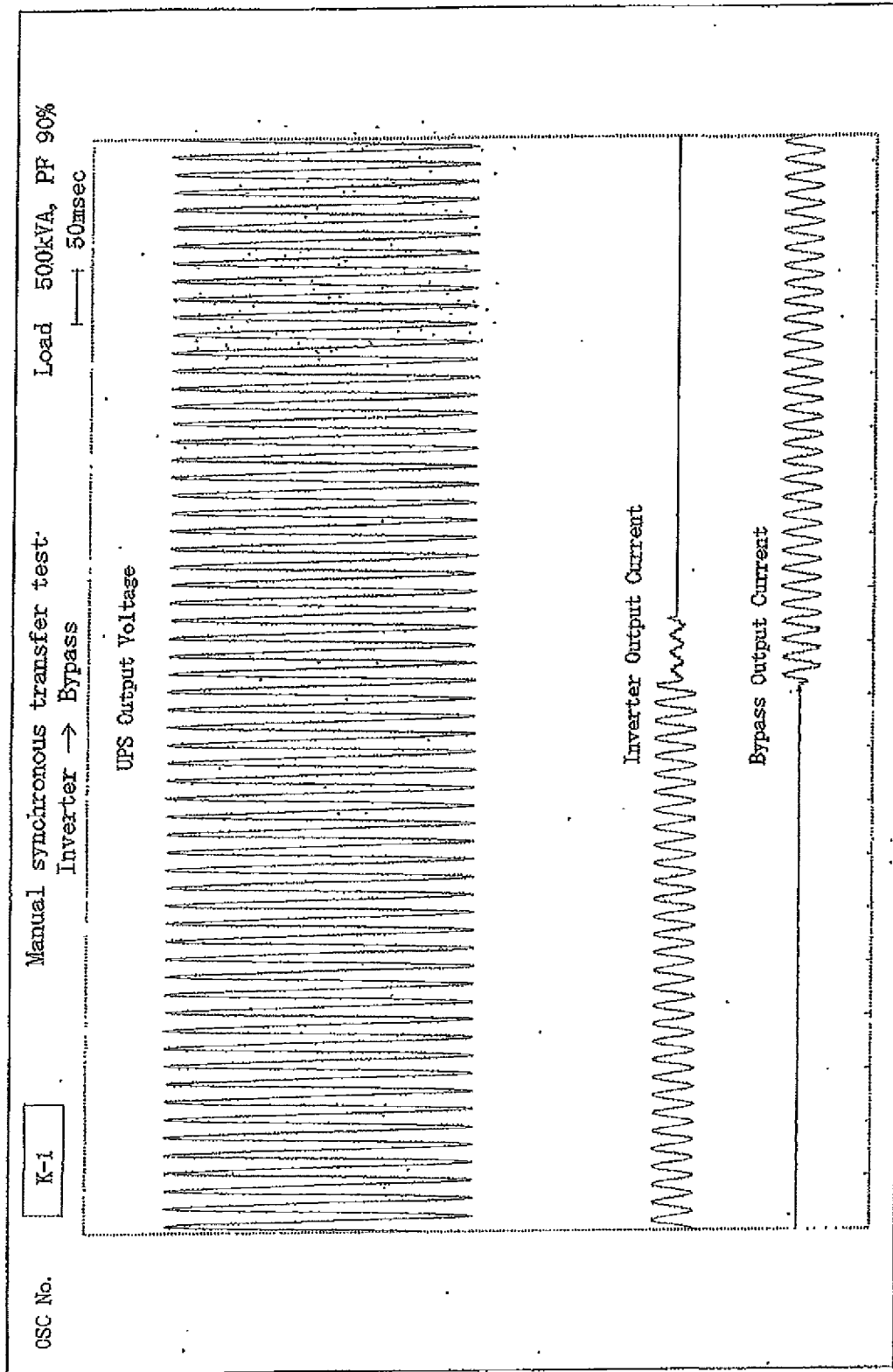
DC Voltage

545V

408V

AC Input Current

( B / E )



OSC No.

K-2

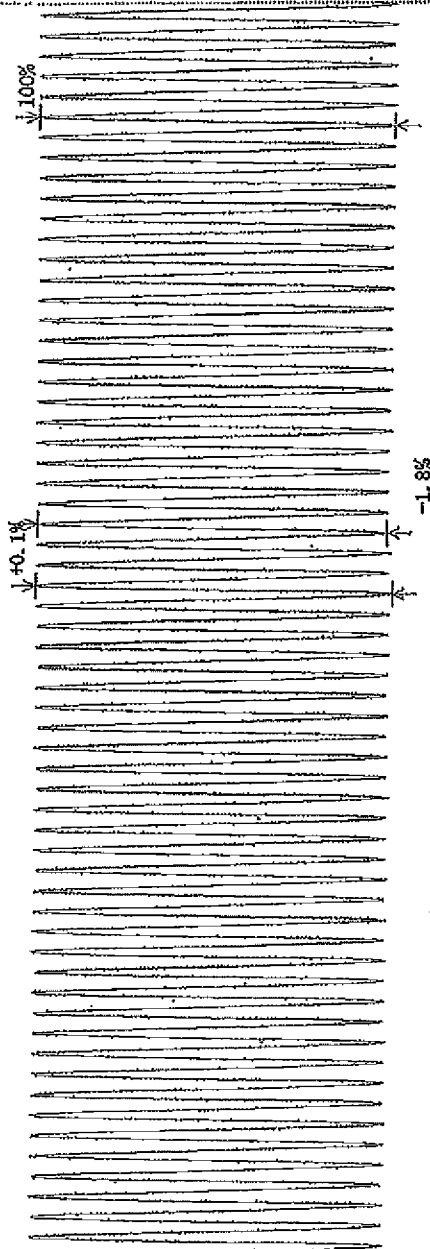
Manual synchronous transfer test

Bypass → Inverter

Load 500kVA, PF 90%

50msec

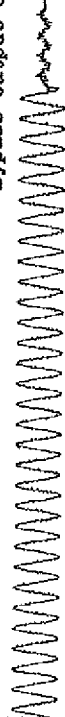
UPS Output Voltage



Inverter Output Current



Bypass Output Current



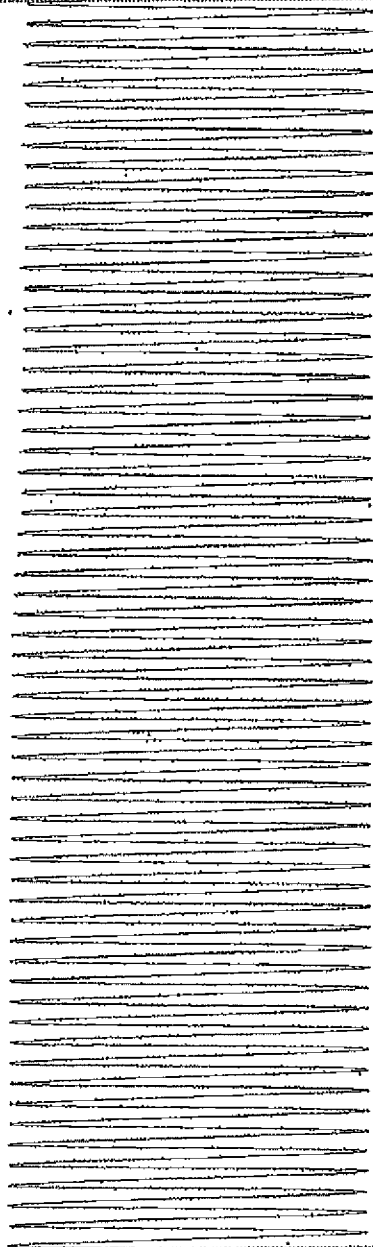
OSC No.

X-3

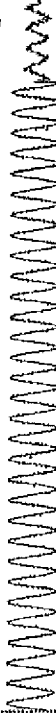
Automatic synchronous transfer test ( UPS failure ) Load 500kVA, PF 90%  
Inverter → Bypass

50msec

UPS Output Voltage



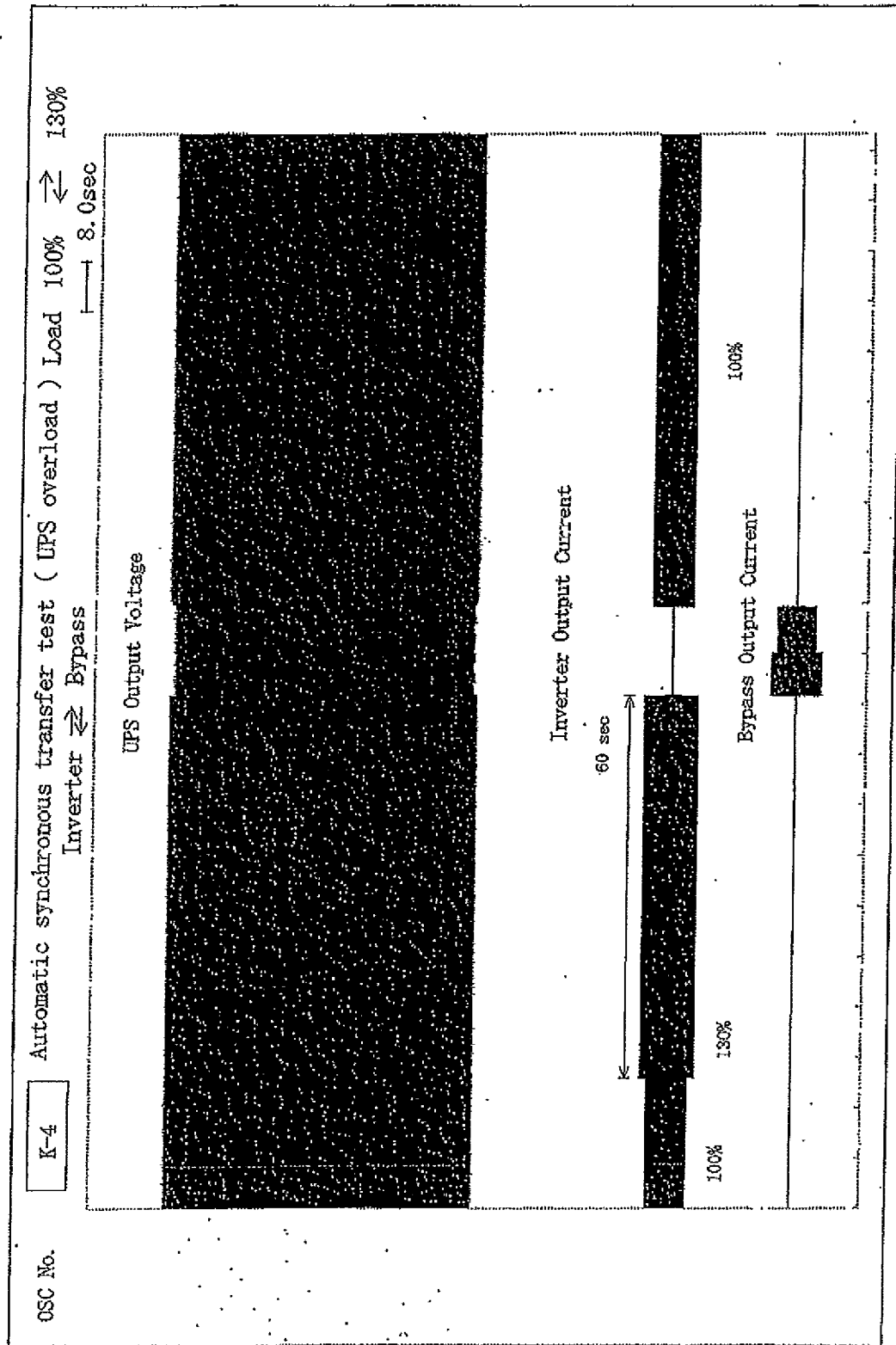
Inverter Output Current

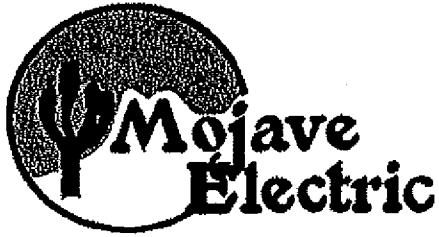


Bypass Output Current



< 11 / 12 >





## TRANSMITTAL

MOJAVE JOB # 767810

DATE: 06/16/10

JOB NAME: City of Las Vegas New City Hall  
ADDRESS: 495 Main Street  
Las Vegas Nevada 89101

TO: CAM Consulting c/o Cashman Equipment

ATTN: Angelo Carvalho / Keith Lozeau

### WE ARE SENDING

- ☐ SHOP DRAWINGS
- ☐ LETTER
- ☐ DRAWINGS
- ☒ SUBMITTALS
- ☐ SAMPLES
- ☐ SUB CONTRACT

### SUBMITTED FOR

- ☐ APPROVAL
- ☒ YOUR RECORDS
- ☐ CORRECTION AND RESUBMITTAL
- ☐ IMMEDIATE RELEASE TO JOBSITE
- ☐ IMMEDIATE RELEASE TO SHOP

### ACTION TAKEN

- ☒ APPROVED
- ☐ APPROVED AS NOTED
- ☐ REVISE AND RESUBMIT
- ☐ REJECTED

| SPEC. SECT. | ITEMS SUBMITTED        | MANUFACTURER | COPIES SENT | COPIES TO BE RETURNED |
|-------------|------------------------|--------------|-------------|-----------------------|
| 263600      | ATS Product Data       | Catapillar   | 1           | 0                     |
| 263213      | Generator Installation | Catapillar   | 1           | 0                     |
| 263600      | Generator Drawing      | Catapillar   | 1           | 0                     |
|             |                        |              |             |                       |
|             |                        |              |             |                       |
|             |                        |              |             |                       |
|             |                        |              |             |                       |

RESUBMITTAL DUE BY: \_\_\_\_\_

REMARKS: Documents given directly to Cashman Power Systems

RECEIVED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

3755 W. Hacienda Avenue

Las Vegas, Nevada 89118-1766

FAX 702-798-3740

CASH1019  
J54-497  
JA 00004337

## Submittal Transmittal

Project Name : Las Vegas New City Hall

Project Number : 12600

Package Name: Engine Generator Systems Parts List & Installation Manual



Mojave Electric, Inc.  
3755 W. Hacienda Ave.  
Las Vegas, NV 89118  
Tel: 702-798-2970  
Fax: 702-798-0547

The Whiting-Turner Contracting Company  
6720 Via Austi Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2650

Attn: Chris Meiers

From: Elliott Lloyd

Delivered Via :

Tracking Number:

| Spec Section | Submittal Number | Title                                                           | Type         | Copies | Sent Date  | Due Date   | Action   |
|--------------|------------------|-----------------------------------------------------------------|--------------|--------|------------|------------|----------|
| 263213       | 0766             | Engine Generator Systems Parts List & Installation Instructions | Product Data | 2      | 09/21/2010 | 09/21/2010 | Approved |

Subcontractor : Mojave Electric, Inc.

Contractor  
Comments:

Transmittal  
Remarks:

| Package Reviewers     |                 |               |            |            |              |
|-----------------------|-----------------|---------------|------------|------------|--------------|
| To Company            | To:             | From          | Date Rcv'd | Date Sent  | Action Taken |
| JMA Architects        | Robert Mossfana | Elliott Lloyd | 09/16/2010 | 09/07/2010 | Approved     |
| Mojave Electric, Inc. | Chris Meiers    | Elliott Lloyd | 09/16/2010 | 09/21/2010 | Approved     |

A/E Remarks

Copies To:

jma

elevated architecture

TRANSMITTAL

No. 00418

PROJECT: City of Las Vegas City Hall

DATE: 9/13/2010

TO: The Whiting-Turner Contracting Co.  
618 South 1st Street

REF: Sub-26 32 13-0766

Las Vegas, NV 89101

JMA Project number: 2007315

ATTN: Elliott Lloyd

Phone: 702-851-4190

Fax: 702-851-4198

| WE ARE SENDING:                                                | SUBMITTED FOR:                                    | ACTION TAKEN:                                     |
|----------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| <input checked="" type="checkbox"/> Shop Drawings              | <input type="checkbox"/> Approval                 | <input type="checkbox"/> Approved as Submitted    |
| <input type="checkbox"/> Letter                                | <input type="checkbox"/> Your Use                 | <input type="checkbox"/> Approved as Noted        |
| <input type="checkbox"/> Prints                                | <input checked="" type="checkbox"/> As Requested  | <input type="checkbox"/> Returned After Loan      |
| <input type="checkbox"/> Change Order                          | <input type="checkbox"/> Review and Comment       | <input type="checkbox"/> Resubmit                 |
| <input type="checkbox"/> Plans                                 |                                                   | <input type="checkbox"/> Submit                   |
| <input type="checkbox"/> Samples                               | SENT VIA:                                         | <input type="checkbox"/> Returned                 |
| <input type="checkbox"/> Specifications                        | <input checked="" type="checkbox"/> Attached      | <input type="checkbox"/> Returned for Corrections |
| <input checked="" type="checkbox"/> Other: Made from Submittal | <input type="checkbox"/> Separate Cover Via: Mail | <input type="checkbox"/> Due Date:                |

| ITEM NO. | COPIES | DATE      | ITEM | NUMBER        | REV. NO. | DESCRIPTION                                                                      | STATUS |
|----------|--------|-----------|------|---------------|----------|----------------------------------------------------------------------------------|--------|
| 0766     | 3      | 9/13/2010 | SUT  | 26 32 13-0766 | 001      | Dwg: Title: Packaged Engine Generator Systems<br>Desc: Installation Instructions | APP    |

CC:

Signed: Robert Messiana  
Robert Messiana

10150 Covington Cross Drive Las Vegas NV 89144 702-731-2033 T 702-731-2039 F www.jmaarch.com

Page 1 of 1

CASH1021  
J54-499  
JA 00004339



consulting  
engineers

RECEIVED

SEP 13 2010

JMA

September 13, 2010

JMA Architecture Studios  
10150 Covington Cross  
Las Vegas, NV 89144

Attention: Mr. Robert Messiana

Subject: Las Vegas City Hall  
Our Project No. 08.0214

Dear Robert:

We have completed our review of submittal #263213-0766 for the subject project. Our comments follow:

Submittal #263213-0766- Packaged Engine Generator System- Reviewed

We are retaining one (1) copy for our files and returning the balance of four (4).

If you should have any questions or concerns, please do not hesitate to call.

Very truly yours,

JBA CONSULTING ENGINEERS

Clint Gordon  
Senior Project Manager- Electrical Engineering

CRG/kw

F:\2009 PROJECTS\08.0214 - 08.03.09\08.0214 - CITY OF LAS VEGAS CITY HALL\Documents\Submittals\JMA Submittal 263213-0766.rg.doc

# Submittal Transmittal

Project Name : Las Vegas New City Hall  
Project Number : 12600

Package Name: Engine Generator Systems Parts List & Installation Manual

RECEIVED

SEP 09 2010

JMA



## JMA Architects

10150 Covington Cross Drive  
Las Vegas, NV 89144  
Tel: 702-731-2033  
Fax: 702-731-2039

## The Whiting-Turner Contracting Company

6720 Via Austi Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2650

Attn: Robert Messiana  
Delivered Via:

From: Elliott Lloyd  
Tracking Number:



| Spec Section | Submittal Number | Title                                                        | Type         | Copies | Sent Date  | Due Date   | Action    |
|--------------|------------------|--------------------------------------------------------------|--------------|--------|------------|------------|-----------|
| 263213       | 0766             | Packaged Engine Generator Systems; Installation Instructions | Product Data | 5      | 09/07/2010 | 09/21/2010 | Submitted |

Subcontractor : Mojave Electric, Inc.

Contractor  
Comments:

Transmittal  
Remarks:

| Package Reviewers |                 |               |            |            |              |
|-------------------|-----------------|---------------|------------|------------|--------------|
| To Company        | To:             | From          | Date Rcv'd | Date Sent  | Action Taken |
| JMA Architects    | Robert Messiana | Elliott Lloyd |            | 09/07/2010 | Submitted    |

A/E Remarks

Copies To:

|                                              |                                               |
|----------------------------------------------|-----------------------------------------------|
| <input checked="" type="checkbox"/> REVIEWED | <input type="checkbox"/> REVISE AND RESUBMIT  |
| <input type="checkbox"/> REJECTED            | <input type="checkbox"/> FURNISH AS CORRECTED |

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This review is only for review of general compliance with the design concept of the project. General compliance with the drawings is the contractor's responsibility. The contractor is responsible for confirming and correcting all errors and omissions. The contractor is responsible for his work and for performing his work in a satisfactory manner.

Date: 9/13/10 CRG  
 Job Number: 263213-0766



MOJAVE JOB # 767810

26 32 13 - Engine Generator Systems

FOR

City of Las Vegas New City Hall

1.05E - Installation Manual

SUBMITTED 09/10/10

REVIEWED BY  
 THE WHITING TURNER CONTRACTING CO  
 WT SUBMITTAL NO.

263213-0766

CASH1024  
 J54-502  
 JA 00004342



POWER SOLUTIONS

Las Vegas City Hall  
Division 26 32 13 - 1.05E  
Mounting information

See following pages.

Las Vegas  
3300 St. Rose Pkwy  
Henderson, NV 89052  
PH: 702-649-8777  
FAX: 702-639-5090

Reno  
600 Glendale Ave.  
Sparks, NV, 89431  
PH: 775-358-5111  
FAX: 775-358-0433

Elko  
5010 Idaho Street  
Elko, NV, 89801  
PH: 775-738-9871  
FAX: 775-738-7865

## Foundations

The major functions of a foundation are to:

- Support total weight of equipment, accessory equipment and fluids (coolant, oil and fuel)
- Maintain alignment between engine, driven equipment, and accessory equipment
- Isolate equipment vibration from surrounding structures.

### Responsibility

The equipment foundation and the driven equipment attachment to the foundation are not the responsibility of Caterpillar. The customer or customer's agent, familiar with local site conditions and application requirements, bears foundation design responsibility. Foundation comments published herein are intended only as general guidelines for consideration. Further engine foundation general guidelines can be found in the appropriate Engine Data Sheet.

### Ground Loading

Initial considerations include equipment weight and material supporting this weight. The wet weight of the total package must be calculated. This includes accessory equipment and weight of all liquids (coolant, oil, and fuel) supported by the foundation. Dry weights of engine and attachments can be found in the price list. Liquid densities are given in the following table.

| Fluid        | kg/m <sup>3</sup> | lb/lb | lb/ft <sup>3</sup> | Specific Gravity |
|--------------|-------------------|-------|--------------------|------------------|
| Water, Fresh | 1000.0            | 8.33  | 62.1               | 1.001            |
| Water, Sea   | 1025.0            | 8.51  | 63.6               | 1.021            |
| Water/Glycol | 1024.4            | 8.55  | 64.0               | 1.031            |
| Diesel Fuel  | 850.7             | 7.11  | 53.1               | 0.855            |
| Lube Oil     | 890.7             | 7.61  | 56.8               | 0.916            |
| Kerosene     | 802.7             | 6.71  | 50.1               | 0.807            |

Material supporting the foundation must carry the total weight. The table below shows the bearing load capabilities of common materials.

| Material                          | Bearing Capacity (psi) |
|-----------------------------------|------------------------|
| Rock, Hardpan                     | 492.6 (70)             |
| Hard Clay, Gravel and Coarse Sand | 386 (55)               |
| Loose Medium Sand and Medium Clay | 193 (28)               |
| Loose Fine Sand                   | 98.6 (14)              |
| Soft Clay                         | 0-98.6 (0-14)          |

Firm level soil, gravel, or rock provides satisfactory support for single-bearing generator sets used in stationary or portable service. This support can be used where the weight-bearing capacity of the supporting material exceeds pressure exerted by the equipment package, and where alignment with external machinery is unimportant.

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If a concrete foundation is required, minimum design guidelines include:

- Strength must support wet weight of units plus dynamic loads. The dynamic load can be calculated using the allowable centerline vibration limits and the equipment mass.
- Depth sufficient to attain a minimum weight equal to equipment wet weight (only if large mass, i.e. inertia block, is specified for vibration control).
- The mass of the foundation should be no less than the mass of the equipment.
- Outside dimensions exceed that of the equipment, a minimum of 305 mm (12 in) on all sides.
- When effective vibration isolation equipment is used, figure depth of floor concrete needed for structural support of the static load. If isolators are not used, dynamic loads transmit to the facility floor and require the floor to support 125 percent of the generator set weight.
- If generator sets are paralleled, possible out-of-phase paralleling and resulting torque reactions demand stronger foundations. The

foundation must withstand twice the wet weight of the generator set. Bolting the set to the foundation is recommended.

Estimate foundation depth that will accommodate equipment weight using the formula:

$$FD = W \div (D \times B \times L)$$

Where:

FD = Foundation depth in m (ft)

W = Total wet weight of equipment in kg (lb)

D = Density of concrete in kg/m<sup>3</sup> (lb/ft<sup>3</sup>)

Note: Use 2402.8 for metric units and 150 for English units.

B = Foundation width in m (ft)

L = Foundation length in m (ft)

Suggested concrete mixture by volume is 1:2:3 of cement, sand, aggregate, with maximum 102 mm (4 in) slump and 28-day compressive strength of 21 mPa (3000 psi).

Reinforce concrete with No. 8 gauge steel wire mesh, or equivalent, horizontally placed on 152 mm (6 in) centers. An alternative method places No. 6 reinforcing bars on 305 mm (12 in) centers horizontally. Bars must clear foundation surfaces 76 mm (3 in) minimum. Refer to Figure 37.

## Bases

### Purpose and Function

The most important function of an engine base is rigidity. It must maintain alignment between the engine and its driven equipment. The major cause of misalignment is flexing of the base due to lack of torsional rigidity. Other causes are poor installation methods and incorrect alignment procedures.

The base must offer rigidity adequate to oppose the twist due to torque reaction on drives where the driven equipment is mounted on the base assembly, but not bolted directly to the engine flywheel housing.

In general, Caterpillar engine bases will:

- Protect the engine block, drive train couplings, and driven equipment (generator gear reducer, or pump) from bending forces during shipment. The entire package must be able to withstand normal handling during transportation without permanently distorting the base or causing misalignment of the driven equipment.
- Limit torsional and bending moment forces caused by torque reaction and flexing of the foundation or substructure under the base.
- Be free of torsional or linear vibration in the operating speed range of the engine,

and have a natural frequency such that resonance does not occur during the machinery's normal work.

- Make proper alignment easy, and maintain this alignment under all operational and environmental conditions, thus eliminating the need for frequent, periodic realignment of the engine and driven equipment. Allow sufficient space for shimming in the alignment process.
- Provide proper mounting holes for the engine and all other base mounted components.

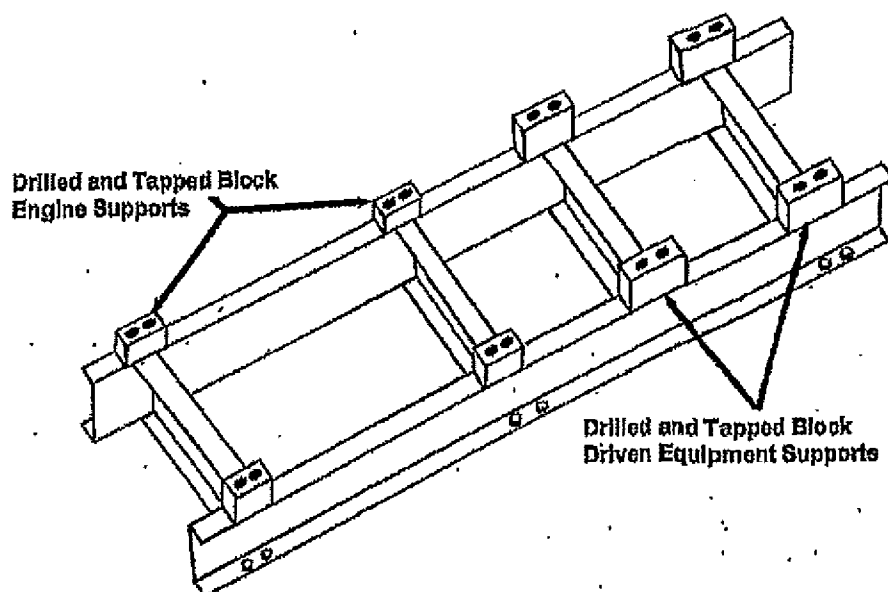
**Note:** Bases designed and fabricated by dealers, or others, must meet the design requirements of Caterpillar supplied bases to assure strength and vibration resistance.

### Caterpillar Base Design

Ease of initial installation, vibration isolation, and need for isolation from flexing mounting surfaces are major reasons for using fabricated bases. No base of any type should be rigidly connected to a flexing mounting surface.

The type of load will also determine specific design features required in an engine base. Caterpillar offers different bases for close-coupled units (such as single bearing generators) and for remote mounted units (such as two bearing generators).

## Base for Foot Mounted Engine with Close Coupled Load

**Figure 40****Foot-Mounted Engines**

Bases for foot-mounted engines should have cross members as substantial as the longitudinal beams. Place these cross members beneath each engine and driven unit support location.

Do not fasten the engine and driven unit mounting feet to the base by welding.

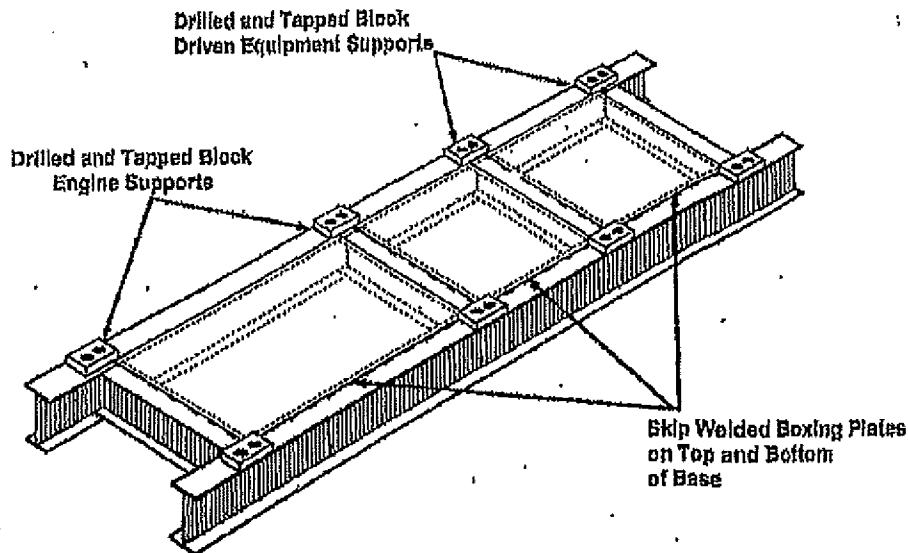
Use drilled and tapped steel mounting blocks between the engine/driven equipment and the base. Refer to Figure 40. Bolt these blocks to the engine/driven

equipment first and then weld to the base providing a flat surface for shimming and mounting. Mounting holes drilled into the structural members of the base are not recommended.

There should be sufficient space for shimming between the mounting blocks and the engine/driven equipment mounting surfaces.

Flexible mounts are not allowed between the mounting blocks and the engine/load mounting foot surfaces.

### Base for Engines with Remote Mounted Driven Equipment



**Figure 42**

#### Bases for Engines with Remote-Mounted Loads

The design requirements for bases used on engines with close-coupled units also apply to bases used for engines with remote-mounted units. Bases for use with remote-mounted units must be more rigid. The base must absorb the full-load torque between the engine and driven unit without causing excessive deflection in the coupling.

The base shown in Figure 42 is a boxed beam design that provides a torsionally rigid base.

Boxing consists of welding steel plates on top and bottom surfaces of machinery base girders. Skip-weld the plates to prevent excessive base

distortion during welding. Boxing is done to make the base structure stiffer.

The additional stiffness is necessary to resist torque loads between the engine and remote-mounted driven equipment and to resist possible vibration loads. Vibration-induced base loads are difficult to predict.

Experience has shown boxing is effective in preventing base cracking and misalignment.

#### Caterpillar Special Duty Bases

##### *Offshore Power Modules*

The Caterpillar petroleum offshore base consists of a base-within-a-base. The inner base is three-point mounted, with integral spring

Land Rig Power Module

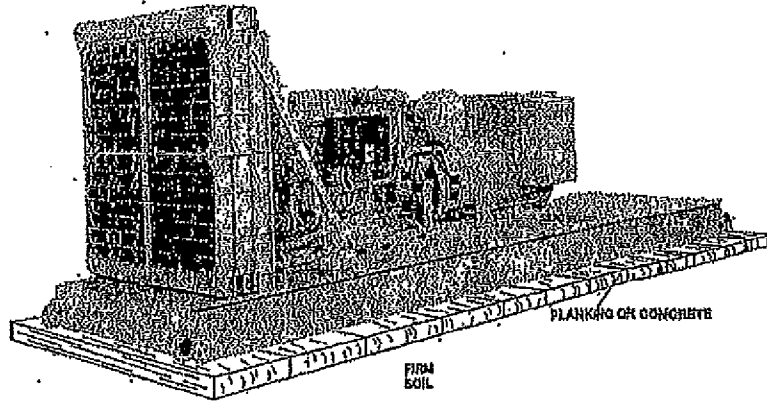


Figure 44

Land Rig Power Module

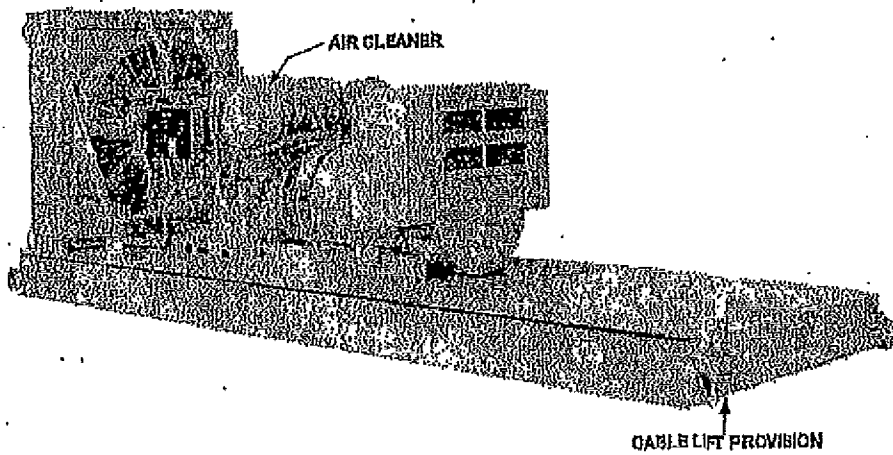


Figure 45

---

## Reference Material

The following information is provided as an additional reference to subjects discussed in this guide.

### **SEHSB700**

Special Instruction - Installation of Flexible Mounting Groups

### **SEHS9162**

Special Instruction - Spring Isolator Group Installation and Adjustment Procedure

# Submittal Transmittal

Project Name : Las Vegas New City Hall

Project Number : 12600

Package Name: ATS Product Data



Mojave Electric, Inc.  
3755 W. Hacienda Ave.  
Las Vegas, NV 89118  
Tel: 702-798-2970  
Fax: 702-798-0547

The Whiting-Turner Contracting Company  
6720 Via Austi Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2650

Attn: Chris Meiers  
Delivered Via:

From: Elliott Lloyd  
Tracking Number:

| Spec Section | Submittal Number | Title           | Type         | Copies | Sent Date  | Due Date   | Action   |
|--------------|------------------|-----------------|--------------|--------|------------|------------|----------|
| 263609       | 0776             | Transfer Switch | Product Data | 3      | 09/21/2010 | 09/21/2010 | Approved |

Subcontractor : Mojave Electric, Inc.

Contractor  
Comments:

Transmittal  
Remarks:

| Package Reviewers     |                |               |            |            |              |
|-----------------------|----------------|---------------|------------|------------|--------------|
| To Company            | To:            | From          | Date Rcv'd | Date Sent  | Action Taken |
| JMA Architects        | Robert Messana | Elliott Lloyd | 09/16/2010 | 09/03/2010 | Approved     |
| Mojave Electric, Inc. | Chris Meiers   | Elliott Lloyd | 09/21/2010 | 09/21/2010 | Approved     |

A/E Remarks

Copies To:

elevated architecture

TRANSMITTAL

No. 00409

PROJECT: City of Las Vegas City Hall

DATE: 9/9/2010

TO: The Whiting-Turner Contracting Co.  
518 South 1st Street

REF: Sub 26 36 00-0776  
Transfer Switches

Las Vegas, NV 89101

JMA Project number: 2007816

ATTN: Elliott Lloyd

Phone: 702-851-4190

Fax: 702-851-4198

| WE ARE SENDING:                                                | SUBMITTED FOR:                                    | ACTION TAKEN:                                     |
|----------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| <input checked="" type="checkbox"/> Shop Drawings              | <input type="checkbox"/> Approval                 | <input type="checkbox"/> Approved as Submitted    |
| <input type="checkbox"/> Letter                                | <input type="checkbox"/> Your Use                 | <input type="checkbox"/> Approved as Noted        |
| <input type="checkbox"/> Prints                                | <input checked="" type="checkbox"/> As Requested  | <input type="checkbox"/> Returned After Loan      |
| <input type="checkbox"/> Change Order                          | <input type="checkbox"/> Review and Comment       | <input type="checkbox"/> Resubmit                 |
| <input type="checkbox"/> Plans                                 |                                                   | <input type="checkbox"/> Submit                   |
| <input type="checkbox"/> Samples                               | SENT VIA:                                         | <input type="checkbox"/> Returned                 |
| <input type="checkbox"/> Specifications                        | <input checked="" type="checkbox"/> Attached      | <input type="checkbox"/> Returned for Corrections |
| <input checked="" type="checkbox"/> Other: Made from Submittal | <input type="checkbox"/> Separate Cover Via: Mail | <input type="checkbox"/> Due Date:                |

| ITEM NO. | COPIES | DATE     | ITEM | NUMBER        | REV. NO. | DESCRIPTION                                           | STATUS |
|----------|--------|----------|------|---------------|----------|-------------------------------------------------------|--------|
| 0776     | 4      | 9/9/2010 | SUT  | 26 36 00-0776 | 001      | Dwg: Title: Transfer Switches Desc: Transfer Switches | APP    |

CC:

Signed: BLAINE FOR  
Robert Messana

10150 Covington Cross Drive Las Vegas NV 89144 702-731-2033 T 702-731-2039 F www.jmaarch.com

JMA Transmittal - f\_tr\_01\_jma

Page 1 of 1

CASH1034  
J54-512  
JA 00004352

RECEIVED

SEP 09 2010

JMA



September 9, 2010

JMA Architecture Studios  
10150 Covington Cross  
Las Vegas, NV 89144

Attention: Mr. Robert Messiana

Subject: Las Vegas City Hall  
Our Project No. 08.0214

Dear Robert:

We have completed our review of submittal #263600-0776 for the subject project. Our comments follow:

Submittal #263600-0776- Transfer Switches- Reviewed

We are retaining one (1) copy for our files and returning the balance of four (4).

If you should have any questions or concerns, please do not hesitate to call.

Very truly yours,

JBA CONSULTING ENGINEERS

A handwritten signature in black ink, appearing to read 'Clint Gordon'.

Clint Gordon  
Senior Project Manager- Electrical Engineering

CRG/kw

F:\2009 PROJ\070909.0200 - 08.030909.0214 - CITY OF LAS VEGAS CITY HALL\Documents\Submittals\JMA Submittal 263600-0776.crp.doc

# Submittal Transmittal

Project Name : Las Vegas New City Hall

Project Number : 12600

Package Name: ATS Product Data



## JMA Architects

10150 Covington Cross Drive

Las Vegas, NV 89144

Tel: 702-731-2033

Fax: 702-731-2039

## The Whiting-Turner Contracting Company

6720 Via Austi Parkway

Suite 300

Las Vegas, NV 89119

Tel: 702-650-0700

Fax: 702-650-2650

RECEIVED

SEP 02 2010

Attn: Robert Messiana

From: Elliott Lloyd

Delivered Via:

Tracking Number:

JMA

| Spec Section | Submittal Number | Title             | Type         | Copies | Sent Date  | Due Date   | Action    |
|--------------|------------------|-------------------|--------------|--------|------------|------------|-----------|
| 263600       | 0776             | Transfer Switches | Product Data | 5      | 09/03/2010 | 09/17/2010 | Submitted |

Subcontractor : Mojave Electric, Inc.

Contractor

Comments:



Transmittal

Remarks:

## Package Reviewers

| To Company     | To:             | From          | Date Rcv'd | Date Sent  | Action Taken |
|----------------|-----------------|---------------|------------|------------|--------------|
| JMA Architects | Robert Messiana | Elliott Lloyd |            | 09/03/2010 | Submitted    |

A/E Remarks

:

Copies To:

## Submittal Transmittal

Project Name : Las Vegas New City Hall

Project Number : 12600

Package Name: Electrical Submittals Vol 2 of 4



Mojave Electric, Inc.  
3755 W. Hacienda Ave.  
Las Vegas, NV 89118  
Tel: 702-798-2970  
Fax: 702-798-0547

The Whiting-Turner Contracting Company  
6720 Via Austi Parkway  
Suite 300  
Las Vegas, NV 89119  
Tel: 702-650-0700  
Fax: 702-650-2650

Attn: Chris Melers

Delivered Via:

From: Elliott Lloyd

Tracking Number:

| Spec Section | Submittal Number | Title                                                                       | Type         | Copies | Sent Date  | Due Date   | Action            |
|--------------|------------------|-----------------------------------------------------------------------------|--------------|--------|------------|------------|-------------------|
| 260924       | 0734             | Lighting Control Panels                                                     | Product Data | 2      | 09/21/2010 | 09/21/2010 | Approved as Noted |
| 260925       | 0737             | Dimming Lighting Control Panels: Complete Shop Drawings and 1-Line Diagrams | Shop Drawing | 2      | 09/21/2010 | 09/21/2010 | Approved as Noted |
| 260526       | 0715             | Grounding and Bonding For Electrical                                        | Product Data | 2      | 09/21/2010 | 09/21/2010 | Approved          |
| 263213       | 0764             | Backup Engine Generator System                                              | Shop Drawing | 2      | 09/21/2010 | 09/21/2010 | Approved          |

Subcontractor : Mojave Electric, Inc.

Contractor  
Comments:

Transmittal  
Remarks:

| Package Reviewers     |                |                 |            |            |                     |
|-----------------------|----------------|-----------------|------------|------------|---------------------|
| To Company            | To:            | From            | Date Rcv'd | Date Sent  | Action Taken        |
| JMA Architects        | Robert Messina | David Kortekaas | 05/18/2010 | 04/16/2010 | Submitted           |
| Mojave Electric, Inc. | Chris Melers   | David Leo       | 05/19/2010 | 05/19/2010 | Revise and Resubmit |
| JMA Architects        | Robert Messina | Elliott Lloyd   | 09/21/2010 | 08/30/2010 | Approved            |
| Mojave Electric, Inc. | Chris Melers   | Elliott Lloyd   | 09/21/2010 | 09/21/2010 | Approved            |

A/E Remarks

Copies To:

elevated architecture

TRANSMITTAL

No. 00411

PROJECT: City of Las Vegas City Hall

DATE: 9/9/2010

TO: The Whiting-Turner Contracting Co.  
518 South 1st Street

REF: Electrical Sub Vol. 2 of 4

Las Vegas, NV 89101

JMA Project number: 2007315

ATTN: Elliott Lloyd

Phone: 702-861-4190

Fax: 702-861-4198

| WE ARE SENDING:                                                | SUBMITTED FOR:                                    | ACTION TAKEN:                                     |
|----------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| <input checked="" type="checkbox"/> Shop Drawings              | <input type="checkbox"/> Approval                 | <input type="checkbox"/> Approved as Submitted    |
| <input type="checkbox"/> Letter                                | <input type="checkbox"/> Your Use                 | <input type="checkbox"/> Approved as Noted        |
| <input type="checkbox"/> Prints                                | <input checked="" type="checkbox"/> As Requested  | <input type="checkbox"/> Returned After Loan      |
| <input type="checkbox"/> Change Order                          | <input type="checkbox"/> Review and Comment       | <input type="checkbox"/> Resubmit                 |
| <input type="checkbox"/> Plans                                 |                                                   | <input type="checkbox"/> Submit                   |
| <input type="checkbox"/> Samples                               | SENT VIA:                                         | <input type="checkbox"/> Returned                 |
| <input type="checkbox"/> Specifications                        | <input checked="" type="checkbox"/> Attached      | <input type="checkbox"/> Returned for Corrections |
| <input checked="" type="checkbox"/> Other: Made from Submittal | <input type="checkbox"/> Separate Cover Via: Mail | <input type="checkbox"/> Due Date:                |

| ITEM NO. | COPIES | DATE     | ITEM | NUMBER        | REV. NO. | DESCRIPTION                                                       | STATUS |
|----------|--------|----------|------|---------------|----------|-------------------------------------------------------------------|--------|
| 0715     | 3      | 9/9/2010 | SUT  | 26 05 26-0715 | 003      | Dwg: Title: Grounding & Bonding for Electrical Desc: Product Data | APP    |
| 0734     | 3      | 9/9/2010 | SUT  | 26 09 24-0734 | 003      | Dwg: Title: Lighting Control Panels Desc: Product Data            | AAN    |
| 0737     | 3      | 9/9/2010 | SUT  | 26 08 25-0737 | 002      | Dwg: Title: Complete Shops & 1-Line Diagrams Desc: Shop Drawings  | AAN    |
| 0764     | 3      | 9/9/2010 | SUT  | 26 32 13-0764 | 002      | Dwg: Title: Packaged Engine Generator Systems Desc: Shop Drawings | APP    |

CC:

Signed: ELAINE FOR  
Robert Messiana

10150 Covington Cross Drive Las Vegas NV 89144 702-731-2033 T 702-731-2039 F www.jmaarch.com

JMA Transmittal - f\_tr\_01\_jma

Page 1 of 1

CASH1038  
J54-516  
JA 00004356



consulting  
engineers

RECEIVED  
SEP 09 2010  
JMA

September 9, 2010

JMA Architecture Studios  
10150 Covington Cross  
Las Vegas, NV 89144

Attention: Mr. Robert Messiana

Subject: Las Vegas City Hall  
Our Project No. 08.0214

Dear Robert:

We have completed our review of submittal #260526-0715, 260924-0734, 260925-0737 and 263213-0764 for the subject project. Our comments follow:

Submittal #263213-0764- Packaged Engine Generator System- Reviewed

Submittal #260526-0715- Grounding and Bonding- Reviewed

Submittal #260925-0737- Dimming Control Panel- Furnish as Corrected

1. Dimmer modules for fixture types PC1 and PP1 shall be dimmable.

Submittal #260924-0734- Lighting Control Panel- Furnish as Corrected

1. Reprint single line shop drawing full size.

We are retaining one (1) copy for our files and returning the balance of four (4).

If you should have any questions or concerns, please do not hesitate to call.

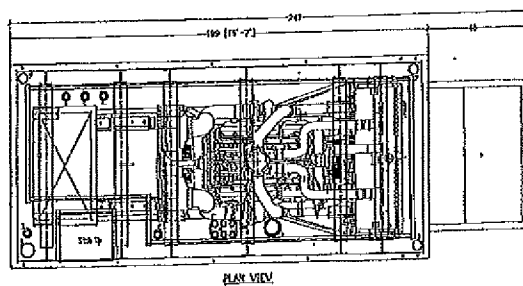
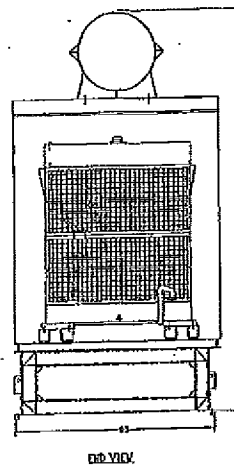
Very truly yours,

JBA CONSULTING ENGINEERS

Clint Gordon  
Senior Project Manager- Electrical Engineering

CRG/kw

F:\2009 PROJECTS\08.0214 - CITY OF LAS VEGAS CITY HALL\Documents\Submittals\JMA Submittal 260526-0715, 260924-0734, 260925-0737 and 263213-0764.crg.doc



265213-0764

[illegible]

CASH1040



|                                              |                                               |
|----------------------------------------------|-----------------------------------------------|
| <input checked="" type="checkbox"/> REVIEWED | <input type="checkbox"/> REVISE AND RESUBMIT  |
| <input type="checkbox"/> REJECTED            | <input type="checkbox"/> FURNISH AS CORRECTED |

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This mark is only for review of general conformity with the design concept of the project and general accordance with the information given on the contract documents. The contractor is responsible for confirming and correcting all quantities and dimensions, including fabrication processes and techniques of construction, coordinating his work with that of all other trades and performing his work in a satisfactory manner.

Date 9/9/10 By CRB  
 for CONTRACTOR



MOJAVE JOB # 767810

26 36 00 - Transfer Switches

for

City of Las Vegas New City Hall

1.03A - Product Data

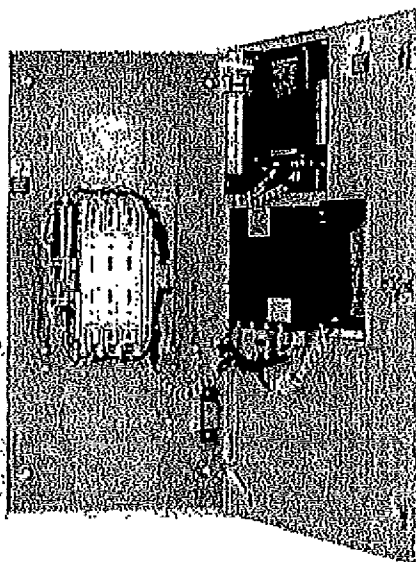
SUBMITTED 09/02/2010

RECEIVED  
 09/02/2010

26 36 00 - 0776

CASH1042  
 J54-520  
 JA 00004360





## **CTS SERIES AUTOMATIC TRANSFER SWITCH**

The Cat® CTS Series transfer switch is configurable for applications requiring the dependability and ease of operation found in a full featured power contactor type transfer switch.

The CTS Series is equipped with the MX250 controller that is designed for the most demanding transfer or bypass switch applications.

### **FEATURES**

#### **ELECTRICAL RATINGS**

- Ratings 40 to 4000 amperes
- 4 Poles
- NEMA 1,
- Available to 600 VAC, 60 Hz
- Suitable for emergency and standby applications on all classes of load.

- UL 1008 listed at 480 VAC
- CSA C22.2 No. 178 certified at 600 VAC
- IEC 947-6-1 listed through 480 VAC

#### **PERFORMANCE FEATURES**

- Contact transfer speed less than 100 milliseconds
- High close-in and withstand capability
- Temperature rise test per UL 1008 conducted after overload and endurance tests in unventilated enclosure - exceeds UL requirements
- Equipped w/MX250 Control Package

### **DESIGN AND CONSTRUCTION FEATURES**

- Double throw, interlocked operation
- Electrically operated, mechanically held by a simple, over-center mechanism
- Silver alloy contacts with separate arcing contacts on 600 amp and above
- Arc quenching grids, enclosed arc chambers, and wide contact air gap for superior source to source isolation on all units
- Control circuit disconnect plug and drive inhibit switch for safe maintenance
- Components accessible for inspection and maintenance without removal of the switch or the power conductors
- Mechanical indicator and contact chamber cover designed for inspection, safety and position designation



## THE CAT CTS SERIES OF AUTOMATIC TRANSFER SWITCHES

The Cat CTS Series power contactor Type transfer switch makes use of a fully programmable/configurable microprocessor-based controller to allow the utmost in application flexibility. Further, the CTS Series is offered in a wide array of configurations enabling it to meet the needs of even the most highly critical load.

Available configurations include:

40-4000 Amps:

- CTS Automatic Transfer Switches

100-4000 Amps:

All CTS products meet or exceed industry requirements to allow specification and installation with confidence.

- UL 1008 listed through 480 VAC
- CSA C22.2 No. 178 listed through 600 VAC
- IEC 947-6-1 listed through 480 VAC
- Codes and Standards
  - NFPA 70, 99, 101, 110
  - NEC 517, 700, 701, 702
  - IEEE 448, 241
  - NEMA ICS2-447
- Controls tested in accordance with:
  - IEEE 472 (ANSI C37.90A)
  - EN55022 Class B (CISPR 22)
  - (Exceeds EN55011 & MILSTD 461 Class 3)
  - EN61000-4-2 Class B (Level 4)
  - EN61000-4-3 (ENV50140) 10v/m
  - EN61000-4-4
  - EN61000-4-5, IEEE C62.41
  - EN61000-4-6 (ENV50141)
  - EN61000-4-11
- Equipment (Controls and Power Section)
  - Seismic Test Qualified to:
    - IBC-2003
    - IEEE-693-2005
- Enclosures meet the requirements of:
  - UL 508, UL 50, ICS 6, ANSI C33.76 and NEMA 250
- Quality System:
  - ISO 9001 Registered

This ruggedly built family of power contactor switches has been specifically designed for transfer switch duty with dependability, versatility and user friendliness of prime concern.

The CTS power panel components, consisting of power switching contacts, drive mechanism and terminal lugs, are mounted on a specially formed backplane. Logic devices including microprocessor control auxiliary time delays and special accessory equipment are assembled on the door for ease of maintenance and separation from the power section. They are connected with a numbered wiring harness equipped with a disconnect plug that allows isolation of the control panel for maintenance.

## CTS SERIES METHOD OF OPERATION

When the normal source falls or the voltage drops to a predetermined point (usually 80% of nominal), if required, a circuit is closed to start the engine generator set. When the emergency source reaches 90% of rated voltage and 95% of rated frequency, the drive solenoid is energized through the emergency coil control relay, causing the main contacts to disconnect the load from the normal source and connect it to the emergency source. After the drive solenoid has completed its electrical stroke and is seated, the emergency coil control relay opens to disconnect it. The transfer switch is now mechanically locked in the emergency position. When normal voltage is restored to a predetermined point (usually 90% of nominal), the control voltage sensing energizes. The normal side coil relay closes, and after the drive solenoid has completed its electrical stroke and is seated, the coil control relay opens to disconnect it. The transfer switch is now mechanically locked in the normal position.

## DRIVE MECHANISM

All CTS switches employ the simple "over-center" principle to achieve a mechanically locked position in either normal or emergency and a high speed drive assures contact transfer in 100 ms or less. High contact pressure and positive mechanical lock allow for high withstand and closing ratings, far exceeding UL requirements.

## NEUTRAL SWITCHING

The CTS Series is available in true four pole designs for multi-source power systems that require switching the neutral. The neutral contact is on the same shaft as the associated main contacts. This design ensures positive operation, and prevents any possibility that the neutral contact will fail to open or close, as is possible when the neutral pole is an add-on accessory. The neutral contacts are identical to the main contacts, having the same current carrying and high withstand /closing ratings as the mains. They are designed to *break last and make first* to negate the possibility of transients while switching the neutral.

## SAFE MANUAL OPERATION

The CTS manual operator consists of a large, easy-to-use handle that fits securely for manual operation during installation and maintenance or in an emergency.

Every CTS is provided with an operator inhibit switch to disconnect the electrical drive prior to maintenance. Fully enclosed wrap-around arc covers shield the main contacts and mechanical components, preventing operator exposure during manual operation.

## TRANSFERRING LARGE MOTOR OR HIGHLY INDUCTIVE LOADS

Some loads, especially large motors receive severe mechanical stress if power is transferred out of phase while the motor is still rotating. Also, back EMF generated by a motor can result in over currents that can blow fuses or trip circuit breakers. The CTS Series offers four solutions to these problems:

### 1. Optional Universal Motor Disconnect Contact:

This load control disconnects a large motor via its control circuit for an adjustable period of time prior to transfer in either direction. For switching multiple motors, the motor disconnect contact with staged restart disconnects the motors prior to transfer and brings them back on line sequentially.

### 2. Accessory R50 Phase Monitor: This feature compares the phase angle between both sources of power and prevents transfer until the two are approximately in phase (within a self adjusting range). The CTS's high speed transfer action coupled with the MX series microprocessor control logic ensure closures at or near zero degree phase difference



CTS SERIES ATS  
400 amp, 2 pole

## STANDARD FEATURES (MSTD PACKAGE)

| Feature   | Function                              |
|-----------|---------------------------------------|
| 6/P       | Momentary Test Switch                 |
| J2E/J2N   | Adj. over/under freq (S1 and S2)      |
| A3        | Aux Contact (S2 position)             |
| L1/L2     | Source Position LEDs                  |
| A4        | Aux Contact (S1 position)             |
| L3/L4     | Source Available LEDs                 |
| Calibrate | Volt. and Freq. calibration           |
| LN/P      | Center-Off Position LCD*              |
| CDT       | Load/No-Load Exerciser                |
| P1        | Source 2 Start Time Delay             |
| DS        | Auto/Inhibit Switch (> 600A)          |
| R50       | In-Phase Monitor                      |
| DT        | Time Delay - Neutral to S1*           |
| S13/P     | Transfer Commit                       |
| DW        | Time Delay - Neutral to S2*           |
| T         | Source 1 Stable Time Delay            |
| E         | Engine Start Contact                  |
| U         | Source 2 Stop Time Delay              |
| EL/P      | Log of last 16 events and System Data |
| VI        | Voltage Imbalance                     |
| K/P       | S1 and S2 Freq. Indication            |
| W         | S2 Stable Time Delay                  |
| YEN       | Bypass T and W Time Delays            |

\*Available with Delayed Transition switches only.

## OPTIONAL PACKAGES

**Exerciser (MEXE) Package, includes:**

- STDS Functions
- A1/A1E - S1/S2 Failure aux contact
- A3/A4 - One additional contact each
- CDP - Programmable exerciser
- Q2 - Remote Peak Shave/Load Test
- R16 - Phase Rotation Sensing

**Controls (MCON) Package, includes:**

- EXES Functions
- Q3 - Remote Inhibit transfer to Emergency
- Q7 - Inhibit Transfer to Normal
- T3/W3 - Elevator Pre-Signal Aux Contacts
- UMD - Universal Motor Load Disconnect

**Sensing (MSEN) Package, includes:**

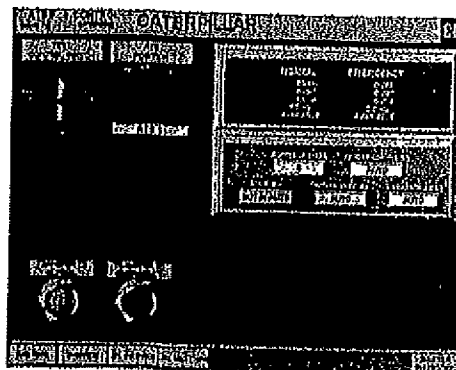
- EXES Functions
- Normal Source Over voltage sensing (3 phase)
- Q7 - Inhibit Transfer to Normal
- S12P - Auto/Manual Selector Switch

**Special (MSPE) Package, includes:**

- CONS Functions
- SENS Functions
- S6P - Manual transfer to Normal Switch (Replaces S12P)

**Switchgear (MPSG) Package, includes:**

- SPES Functions
- Additional set of A3/A4 Contacts
- R15 - Load Shed to "Dead Normal" or
- R16D - Load Shed to Neutral Position\*
- S12/P - Auto-Manual Selector Switch



Screenshot of ATS operating parameters on Cat Switchgear HMI.

Combined with the optional Modbus

Communication Card, the PSGS package allows for integration with Cat Switchgear. This feature allows ATS operating parameters to be displayed on the PowerLynx 3000 HMI as well as on the optional Remote Monitoring Software. Supply of this feature set affords real-time monitoring of the ATS as well as direct control over the following parameters from the Switchgear HMI:

- Timer Settings
- Pickup/Dropout settings
- Testing Functions
- Alarm functions
- Manual operation

# AUTOMATIC TRANSFER SWITCH 263600 - 1.03A Product Data



## CTS SERIES ACCESSORY DEFINITIONS

**6P**  
 Microprocessor activated test switch (Momentary)  
**6A**  
 Hardwired test switch (Maintained)  
**6AP**  
 Microprocessor activated test switch (Maintained)  
**6BK**  
 Hardwired test switch (Maintained Auto - Momentary Test)  
 Key operated  
**6CK**  
 Hardwired test switch (Maintained Auto - Maintained Test)  
 Key operated  
**A1**  
 Auxiliary Contact S.P.D.T. - Normal (Source 1) Failure  
**A1E**  
 Auxiliary Contact S.P.D.T. - Emergency (Source 2) Failure  
**A3**  
 Auxiliary Contact - closed in emergency (Source 2) Additional available (10 max.) on CTS Series and need to be specified  
**A4**  
 Auxiliary Contact - closed in normal (Source 1) Additional available (10 max.) on CTS Series and need to be specified  
**A62**  
 Motor disconnect and staged restart (1 contact)  
**AB3**  
 Auxiliary contact - closed in bypass emergency (Source 2) (S.P.D.T.) (Standard up to 400A) Additional available (10 max.) on CBTS Series and need to be specified  
**AB4**  
 Auxiliary contact - closed in bypass emergency (Source 1) (S.P.D.T.) (Standard up to 400A) Additional available (10 max.) on CBTS Series and need to be specified  
**CALIBRATE**  
 Microprocessor activated calibration feature  
**CDP**  
 Programmable exerciser daily, 7/14/28/365 days user-selectable, with or without load  
**CDT**  
 Exerciser no load timer  
**CTAP**  
 Chicago transfer alarm panel mounted in door of enclosure. Includes 3 aux. contacts and fuse.  
**DS**  
 Disconnect Switch. Disconnects source voltage to transfer power panel.  
**DT (DELAYED TRANSITION ONLY)**  
 Time Delay from Neutral Switch position to Source 2 on retransfer  
**DW (DELAYED TRANSITION ONLY)**  
 Time Delay from Neutral Switch position to Source 2 on retransfer  
**E**  
 Engine Start Relay  
**EL/P**  
 Event log of last 16 events  
**ETHERNET**  
 Ethernet Communication Adapter. Requires Modbus Communication Module.  
**F**  
 Fan contact, closed when engine runs.

## CTS SERIES ACCESSORY GROUP MATRIX

| Accessory | 6P | 6A | 6AP | 6BK | 6CK | A1 | A1E | A3 | A4 | A62 | AB3 | AB4 | CALIBRATE | CDP | CDT | CTAP | DS | DT | DW | E | EL/P | ETHERNET | F |
|-----------|----|----|-----|-----|-----|----|-----|----|----|-----|-----|-----|-----------|-----|-----|------|----|----|----|---|------|----------|---|
| 6P        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| 6A        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| 6AP       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| 6BK       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| 6CK       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| A1        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| A1E       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| A3        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| A4        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| A62       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| AB3       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| AB4       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| CALIBRATE |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| CDP       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| CDT       |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| CTAP      |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| DS        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| DT        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| DW        |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| E         |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| EL/P      |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| ETHERNET  |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |
| F         |    |    |     |     |     |    |     |    |    |     |     |     |           |     |     |      |    |    |    |   |      |          |   |

- Standard Accessory Included in the group package.
- Optional Accessory not included but can be added to group package.
- ◐ Optional Accessory, cannot be added with accessory for the same symbol.
- NA
- ⊗ Denotes an Accessory with 2 circuit breakers standard.
- ⊕ Denotes an Accessory with 3 circuit breakers standard.
- \* Delayed Transition Unit Only.
- †† Optional for 40-600 Amp.

## CTS SERIES ACCESSORY DEFINITIONS (continued)

**HT(1)(2)**  
 Heater and Thermostat 208/240V (1) 380/600V (2) mounted and interwired in enclosure. (requires larger enclosure for 40-200A)  
**K**  
 Frequency Meter (Analog) - Door mounted  
**K/P**  
 Frequency indication on the controller  
**LNP**  
 Center-off position LCD-indicator  
**L1**  
 LED light indicates Switch in Source 2 position  
**L2**  
 LED light indicates Switch in Source 1 position  
**L3**  
 LED light indicates Source 1 available  
**L4**  
 LED light indicates Source 2 available



## CTS SERIES ACCESSORY DEFINITIONS (continued)

### LonWorks

LonWorks Communication Module

M1

Single Phase Amp Meter (Analog)

M2

Three Phase Amp Meter (Analog)

M90

EPM2000 True RMS Digital Meter with display (Amps, Volts, Power, Energy, Power Factor and Frequency), 3 Line LED Display, 50/60 Hz Universal Operation, 1 or 3 phase, Standard Modbus RTU RS485 communications capability.

M90A

Includes Modbus communication card and factory wiring between EPM2000 and Modbus communication card.

M90B

Includes Modbus communication card, Ethernet communication adapter and factory wiring between EPM2000 and Modbus communication card.

M91

EPM6000 True RMS Digital Meter with display (Amps, Volts, Power, Energy, Power Factor and Frequency, THD). Certified energy and demand metering. Meets ANSI C12.20 and IEC 687 Accuracy Classes. Front IRDA Port Laptop Connection. Standard Modbus RTU RS485 or DNP 3.0 communications capability.

M91A

Includes Modbus communication card and factory wiring between EPM6000 and Modbus communication card.

M91B

Includes Modbus communication card, Ethernet communication adapter and factory wiring between EPM6000 and Modbus communication card.

### Modbus

Modbus RTU Communication Module

N1

Running Time Indicator - Door mounted

N2

Operation Counter - Door Mounted

P1

Engine Start Timer (adjustable to 6 seconds)

P2

Engine Start Timer - Extended time delay (adjustable to 300 seconds)

Q2

Peak shave/remote load test/area protection - Relay (S.P.D.T.) (Need to specify voltage - 120 VAC, 24 VAC, 24 VDC - 120V default standard)

Q3

Inhibit transfer to emergency (Source 2) (load add relay) - Relay (S.P.D.T.) (Need to specify voltage - 120 VAC, 24 VAC, 24 VDC - 120V default standard)

Q7

Inhibit transfer to normal (Source 1) - Relay (S.P.D.T.) (Need to specify voltage - 120 VAC, 24 VAC, 24 VDC - 120V default standard)

R1-1/R1-3

Over Voltage sensing for normal (Source 1) single (R1-1) or three (R1-3) phase

R15/R15D

Load Shed. Should Source 2 become overloaded, a signal can be given to switch to the Neutral position.

R16

Phase rotation sensing of Normal (Source 1) and Emergency (Source 2)

R26/R26D

Interruptible Power Rate Provisions. Allow transfer out of Source 1 position to Mid position or dead Source 2. Alarm and Pre-Signal circuit included. (Need to specify voltage - 120 VAC, 24 VAC, 24 VDC)

R60

In Phase monitor between Normal (Source 1) and Emergency (Source 2) to allow transfer

S6P

Microprocessor activated auto/manual retransfer selector switch for transferring to Normal (Source 1) (Includes microprocessor activated YN accessory)

S12P

Microprocessor activated auto/manual retransfer selector switch for transferring to Normal (Source 1) (Includes microprocessor activated YN & YE accessory)

S13P

Microprocessor activated commit/no commit on transferring to Emergency (Source 2) (with enable/disable settings)

S14K

Keyed selector switch for retransfer to normal-test-auto

SW1

Auto/Off/Start Engine control selector - Door mounted (keyed or non-keyed operation available)

SW2

Auto/Off Engine control selector - Door mounted (keyed or non-keyed operation available)

SW3

Source Priority Selector Switch - Door mounted. Allows selection of Source 1 or Source 2 to be the Prime Source. Transfer Switch will transfer to selected Prime Source if that Source is available. (keyed or non-keyed operation available)

T

Retransfer to Normal (Source 1) adjustable time delay

T3/W3

Pre-signal contact on transfer to Normal (Source 1) or Emergency (Source 2) during test

U

Engine stop /cool adjustable cool down timer

UMD

Pre and post transfer output adjustable time range. Functions in both directions. Includes 2 circuits. (Additional circuits available).

VI

Voltage imbalance between phases (3 Phase only)

W

Adjustable time delay on transfer to Emergency (Source 2)

YEN

Bypass transfer timers function (soft key switch in microprocessor)

# AUTOMATIC TRANSFER SWITCH 263600 - 1.03A Product Data



## CTS SERIES DIMENSIONAL SPECIFICATIONS

| CTS Series Transfer Switches |       |                 |           |           |                  |           |                   |
|------------------------------|-------|-----------------|-----------|-----------|------------------|-----------|-------------------|
| Ampere Rating                | Poles | NEMA 1 Enclosed |           |           |                  |           | Application Notes |
|                              |       | Height (A)      | Width (B) | Depth (C) | Reference Figure | Weight    |                   |
| 800, 1000 & 1200             | 4     | 74 (1880)       | 40 (1016) | 20 (508)  | B                | 540 (245) |                   |

### Application Notes :

1. Dimensions are listed in inches (mm) and weights in pounds (kg).
2. Includes 1.25" door projection beyond base depth. Allow a minimum of 3" additional depth for projection of handle, light, switches, pushbuttons, etc.
3. All dimensions and weights are approximate and subject to change without notice and are not for construction use.
4. Special enclosures (NEMA 3R, 4, 12, etc.) may include mounting tabs, etc. Consult the published dimension drawings for details.
5. Normal and emergency may be ordered inverted on any switch. The load may be inverted 600-1200 amps. Consult the factory for details.
6. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact Caterpillar.
7. Packing materials must be added to weights shown. Allow 15% additional weight for cartons, skids, cranes, etc.
8. Add 4" in height for removable lifting lugs.
9. 4000 amp depth dimension shown is standard. Depending on your cable/conduit requirements you may desire a deeper enclosure. Consult Caterpillar for further details.
10. Lug adapters for 3000-4000 amp limits may be staggered length for ease of entrance. Consult Caterpillar for details.
11. Ventilation louvers on side/rear of enclosure at 3000 and 4000A. One side or rear must be clear to afford proper airflow.

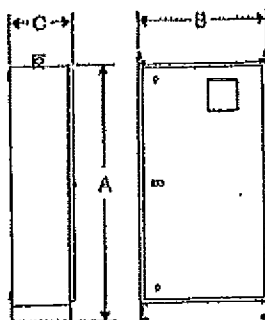


Figure B

# AUTOMATIC TRANSFER SWITCH 263600 - 1.03A Product Data



## AL-CU UL LISTED SOLDERLESS SCREW-TYPE TERMINALS FOR EXTERNAL POWER CONNECTIONS

| Switch Size<br>Amps | Normal, Emergency<br>& Load Terminals |                        | Switch Size<br>Amps | Normal, Emergency<br>& Load Terminals |                        |
|---------------------|---------------------------------------|------------------------|---------------------|---------------------------------------|------------------------|
|                     | Cables<br>per Pole                    | Range of<br>Wire Sizes |                     | Cables<br>per Pole                    | Range of<br>Wire Sizes |
|                     |                                       |                        | 800/1000/1200       | 4                                     | #2 AWG to 600 MCM      |

### NOTES:

- \* Line and load terminals are located in rear and arranged for bus bar connection.
- 1. Special terminal lugs and neutral bars are available at additional cost.  
Contact factory and advise cable sizes and number of conductors per pole.
- 2. Fully rated solid neutral (3x standard normal power connector) provided when required by system voltage.
- 3. Normal and emergency may be ordered inverted on any switch. Load may be inverted 600-1200 amps.  
Consult the factory for details.
- 4. Lug adapters for 3000-4000 amp units may be staggered length for ease of entrance. Consult the factory for details.
- 5. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact Caterpillar.

# AUTOMATIC TRANSFER SWITCH 263600 - 1.03A Product Data



## UL AND CSA RATINGS

The CTS Series Automatic Transfer Switches have been subjected to an extensive test program to show that they comply with and exceed UL 1008 standards, as well as the various performance specifications used by most government agencies and major electrical engineering firms throughout the world.

The Primary test to ensure the quality and dependability of an automatic transfer switch is its ability to close into and withstand high fault currents. The table shows the Underwriters Laboratories and Canadian Standards certified withstand and closing current ratings in symmetrical RMS amperes at 480 and 600 volts AC.

| CTS Series Switches Rated for Total Systems or Motor Loads (1) |                           | Withstand and Closing Current Ratings per UL 1008 and CSA |                                   |                                    |                                         |                                   |                                    |                                   |                                    |
|----------------------------------------------------------------|---------------------------|-----------------------------------------------------------|-----------------------------------|------------------------------------|-----------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|
| Series                                                         | UL 1008 CTS Switch Rating | Current Limiting Fuse                                     |                                   |                                    | Specific Coordinated Breaker Rating (3) |                                   |                                    | Any Breaker Rating                |                                    |
|                                                                |                           | Max. Fuse Size Amps                                       | Max. Circuit Amps at 480 VAC (UL) | Max. Circuit Amps at 600 VAC (CSA) | Max. Circuit Breaker Size Amps          | Max. Circuit Amps at 480 VAC (UL) | Max. Circuit Amps at 600 VAC (CSA) | Max. Circuit Amps at 480 VAC (UL) | Max. Circuit Amps at 600 VAC (CSA) |
| CTS                                                            | 800                       | 1000                                                      | 200,000                           | N/A                                | 1600                                    | 65,000                            | N/A                                | 50,000                            | N/A                                |
|                                                                | 1000                      | 1250                                                      | 200,000                           | 150,000                            | 1600                                    | 65,000                            | 65,000                             | 50,000                            | 42,000                             |
|                                                                | 1200                      | 1500                                                      | 200,000                           | 150,000                            | 1600                                    | 65,000                            | 65,000                             | 50,000                            | 42,000                             |

CTSD 600 amp - 4800 amp - Ratings identical to CTS Series

CTSCCT and CBTSCCT 100 amp - 4000 amp - Ratings identical to CBTS Series

NOTES: 1. For each rating attained in above table, the heat run was performed after the overload and endurance tests.

2. These models also listed for 100% tungsten lamp loads.

3. Contact Caterpillar for coordinated breaker types and ratings.

4. All transfer switches are rated in coordination with the protective device installed.

Lower rated devices than those shown may be utilized and the system rated accordingly.

5. Contact Caterpillar for IEC ratings

**AUTOMATIC TRANSFER SWITCH** 263600 - 1.03A Product Data

- 1 800A, 4P, CTS OPEN TRANSITION MX250-277/480V, 3 PHASE, 4 WIRE, 60HZ NEMA1
- 1 1000A, 4P, CTS OPEN TRANSITION MX250-277/480V, 3 PHASE, 4 WIRE, 60HZ NEMA1
- 1 1200A, 4P, CTS OPEN TRANSITION MX250-277/480V, 3 PHASE, 4 WIRE, 60HZ NEMA1

**Furnished with:**

MX250 microprocessor panel

Multipurpose display: LEDs for continuous monitoring of switch position and source availability; a four-line by 20-character, backlit LCD display for settings, functions, programming and annunciation

Through-the-door programming and display

Simplified keypad entry, menu-driven system is designed for ease of use

Built-in diagnostics with displays for ease of troubleshooting

Pass code protected to limit user access

Timer countdown display for ease of operation

User settings unaffected by power outages

Close differential 3-phase under-voltage sensing of the normal source - factory standard setting 90% pickup, 80% dropout (adjustable); under-frequency sensing of the normal source factory setting 95% pickup (adjustable)

Voltage and frequency sensing of the emergency source - factory standard setting 90% pickup voltage, 95% pickup frequency (adjustable)

Metering: Normal and Emergency - Voltage (Line to Line) and Frequency

Test switch (fast test/load/no load) to simulate normal source failure - automatically bypassed should the emergency source fail

Transfer Commit / No Commit selection feature

Time Delays for:

Engine Start (Adjustable from 0-10 seconds)

Transfer to Emergency (Adjustable from 0-5 minutes)

Retransfer to Normal (Adjustable from 0-60 minutes)

Engine Cool down (Adjustable from 0-60 minutes)

1- In Phase Monitor - Self Adjusting (Open Transition Switches Only)

1- Auxiliary Contact (form a): Closed when the switch is in the Emergency position

1- Auxiliary Contact (form a): Closed when the switch is in the Normal position

1- Engine Start Contacts

1- UL1008 listed

1- Double throw, mechanically interlocked contactor mechanism

1- Electrically operated, mechanically held

1- Designed for emergency and standby applications

1- AL/CU Mechanical Screw Type Lugs

Inphase Monitor

**MCONS ACCESSORY PACKAGE**

The transfer switch listed in this quotation is furnished with a powerful MX-250 controller which meets or exceeds the requirements of the most demanding of emergency power applications.

The MX250 controller offered in this quotation is equipped with the MCONS accessory package which includes the following features: A1 - Normal Failure Auxiliary Contact, A1E - Emergency Failure Auxiliary Contact, A3(2) - Emergency Source

position auxiliary contact, A4(2) - Normal Source position auxiliary contact, CD/P - Clock Exerciser Load/ No Load: Allows the Generator to start and run unloaded or to simulate a power failure, start Generator and run under load, DT - Time delay

from neutral switch position to normal on retransfer (only for Delay Transition Switches), DW - Time delay from neutral switch position to emergency on retransfer (only for Delay Transition Switches), E - Engine Start Contact, EL/P - Event Log:

Sequentially numbered log of 16 events that track date, time, reason and action taken, J2E - Adjustable over/under frequency sensor (source 2 or emergency), J2N - Adjustable over/under frequency sensor (source 1), K/P - Frequency

Indication ((on the controller), L1 - LED Source 2 (emergency) position indication, L2 - LED Source 1 (normal) position indication, L3 - LED Source 1 (normal) source availability indication, L4 - LED Source 2 (emergency) source availability

Indication, LN/P - Center off position/LCD indication on controller (only for Delay Transition Switches), P1 - Time delay start for Emergency Source (adj. From 0-10 seconds), Q2 - Peak Shave /Remote Load Test /Area Protection AC Relay (Must

specify voltage 120VAC, 24VDC, 24VAC at time of ordering. 120VAC is default), Q3 - Inhibit Transfer to Emergency (load add relay), - (Must specify voltage 120VAC, 24VDC, 24VAC at time of ordering. 120VAC is default), Q7 - Inhibit Transfer to

Normal Relay, - (Must specify voltage 120VAC, 24VDC, 24VAC at time of ordering. 120VAC is default), R2E - Undervoltage Sensing for Emergency Source (single phase), R7 - Overvoltage Sensing of Emergency Source (single phase), R8 -

Overvoltage Sensing of Emergency Source (three phase), R16 - Phase Rotation Sensing of Source 1 and Source 2, R17 - Undervoltage Sensing for Emergency Source (three phase), R50 - Inphase Monitor (only furnished with Open Transition ATS,

not furnished with Delay Transition ATS), S13/P - Commit/No Commit to transfer to Emergency Source, T - Retransfer to Normal Time Delay (adj. 0-60 mins), T3/W3 - Elevator Pre-Signal Auxiliary Contacts: Open 0-60 seconds prior to transfer to

either direction, re-closes after transfer, U - Engine Cooledown Run Timer (adj. 0-60min), UMD - Pre and post transfer output adjustable time range functions in both directions. Includes two circuits, VI - Voltage Imbalance - monitors phase voltages

initiates transfer upon selected phase to phase voltage differential, W - Adjustable Time Delay on Transfer to Emergency Source, YEN/P - Bypass Timers Key (On Keypad). Bypasses (T) or (W) time delay settings, G/P - Test Switch, Momentary,

Additional Accessories 2- MX250 Position Contact -Closed on E position - 10 A Single Pole Double Throw, 2- MX250 Position Contact -Closed on N position - 10 A Single Pole Double Throw 1- Auto/Manual Selector for Transfer to N or E 1- Motor

Disconnect (CTS-A62) Motor Disconnect and staged restart.



POWER SOLUTIONS

May 24, 2010

Cashman Power Solutions  
3300 St. Rose Pkwy.  
Henderson, NV 89062

Mojave Electric  
3765 W. Hacienda  
Las Vegas, NV 89118

Subject: Las Vegas City Hall Submittal review

Pete,  
We have completed our review of the Las Vegas City Hall submittal with the following responses for re-submittal:

Div 263213- Packaged Generator Systems

1. 9kw jacket heaters require circuit revisions to the drawings.
  - a. Jacket heaters are designed to work on either 240V or 208V.
2. Generators shall be furnished with upturn radiator exhaust scoops.
  - a. Upturn scoops will be provided. Revised drawings are being produced.
3. Shop drawings of the generator yard not in the Cashman scope.

Div 263363- Static uninterruptible power supply

1. Furnish with network monitoring via Ethernet cable connection
  - a. Item D in the UPS BOM and Section 5 in the UPS submittal references the NETCOM UPS monitoring equipment.

Div 263600- Transfer switches

1. Provide information for remote status panel.
  - a. Cashman will provide a remote status panel for the Fire Command indicating ATS switch position.
2. Equipment room layouts not in the Cashman scope.
3. Indicate automatic transfer switch features as indicated in specifications.
  - a. Transfer switches meet the scope of the specification.

Thank you,

Kim Symons  
Account Manager  
Cashman Power Solutions

Las Vegas  
3300 St. Rose Pkwy  
Henderson, NV 89062  
PH: 702-649-8777  
FAX: 702-639-5090

Reno  
600 Glendale Ave.  
Sparks, NV. 89431  
PH: 775-358-5111  
FAX: 775-358-0433

Elko  
5010 Idaho Street  
Elko, NV. 89801  
PH: 775-738-9871  
FAX: 775-738-7865

CASH1054  
J54-532  
JA 00004372



May 17, 2010

JMA Architecture Studios  
10150 Covington Cross  
Las Vegas, NV 89144

Attention: Mr. Robert Messiana  
Subject: Las Vegas City Hall  
Our Project No. 08.0214

Dear Michael:

We have completed our review of the electrical submittal books for the subject project. Our comments follow:

Div 078400-Fire Stop System- Reviewed

1. Architect shall review for compliance with specifications and drawing details.

Div 260500- Sleeve and Seals- Reviewed

1. No submittal for seals or grout submitted.

Div 260510- Low Voltage Conductors and Cable- Revise and Resubmit

1. Metal clad cable is not approved per City of Las Vegas Standards.
2. Provide information regarding protection of emergency feeders per NEC 700.9(D)(1)- note #10 on sheet E5.03 core and shell package.

Div 260520- Grounding and Bonding- Revise and Resubmit

1. Submittal sheets indicate type GR, GT, GY, NC and ND exothermic welds but all part numbers are "x" out. Why are these submitted? Indicate actual products to be used on project.
2. Submit for bolted connectors.

Div 260520- Hangers and Supports- Revise and Resubmit

1. Indicate actual products to be used on this project.

Div 260530- Raceways and Boxes- Revise and Resubmit

1. Indicate actual products to be used on this project.
2. PVC risers are not allowed.
3. Flex metallic conduit shall be zinc-coated steel.

---

JBA Las Vegas • 5155 W Patrick Ln • Las Vegas, NV 89118 • 702.362.9200  
Abu Dhabi • Dubai • Ho Chi Minh City • Las Vegas • Macau • New Orleans • Orange County

CASH1055  
J54-533  
JA 00004373

JMA Architecture Studios  
Attention: Mr. Robert Messina  
Subject: Las Vegas City Hall  
May 17, 2010  
Page 2 of 6

4. Swimming pool junction boxes are not required.
5. Weatherproof lamp holders and garden lights are not required.
6. Submit for precast handholes and pullboxes.
7. Provide cable tray for wall applications as shown on the telecom drawings.
8. Provide open style cable tray in the studio areas as shown on the telecom drawings.

Div 260548- Vibration and Seismic Controls- Revise and Resubmit

1. Submit for vibration isolation devices at transformers.
2. Submit for seismic restraint equipment at importance factor 1.5 serving emergency power distribution and fire alarm systems (where applicable).

Div 280553- Identification- Reviewed

1. Remove park sign.

Div 280573- Coordination Study- Revise and Resubmit

1. Provide coordination study specialist qualifications- professional engineer licensed in the state of Nevada.

Div 280923- Lighting Control Devices- Reviewed

1. Finishes by architect.
2. Resubmit switch with digital timer. Needs to be manual on and auto off.

Div 280924- Lighting Control Panels- Revise and Resubmit

1. Lighting control station missing on second floor. Correct area designations.
2. Sheets E4.00 are from two packages (core/shell package and build-out package). Both are correct.
3. Provide interface with security system and provide corresponding control wiring to emergency lighting relays.
4. Emergency lighting relays indicated on sheet E4.01 are not transfer devices (see diagram B on sheet E4.00). Refer to diagram A for this emergency lighting relay.
5. Time clock schedule by City of Las Vegas.
6. Project is LEED Silver.
7. Control stations are used for lighting override only. Provide appropriate button configuration. Engraving shall indicate "lighting override".
8. Zoning shall be by floor and area.
9. Correct relay panel schedules LR0A and LR6A. Refer to revised drawings dated 4/16/10.
10. There shall be one lighting control override button located on the eighth floor. This will be clarified on a future drawing revision.

JMA Architecture Studios  
Attention: Mr. Robert Messtana  
Subject: Las Vegas City Hall  
May 17, 2010  
Page 3 of 6

Div- 260925- Dimming Control Panel- Revise and Resubmit

1. Dimmer feeders shall be copper only.
2. Control station finishes by Architect (confirm white).
3. RS-232 interface to AV equipment shall be located in the control room.
4. Clarify why two master control stations are indicated on system riser diagram- drawing #662093-101.
5. Coordinate dimmer module types with lamps furnished. Provide information/out-sheets on dimmer modules.

Div 262200- Low Voltage Transformers- Furnish as Corrected

1. Correct designation for transformer T-L3AB.
2. Submit qualification data for independent testing agency.

Div 262413- Switchboards- Revise and Resubmit

1. Correct bussing diagram for SEA. Extra connection between utility meter and outgoing lugs.
2. Coordinate nameplate requirements with specification section 260563.
3. Coordinate bussing diagram for MSA with actual equipment sections. Clarify section #6 with feed from IMDB on bussing diagram.
4. Correct MSB elevations for circuits #1, 2 and 3 (225A CB).
5. 1600A and 2000A fire pump disconnects do not meet physical space requirements. Resubmit equipment meeting physical space requirements and submit shop drawings of electrical room with equipment layout.
6. Provide main circuit breaker in EHDPA with long time delay, short time delay and instantaneous trip functions independent and fully adjustable of each other.
7. Revise circuit breakers in EHDPA serving elevators. Refer to revised drawings dated 4/16/10.
8. 800A circuit breaker in XHDPA serves the UPS (not main CB).
9. Provide equipment room layout shop drawings.
10. Provide testing agency qualifications.
11. Label in LDPBBA for panel LTVC needs to be corrected.

Div 262416- Panelboards- Revise and Resubmit

1. Submit for panels LBBE and ULTV. Refer to the build-out package.
2. Submit for fused coordination panels EH1A, EH4A, EH7A, EHBA, EHBAS, EHRA, EL1A, EL4A, EL7A, ELBA, ELFC and ELRA. Provide specific sheet for each panel.
3. Panels EH1A, EH4A, EH7A, EHBA and EHRA shall be rated 225A.
4. Provide panel EH4A with subfeed lugs or feed through lugs.
5. Panel EHBAS shall be NEMA 3R rated.
6. Panel EHBA shall be 25 KAIC rated.
7. Refer to revised drawings for branch circuit breaker quantities and ratings. Panels H3AA, XH2A, L5AAS and LBBBS have been revised recently. Some of the submitted panels incorrectly indicate 30A/1P circuit breakers where 20A/1P are indicated.

1                                   **IN THE SUPREME COURT OF THE STATE OF NEVADA**

2  
3  
4   CASHMAN EQUIPMENT COMPANY,  
5   a Nevada corporation,

6                                   Appellant,

7   vs.

8  
9   WEST EDNA ASSOCIATES, LTD., dba  
10   MOJAVE ELECTRIC, a Nevada  
11   corporation; WESTERN SURETY  
12   COMPANY, a surety; THE WHITING  
13   TURNER CONTRACTING  
14   COMPANY, a Maryland corporation;  
15   FIDELITY AND DEPOSIT COMPANY  
16   OF MARYLAND, a surety;  
17   TRAVELERS CASUALTY AND  
18   SURETY COMPANY OF AMERICA, a  
19   surety; QH LAS VEGAS LLC, a foreign  
20   limited liability company; PQ LAS  
21   VEGAS, LLC, a foreign limited liability  
22   company; L W T I C SUCCESSOR LLC,  
23   an unknown limited liability company;  
24   FC/LW VEGAS, a foreign limited  
25   liability company;

26                                   Respondents.

                                                          Electronically Filed  
**Case No: 66452** Jun 17 2015 01:04 p.m.  
**Case No: 61715** Tracie K. Lindeman  
**Case No: 65819** Clerk of Supreme Court

District Court Case Nos.:   **A642583 &**  
                                                          **A653029**

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                                                          Volume 18 of 32

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**- CHRONOLOGICAL & ALPHABETICAL -**

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*Attorneys for Respondents*

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|    | Motion for Summary Judgment without Prejudice                                                                                                                                      |            |       |                |
| 78 | Notice of Entry of Order Denying Mojave's Motion to Expunge or Reduce Mechanic's Lien                                                                                              | 05/06/2013 | 10    | JA0002402-07   |
| 79 | Notice of Entry of Order Denying QH Las Vegas, LLC, PQ Las Vegas, LLC, LWTIC Successor, LLC, and FC/LW Vegas Motion to Dismiss, or in the alternative, Motion for Summary Judgment | 05/06/2013 | 10    | JA0002408-13   |
| 87 | Notice of Entry of Order Granting Cashman's Motion for Award of Attorneys' Fees and Costs Pursuant to NRS 108.2275                                                                 | 09/24/2013 | 10-11 | JA0002498-2502 |
| 25 | Notice of Entry of Order Granting Cashman's Motion to Amend Complaint                                                                                                              | 05/25/2012 | 2     | JA000295-99    |

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| 1  | 52  | Notice of Entry of<br>Order Granting<br>Cashman's Motion<br>to Stay or Suspend<br>Order Granting in<br>Part Motion for<br>Preliminary<br>Injunction to<br>Procure Codes                                               | 11/02/2012 | 5  | JA0001079-83 |
| 2  |     |                                                                                                                                                                                                                       |            |    |              |
| 3  |     |                                                                                                                                                                                                                       |            |    |              |
| 4  |     |                                                                                                                                                                                                                       |            |    |              |
| 5  |     |                                                                                                                                                                                                                       |            |    |              |
| 6  |     |                                                                                                                                                                                                                       |            |    |              |
| 7  |     |                                                                                                                                                                                                                       |            |    |              |
| 8  | 60  | Notice of Entry of<br>Order Granting<br>Motion to Amend<br>Complaint                                                                                                                                                  | 01/09/2013 | 5  | JA0001149-53 |
| 9  |     |                                                                                                                                                                                                                       |            |    |              |
| 10 |     |                                                                                                                                                                                                                       |            |    |              |
| 11 | 16  | Notice of Entry of<br>Order Granting<br>Motion to<br>Consolidate (Filed<br>in A653029)                                                                                                                                | 02/02/2012 | 1  | JA000129-34  |
| 12 |     |                                                                                                                                                                                                                       |            |    |              |
| 13 |     |                                                                                                                                                                                                                       |            |    |              |
| 14 |     |                                                                                                                                                                                                                       |            |    |              |
| 15 |     |                                                                                                                                                                                                                       |            |    |              |
| 16 | 114 | Notice of Entry of<br>Stipulation and<br>Order for<br>Dismissal of<br>Defendants<br>Fidelity and<br>Deposit Company<br>of Maryland and<br>Travelers Casualty<br>and Surety<br>Company of<br>America with<br>Prejudice | 05/11/2015 | 32 | JA0007837-42 |
| 17 |     |                                                                                                                                                                                                                       |            |    |              |
| 18 |     |                                                                                                                                                                                                                       |            |    |              |
| 19 |     |                                                                                                                                                                                                                       |            |    |              |
| 20 |     |                                                                                                                                                                                                                       |            |    |              |
| 21 |     |                                                                                                                                                                                                                       |            |    |              |
| 22 |     |                                                                                                                                                                                                                       |            |    |              |
| 23 |     |                                                                                                                                                                                                                       |            |    |              |
| 24 |     |                                                                                                                                                                                                                       |            |    |              |
| 25 |     |                                                                                                                                                                                                                       |            |    |              |
| 26 | 57  | Notice of Posting<br>Bond                                                                                                                                                                                             | 11/07/2012 | 5  | JA0001112-16 |
| 27 |     |                                                                                                                                                                                                                       |            |    |              |

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| 1  | 44 | Notice of Posting<br>Cost Bond                                                                                                                                                                                                                           | 09/19/2012 | 4         | JA000854-57        |
| 2  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 3  | 33 | Notice of Posting<br>Security Bond                                                                                                                                                                                                                       | 08/09/2012 | 2         | JA000407-13        |
| 4  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 5  | 82 | Opposition to<br>Cashman's Motion<br>for Award of<br>Attorneys' Fees<br>and Costs Pursuant<br>to NRS 108.2275                                                                                                                                            | 06/20/2013 | 10        | JA0002462-74       |
| 6  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 7  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 8  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 9  |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 10 | 39 | Opposition to<br>Cashman's Motion<br>for<br>Reconsideration of<br>Order Granting in<br>Part Counter-<br>claimants' Motion<br>for Preliminary<br>Injunction to<br>Procure Codes or<br>Alternatively<br>Motion for<br>Clarification and<br>Request for OST | 09/07/2012 | 2-3       | JA000499-609       |
| 11 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 12 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 13 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 14 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 15 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 16 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 17 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 18 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 19 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 20 | 96 | Opposition to<br>Motion for Relief<br>Pursuant to NRCP<br>60(b) and Motion<br>for Attorneys' Fees<br>and Costs Pursuant<br>to NRS Ch. 108                                                                                                                | 04/15/2014 | 30-<br>31 | JA0007360-<br>7693 |
| 21 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 22 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 23 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 24 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 25 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 26 | 58 | Opposition to<br>Motion to Amend<br>Complaint                                                                                                                                                                                                            | 11/19/2012 | 5         | JA0001117-26       |
| 27 |    |                                                                                                                                                                                                                                                          |            |           |                    |
| 28 |    |                                                                                                                                                                                                                                                          |            |           |                    |

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|     |                                                                                                                                                   |            |    |              |
| 108 | Order Denying<br>Cashman’s<br>Request for Costs<br>Pursuant to NRS<br>18.020                                                                      | 09/02/2014 | 32 | JA0007797-98 |
| 86  | Order Granting<br>Cashman’s Motion<br>for Award of<br>Attorneys’ Fees<br>and Costs Pursuant<br>to NRS 108.2275                                    | 09/20/2013 | 10 | JA0002496-97 |
| 51  | Order Granting<br>Cashman’s Motion<br>to Stay or Suspend<br>Order Granting in<br>Part Motion for<br>Preliminary<br>Injunction to<br>Procure Codes | 11/02/2012 | 5  | JA0001077-78 |
| 75  | Order<br>Rescheduling<br>Pretrial/Calendar<br>Call                                                                                                | 04/17/2013 | 10 | JA0002388-89 |
| 18  | Order Setting Civil<br>Non-Jury Trial,<br>Pre-Trial/Calendar<br>Call                                                                              | 02/21/2012 | 1  | JA000145-46  |
| 32  | Order Setting Civil<br>Non-Jury Trial,<br>Pre-Trial/Calendar<br>Call                                                                              | 08/06/2012 | 2  | JA000405-06  |

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| 1  | 84 | Order Setting Civil<br>Non-Jury Trial,<br>Pre-Trial/Calendar<br>Call                                                                                                                           | 09/06/2013 | 10       | JA0002488-90       |
| 2  |    |                                                                                                                                                                                                |            |          |                    |
| 3  |    |                                                                                                                                                                                                |            |          |                    |
| 4  | 88 | Order Setting Civil<br>Non-Jury Trial,<br>Pre-Trial/Calendar<br>Call                                                                                                                           | 10/1/2013  | 11       | JA0002503-05       |
| 5  |    |                                                                                                                                                                                                |            |          |                    |
| 6  |    |                                                                                                                                                                                                |            |          |                    |
| 7  |    |                                                                                                                                                                                                |            |          |                    |
| 8  | 90 | Plaintiff's Trial<br>Brief                                                                                                                                                                     | 01/16/2014 | 11       | JA0002534-59       |
| 9  |    |                                                                                                                                                                                                |            |          |                    |
| 10 | 66 | QH Las Vegas,<br>LLC, PQ Las<br>Vegas, LLC,<br>LWTIC Successor,<br>LLC, and FC/LW<br>Vegas Motion to<br>Dismiss, or in the<br>alternative, Motion<br>for Summary<br>Judgment                   | 02/07/2013 | 5-6      | JA0001241-<br>1355 |
| 11 |    |                                                                                                                                                                                                |            |          |                    |
| 12 |    |                                                                                                                                                                                                |            |          |                    |
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| 16 |    |                                                                                                                                                                                                |            |          |                    |
| 17 |    |                                                                                                                                                                                                |            |          |                    |
| 18 | 74 | QH Las Vegas,<br>LLC, PQ Las<br>Vegas, LLC,<br>LWTIC Successor,<br>LLC, and FC/LW<br>Vegas Reply to<br>their Motion to<br>Dismiss, or in the<br>alternative, Motion<br>for Summary<br>Judgment | 04/05/2013 | 9-<br>10 | JA0002102-<br>2387 |
| 19 |    |                                                                                                                                                                                                |            |          |                    |
| 20 |    |                                                                                                                                                                                                |            |          |                    |
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| 24 |    |                                                                                                                                                                                                |            |          |                    |
| 25 |    |                                                                                                                                                                                                |            |          |                    |
| 26 | 81 | QH Las Vegas, PQ<br>Las Vegas, LWITC<br>Successor and<br>FC/LW Vegas'                                                                                                                          | 06/11/2013 | 10       | JA0002441-61       |
| 27 |    |                                                                                                                                                                                                |            |          |                    |
| 28 |    |                                                                                                                                                                                                |            |          |                    |

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|     | Answer to Fourth Amended Complaint                                                                                                         |            |    |                |
| 59  | Reply in Support of Motion to Amend Complaint                                                                                              | 12/17/2012 | 5  | JA0001127-48   |
| 31  | Reply to Cashman's Opposition to Motion for Injunctive Relief or Writ of Possession                                                        | 07/31/2012 | 2  | JA000398-404   |
| 97  | Reply to Cashman's Opposition to Motion for Relief Pursuant to NRCP 60(b) and Motion for Attorneys' Fees and Costs Pursuant to NRS Ch. 108 | 04/23/2014 | 31 | JA0007694-7707 |
| 56  | Reply to Cashman's Opposition to Motion to Expunge or Reduce Mechanic's Lien                                                               | 11/02/2012 | 5  | JA0001102-11   |
| 15  | Scheduling Order                                                                                                                           | 01/31/2012 | 1  | JA000126-28    |
| 4   | Second Amended Complaint                                                                                                                   | 09/30/2011 | 1  | JA00034-50     |
| 113 | Stipulation and Order for                                                                                                                  | 05/08/2015 | 32 | JA0007834-36   |

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|    | Dismissal of Defendants Fidelity and Deposit Company of Maryland and Travelers Casualty and Surety Company of America with Prejudice |            |   |                |
| 73 | Supplement to Cashman's Supplement to its Countermotion for Summary Judgment on its Payment Bond and Mechanic's Lien Claims          | 04/05/2013 | 9 | JA0002095-2101 |
| 24 | Third Amended Complaint                                                                                                              | 05/24/2012 | 2 | JA000276-94    |
| 36 | Transcript of Proceedings for August 3, 2012                                                                                         | 08/22/2012 | 2 | JA000423-38    |
| 62 | Transcript of Proceedings for November 9, 2012                                                                                       | 01/11/2013 | 5 | JA0001173-1203 |