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HOW TO USE THIS MANUAL

This manual is designed for ease of use, giving the user easy and quick reference to information.
This manual uses notice icons to draw attention to the user important information regarding the safe operation and installation of the UPS. The notice icons used in this manual are explained below, and should be taken into account and adhered to whenever they appear in the text of this manual.

**Warning:** A warning notice icon conveys information provided to protect the user and service personnel against hazards and/or possible equipment damage.

**Caution:** A caution notice icon conveys information provided to protect the user and service personnel against possible equipment damage.

**Note:** A Note notice icon indicates when the user should make a reference of information regarding the UPS operation, load status and display status. Such information is essential if Mitsubishi field service group assistance and correspondence is required.

**Safety Recommendations:** If any problems are encountered while following this manual, Mitsubishi field service group assistance and correspondence is recommended.
1.0 INTRODUCTION

The Mitsubishi Uninterruptible Power Supply System (UPS) is designed to provide many years of reliable protection from power failure, brown-outs, line noise, and voltage transients. To ensure optimum performance of the equipment, follow the manufacturer's instructions. This manual contains descriptions required to operate the UPS. Please read this manual carefully and retain it for future reference.

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions for the 9900B SERIES Uninterruptible Power Supply System that should be followed during installation and maintenance of the UPS and batteries.

WARNING 1

Lethal voltages exist within the equipment during operation. Observe all warning and cautions in this manual. Failure to comply may result in serious injury or death. Obtain qualified service for this equipment as instructed.
In no event will MITSUBISHI be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment. Any modifications without authorization by MITSUBISHI could result in personal injuries, death or destruction of the UPS.

1.1 SAFETY PRECAUTIONS

**APPLICATION**

If the UPS System is to be applied to support equipment that could affect human safety, the following steps must be adhered to:

1. Consult with Mitsubishi Electric Power Products Inc. UPS Division.
2. Special consideration of the overall back up power system configuration is required so that the Mitsubishi UPS System is not the sole support required for operation, maintenance and management of power availability. Other available power sources; for example utility, emergency power generation or other systems shall also support power availability.

Definition of equipment that could affect human safety:

- Life Support Systems (is a system whose failure to perform can be expected to result in bodily injury or death.)
- Essential Public Systems (is a system whose failure to perform can be expected to result in bodily injury or death and/or property damage.)
The UPS is to be installed in a controlled environment. Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions. Keep the installation environment per standard described as follows:

### TABLE 1.1 UPS Installation Environment

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Environment standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Installation Location</td>
<td>Indoors</td>
</tr>
<tr>
<td>2</td>
<td>Ambient temperature</td>
<td>Minimum temperature: 32°F (0°C), Maximum temperature: 104°F (40°C) The average temperature over any 24-hour period must be in the range 41°F (5°C) to 95°F (35°C).</td>
</tr>
<tr>
<td>3</td>
<td>Relative humidity</td>
<td>The relative humidity must be held between 5 and 95%. There must be no condensation due to temperature changes.</td>
</tr>
<tr>
<td>4</td>
<td>Altitude</td>
<td>This equipment must not be applied at altitude that exceeds 2250m (7400ft) above seal level.</td>
</tr>
<tr>
<td>5</td>
<td>Dust</td>
<td>Dust in the room where the UPS is installed must not exceed normal atmospheric dust levels. In particular, that dust should not include iron particles, oils or fats, or organic materials such as silicone.</td>
</tr>
<tr>
<td>6</td>
<td>Inflammable gas following IEC654-4 Part 4</td>
<td>There should be no inflammable/explosive gas.</td>
</tr>
</tbody>
</table>

For the following gas:
- Hydrogen sulfide (H₂S) No more than 0.003 PPM
- Sulfurous acid gas (SO₂) No more than 0.01 PPM
- Chlorine gas (Cl₂) No more than 0.002 PPM
- Ammonia gas (NH₃) No more than 1 PPM
- Nitrous oxides (NO₄) No more than 0.05 PPM
- Ozone (O₃) No more than 0.002 PPM
This UPS does not include a Bypass input circuit breaker (MCCB) to protect bypass circuit. The Bypass input circuit breaker (MCCB) is to be field supplied and installed. Recommended Breaker (MCCB)'s Specifications are as follows:

**TABLE 1.2** Rating of Bypass Input Circuit Breaker

<table>
<thead>
<tr>
<th>Capacity (kVA)</th>
<th>Bypass Voltage (Vac)</th>
<th>Bypass Rating (Aac)</th>
<th>Breaker (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>480</td>
<td>361</td>
<td>500</td>
</tr>
<tr>
<td>500</td>
<td>480</td>
<td>601</td>
<td>800</td>
</tr>
<tr>
<td>750</td>
<td>480</td>
<td>902</td>
<td>1200</td>
</tr>
</tbody>
</table>

AC input and AC output overcurrent protection and disconnect devices shall be field supplied and installed. The DC circuit breaker (MCCB) shall be field supplied and installed. The overcurrent protection device should be installed in the Battery cabinet and rated as indicated in TABLE 1.6.

Note: The DC input overcurrent protection (Battery disconnect breaker) hereinafter will be referred as “CB2”.
1.2 GENERAL

The Mitsubishi 9900B SERIES UPS is designed to provide continuous and clean electrical power to a critical load. Additionally the UPS monitors power conditions affecting the load. In the event of an input power failure, the UPS will supply power to the critical load for the specified battery time.

If the input power is not restored promptly, back up power from the UPS battery permits the orderly shutdown of equipment supported by the UPS. The UPS is simple to start-up, operate and maintain.

The 9900B SERIES UPS is available in 300, 500 and 750kVA. Specifications are shown in Section 1.5. The principles of operation described herein are applicable to all models.

This manual provides an overview of the 9900B SERIES components and their functions. The appearance and purpose of operator controls and indicators is described with procedures for operation, start-up, shutdown and basic maintenance included.
1.3 DEFINITIONS

UNINTERRUPTIBLE POWER SUPPLY SYSTEM (UPS) - All components within the UPS Module Cabinet and associated batteries that function as a system to provide continuous, conditioned AC power to a load. This is sometimes referred to as the "System".

UPS MODULE CABINET - The metal enclosure which contains the Converter / Charger, Inverter, Static Transfer Switch, Internal Bypass line, operator controls, and internal control systems required to provide specified AC power to a load.

UPS MODULE - The Converter / Charger and Inverter assemblies which, under the direction of the internal control system and operator controls, provide specified AC power to a load.

INVERTER - The UPS components which contain the equipment and controls necessary to convert DC power from the Converter / Charger, or the battery, to AC power required by the critical load.

CONVERTER / Charger - The UPS components which contain the equipment and controls necessary to convert input AC power to regulated DC power required for battery charging and for supplying power to the Inverter.

STATIC TRANSFER SWITCH - The device which connects the critical load to the bypass line when the Inverter cannot supply continuous power.

BYPASS LINE - The line which conducts electricity directly from the input power source to the critical load during Maintenance or whenever the UPS is not completely operational.

AC INPUT POWER - Power provided by the electrical utility company, or auxiliary generator, which is connected to the UPS for supplying the critical load.

BATTERY - The rechargeable battery strings which supply DC power to the inverter to maintain continuous AC power to the load during AC input power failure conditions.
1.4 OPERATION OVERVIEW

The UPS provides two power paths between the utility source and the critical load. Figure 1.1 shows the path for normal operation, with the load powered from the inverter. Figure 1.2 shows the path for bypass operation, with the load supplied through the static bypass line.

A) Normal operation: Load power supplied by each system UPS inverter.

![Diagram of Normal Operation](image)

During normal operation, the path through the UPS inverters is used to power the load.

Referring to Figure 1.1: Input AC power is converted to DC by the Converter. DC power is utilized to charge the UPS battery and to provide power to the Inverter. The Inverter converts the DC power to clean AC power to supply the critical load.

The conversion - inversion process eliminates any voltage transients or fluctuations existing in the input power before it reaches the critical load.

The power drawn by the critical load is equally shared between all UPS whenever the system is in the Parallel Operation. (Refer to Figure 3.4 that shows a sample of Parallel Operation System Configuration.)
In the event of a UPS module failure during Parallel Operation, the critical load power will be continually supplied and shared by all other UPS.

The Bypass Input circuit breaker (MCCB) for protection of the UPS and cables are field supplied and field installed. (See WARNING 4 on page 1-4).

B) Bypass Operation: Load Power supplied through UPS internal static bypass line.

**FIGURE 1.2** Single Line Diagram - Bypass Operation: Load fed through static bypass line.

Referring to Figure 1.2: The Internal Bypass line is a Hard-wired line through 52S which supplies the critical load with unconditioned bypass input power. Upon switching to the Internal Bypass line, the Static Transfer Switch line through CB3 (herein after STS contactor CB3) supplies the power immediately, and then the Internal Bypass line through 52S supplies the power. In the event of a switching to the Bypass line, the power to the critical load will be uninterrupted. The purpose of this Internal Bypass line is to route power to the critical load while the UPS module is de-energized (converter and inverter), and during Start-up before the system is fully operational.

Each UPS internal static bypass line will equally share the power supplied to the critical load whenever the system is in the Parallel Operation.
In the event of a load overcurrent, the UPS transfers to bypass without interruption to the critical load. In the case of the Parallel Operation, all UPS will transfer to bypass without interruption to the critical load.

The internal control system determines the operation of the two paths, with the load powered from the inverter being the normal operation.

C) **Battery operation**: Load Power supplied by UPS battery.

**FIGURE 1.3** Single Line Diagram - Battery Operation

Referring to Figure 1.3: In the event of AC input source failure or interruption, the UPS Converter(s)* will de-energize and the UPS battery(s)* will immediately discharge and supply DC power to the Inverter to maintain continuous AC power to the load. This operation will continue until:

a) The battery capacity expires and the inverter turns off, or
b) Input power is restored after which the converter will power the inverter and critical load and simultaneously recharge the batteries.

A fully charged battery will provide power for the specified time at the rated load, or longer, at a reduced load.

(s)* : In the case of the Parallel Operation

When power is restored after a low battery shutdown, the UPS converter(s)* automatically
restarts operation, the charger(s)* recharges the batteries and the Inverter(s)* is automatically restarted without operator intervention. Load is automatically assumed by the inverter without operator intervention.

(s)* : In the case of the Parallel Operation

The power drawn by the load is equally shared between all UPS regardless of the presence or absence of the UPS that is (are) in battery operation or not whenever the system is in the Parallel Operation.
FIGURE 1.4(a) UPS Parts Location (750kVA)

1) UPS cabinet – Front View

- 1. LCD Touch Panel Monitor Display
- Left Door
- Right Door
- Cable Entry Section

2) Backside of left door

- 1. LCD Touch Panel Monitor Display
- 2. Display PCB DPAU-8"1
- 4. Main PCB UPGR-M
- 6. External Communication Connector
FIGURE 1.4(a) UPS Parts Location (750kVA)

3) UPS module – Front View

* Items 9 and 10 (AC input, AC output, DC input terminal, and Grounding Bar) is not shown in Figure 1.4. (Refer to Figure 3.2)
FIGURE 1.4(b) UPS Parts Location (500kVA)

1) UPS cabinet – Front View

- LCD Touch Panel
- Monitor Display
- Left Door
- Right Door
- Cable Entry Section

2) Backside of right door

- LCD Touch Panel Monitor Display
- External Communication Connector
- Display PCB DPAU-81
- Main PCB UPGR-M

3) UPS module – Front View

- CB3
- 52S
- 52C
- CB1
- AC Capacitor
- Converter Unit
- Chopper Unit
- Inverter Unit
- CPB
- CPMS
- EMB
- 52S
- 52C
FIGURE 1.4(c) UPS Parts Location (300kVA)

1) UPS cabinet – Front View
- LCD Touch Panel
- Monitor Display
- Door
- Cable Entry Section

2) Backside of right door
- LCD Touch Panel
- Monitor Display
- Relay PCB
- PSAU-73
- Display PCB
- DPAU-81
- External Communication Connector

3) UPS module – Front View
- CB3
- 52S
- 52C
- AC Capacitor
- Converter Unit
- Chopper Unit
- Inverter Unit
- External I/F PCB (IOAU-09)
- CB1
- CPMC
- CPMS
- EMB
FIGURE 1.5 Display PCB DPAU-81

6. External Communication Connector

13. SW6 MAINTENANCE switch

12. SW5 TEST switch

11. SW1 RESET switch

FIGURE 1.6 External I/F PCB IOAU-09

17. External contact signal terminal block

FIGURE 1.7 Parallel I/F PCB IFAU-09

8. Parallel I/F PCB IFAU-09
FIGURE 1.8  MAIN PCB UPGR-M

11. SW1
RESET switch

14. SW2
BOOT switch

15. SW3
52L S/W switch
Description of Figures 1.4 to 1.8:

1. **LCD Touch Panel Monitor Display**
   The liquid crystal display (LCD) touch panel monitor display indicates power flow, measured values and fault and error messages via user selectable display screens.
   Refer to FIGURE 2.1 for details.

2. **Display PCB DPAU-81** (Figure 1.5):
   Switches on DPAU-81 board: FOR SERVICE PERSONNEL ONLY
   - (11) SW1 (RESET switch)
   - (12) SW5 (TEST switch)
   - (13) SW6 (MAINTENANCE switch)

3. **External I/F PCB IOAU-09** (Figure 1.6):
   Signal I/F on IOAU-09 board
   - (17) External contact signal terminal block
   Refer to FIGURE 2.10 for details.

4. **Main PCB UPGR-M** (Figure 1.8):
   Switches on UPGR-M board: FOR SERVICE PERSONNEL ONLY
   - (11) SW1 (RESET switch)
   - (14) SW2 (BOOT switch)
   - (15) SW3 (52L S/W switch)

5. **Relay PCB PSAU-73**

6. **External Communication Connector**
   RS232C connector on DPAU-81 board: FOR SERVICE PERSONNEL ONLY
   Refer to FIGURE 2.13 for details.

7. **Parallel control PCB TLCR-E** (not shown)
   For use in Parallel Operation system application: Option

8. **Parallel I/F PCB IFAU-09**
   For use in Parallel Operation system application: Option (Figure 1.7):
   Refer to FIGURE 3.5 for details.

9. **AC input, AC output, DC input terminal**
   Refer to Figure 3.2 for details

10. **Grounding Bar (E)**
11. "RESET" switch (FOR SERVICE PERSONNEL ONLY)
   This switch resets errors resulting from alarm conditions.

12. "TEST" switch (FOR SERVICE PERSONNEL ONLY)
   This switch changes system operation to the test-mode.

13. "MAINTENANCE" switch (FOR SERVICE PERSONNEL ONLY)
   This switch sets the UPS menu parameters.

14. "BOOT" switch (FOR SERVICE PERSONNEL ONLY)
   This switch boots the processor on the main control circuit board following alarm conditions.

15. "52L S/W" switch (FOR SERVICE PERSONNEL ONLY)
   This switch prohibits turning on the AC output contactor “52C” during test/maintenance in Parallel Operation system application.

16. External contact signal terminal block
   Terminal block to connect contact signal input/output lines to and from external dry contacts.
   Refer to FIGURE 2.10 for details.
1.5 SPECIFICATIONS

The UPS nameplate displays the rated kVA as well as nominal voltages and currents. The nameplate is located on the backside of the UPS front left door.

**TABLE 1.3** Power Specifications

<table>
<thead>
<tr>
<th>Rated output Power</th>
<th>Input voltage 3 phase / 3 wire</th>
<th>Bypass input voltage 3 phase / 3 wire</th>
<th>Output voltage 3 phase / 3 wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>300kVA / 300kW</td>
<td>480V</td>
<td>480V</td>
<td>480V</td>
</tr>
<tr>
<td>500kVA / 500kW</td>
<td>480V</td>
<td>480V</td>
<td>480V</td>
</tr>
<tr>
<td>750kVA / 750kW</td>
<td>480V</td>
<td>480V</td>
<td>480V</td>
</tr>
</tbody>
</table>

**TABLE 1.4** UPS Module Information

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>BOTTOM / TOP / LEFT SIDE</td>
<td>55.1 / 1400</td>
<td>32.8 / 832</td>
<td>80.7 / 2050</td>
<td>2250 / 1020</td>
<td>41.5</td>
</tr>
<tr>
<td>500</td>
<td>BOTTOM / TOP / LEFT SIDE</td>
<td>72.0 / 1830</td>
<td>32.8 / 832</td>
<td>80.7 / 2050</td>
<td>3330 / 1510</td>
<td>67.4</td>
</tr>
<tr>
<td>750</td>
<td>BOTTOM / TOP / LEFT SIDE</td>
<td>90.6 / 2300</td>
<td>32.8 / 832</td>
<td>80.7 / 2050</td>
<td>4250 / 1930</td>
<td>98.3</td>
</tr>
</tbody>
</table>
### TABLE 1.5  Detail of Specifications

<table>
<thead>
<tr>
<th></th>
<th>300</th>
<th>500</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Output kVA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rated Output kW</strong></td>
<td>300</td>
<td>500</td>
<td>750</td>
</tr>
</tbody>
</table>

#### AC INPUT
- **Configuration**: 3 phase, 3 wire
- **Voltage**: 480 V  +15% to -20%
- **Frequency**: 60 Hz +/-10%
- **Reflected Current THD**: 3% max. at 100% load

#### STATIC BYPASS INPUT
- **Configuration**: 3 phase, 3 wire
- **Voltage**: 480 V  +/-10%
- **Frequency**: 60 Hz +/-5%

#### 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, 3 wire
- **Voltage**: 480 V
- **Voltage Stability**: +/-1%
- **Frequency**: 60 Hz
- **Frequency Stability**: +/-0.01% in free running mode
- **Power Factor**: Unity (nominal)
- **Power Factor Range**: 0.7 lagging to 0.8 leading
- **Voltage THD**: 2% maximum THD at 100% Linear Load
- **Transient Response**: +/-2% maximum at 100% load step
  +/-1% maximum at loss/return of AC power
  +/-5% maximum at load transfer to/from static bypass
- **Transient Recovery**: Less than 20ms
- **Voltage Unbalance**: 2% maximum at 100% unbalanced load
- **Phase Displacement**: 1deg. maximum at 100% load
- **Inverter Overload**: 125% for 10 minutes
  150% for 60 seconds
- **System Overload**: 100% for 1 cycle
  500% for 1 cycle

#### ENVIRONMENTAL
- **Cooling**: Forced Air
- **Operating Temperature**: 32 °F to 104 °F (0 °C to 40 °C).
  Recommended: 68 °F to 86 °F (20 °C to 30 °C)
- **Relative Humidity**: 5% ~ 95% Non Condensing
- **Altitude**: 0 to 7400 feet No Derating at 40 °C
- **Location**: Indoor (free from corrosive gases and dust)
- **Paint Color**: Munsell 5Y7/1 (Beige)
### TABLE 1.6 Rating of Contactors, Breaker and Fuses

<table>
<thead>
<tr>
<th>IDENTIFICATION</th>
<th>APPLICATION</th>
<th>OUTPUT CAPACITY OF EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>300kVA</td>
</tr>
<tr>
<td>Contactors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB1</td>
<td>AC input contactor</td>
<td>452A</td>
</tr>
<tr>
<td>CB3</td>
<td>STS contactor</td>
<td>260A</td>
</tr>
<tr>
<td>52C</td>
<td>Inverter output contactor</td>
<td>452A</td>
</tr>
<tr>
<td>52S</td>
<td>Bypass contactor</td>
<td>452A</td>
</tr>
<tr>
<td>88RC</td>
<td>Control circuit contactor</td>
<td>20A</td>
</tr>
<tr>
<td>Breakers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB2</td>
<td>Battery disconnect breaker (Recommended)</td>
<td>800A</td>
</tr>
<tr>
<td>User supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>User supply</td>
<td></td>
<td>500A</td>
</tr>
<tr>
<td>User supply</td>
<td></td>
<td>500A</td>
</tr>
<tr>
<td>FPR, FPS, FPT, FPU, FPV, FPW, FCR, FCS, FCT, FCU, FCV, FCW, FNR, FNS, FNT, FNU, FNV, FNW, FBPR, FBPS, FBPT, FBNR, FBNS, FBNT</td>
<td>DC fuse</td>
<td>450A / 690V</td>
</tr>
<tr>
<td>FUA, FUB, FUC</td>
<td>Control power fuse</td>
<td>30A / 600V</td>
</tr>
<tr>
<td>FBS1, FBS2, FBS3</td>
<td>Control power fuse</td>
<td>30A / 600V</td>
</tr>
<tr>
<td>FOA, FOB, FOC</td>
<td>Control power fuse</td>
<td>30A / 600V</td>
</tr>
<tr>
<td>(OPTION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSU, FSV, FSW</td>
<td>Bypass input fuse</td>
<td>250A / 690V</td>
</tr>
<tr>
<td>(OPTION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEA, FEB, FEC</td>
<td>Parallel control circuit fuse (optional)</td>
<td></td>
</tr>
</tbody>
</table>

* Rating would be changed.
2.0 OPERATOR CONTROLS AND INDICATORS

The 9900B Series operator controls and indicators are located as follows (Door exterior):

**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) touch 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.

The following will be displayed when the START/STOP key on the MAIN MENU is pressed (Jump into OPERATION MENU):

1) Startup/Shutdown Guidance (FIGURE 2.3)

The display indicates the Startup and Shutdown guidance 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.

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).
- **Stop**: When the bypass voltage is abnormal, the user cannot transfer from inverter to bypass line.
Follow Startup/Shutdown guidance accordingly.

**B) MEASUREMENT MENU (FIGURE 2.4)**

This screen shows details of measured values. Input and Output values are displayed. During Battery operation, Remaining battery power and Run time are also displayed.
C) OPERATION MENU  (FIGURE 2.5)

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).
D) LOG MENU (FIGURE 2.6)
   This LOG MENU displays two Touch icons in EVENT LOG and BATTERY LOG. Pressing the EVENT LOG icon, up to 50 condition/operation records will be displayed. Press ▲ or ■ button for page turning. Pressing the BATTERY LOG icon, Number of battery operations and Summed battery operation time are displayed.
2.3.2 INPUT POWER FAILURE (FIGURE 2.7)

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 2.7(a)** Main screen (Battery operation)

**FIGURE 2.7(b)** 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 2.8)

“MESSAGE” and “SILENCE ALARM” icons will appear on the main menu when UPS failure condition has occurred.

**FIGURE 2.8** Main screen (Fault indication)

The following will be displayed when the MESSAGE icon on the main menu is pressed.

1) MESSAGE (FIGURE 2.9)
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.

2) SILENCE ALARM

This icon will appear when a failure occurs. The audible alarm (announcing the failure) can be silenced by pressing this icon.
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 2.10 with a functional description of the input/output port presented. OUT1 to OUT8 are user programmable, but are factory default set being also shown in Figure 2.10. Adding same external I/F PCB “IOAU-09”, doubling signal outputs is applicable for OUT1 to OUT8.

**FIGURE 2.10(a)  **External Signal Terminal Block (NEC Class2)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SUMMARY ALARM</td>
</tr>
<tr>
<td>2</td>
<td>OUT1: LOAD ON BYPASS</td>
</tr>
<tr>
<td>3</td>
<td>OUT2: LOAD ON INVERTER</td>
</tr>
<tr>
<td>4</td>
<td>OUT3: BATTERY OPERATION</td>
</tr>
<tr>
<td>5</td>
<td>OUT4: CONVERTER OPERATION</td>
</tr>
<tr>
<td>6</td>
<td>OUT5: BATTERY LOW VOLTAGE</td>
</tr>
<tr>
<td>7</td>
<td>OUT6: OVERLOAD</td>
</tr>
<tr>
<td>8</td>
<td>OUT7: TOTAL ALARM</td>
</tr>
<tr>
<td>9</td>
<td>OUT8: SPARE</td>
</tr>
<tr>
<td>10</td>
<td>52C CLOSE</td>
</tr>
</tbody>
</table>

*1 Relay contactor (52C close): Normal Closed
FIGURE 2.10(b)  External Signal Terminal Block (NEC Class2)

TN1

1  CB2 UVT  Battery Breaker Panel
   2
   3  CB2 AX
   4
   5  52L AX  Load Circuit Switch
   6
   7  IN1: REMOTE INVERTER START
   8
   9  IN2: REMOTE INVERTER STOP
   10
   11  IN3: BATTERY TEMP. HIGH
   12
   13  IN4: POWER DEMAND
   14
   15  REMOTE EPO
   16
   17
   18
   19
   20

(User supplied dry contact)
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 2.11 illustrates a typical installation. The external relay can also be a lamp, LED, computer, etc.

**FIGURE 2.11 Control Wiring for External Contacts**

Details of output alarm contacts : TN2

Terminals 1 to 2 "Summary Alarm" contact
- Activated when a major fault has occurred with the system.

Terminals 3 to 4 "Load on Bypass" contact (OUT1)
- Activated when the power is supplied from the static bypass input.

Terminals 5 to 6 "Load on Inverter" contact (OUT2)
- Activated when the power is supplied by the inverter.

Terminals 7 to 8 "Battery Operation" contact (OUT3)
- Activated when the battery is operating following an AC power failure.

Terminals 9 to 10 "Converter Operation" contact (OUT4)
- Activated when the converter is operating.

Terminals 11 to 12 "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 13 to 14 "Overload" contact (OUT6)
- Activated when an overload has occurred to the system.

Terminals 15 to 16 "Total Alarm" contact (OUT7)
- Activated during major fault, minor fault and alarm events.

Terminals 17 to 18 "Spare" contact (OUT8)
Terminals 19 to 20 "52C Close" contact (OUT9)
Activated when the inverter output contactor 52C has closed.

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 2.12 for a typical wiring configuration. Although this figure applies to the remote start/stop terminals, the same wiring arrangement is used for emergency stop; power demand; and battery temperature high.

FIGURE 2.12 Remote "Start" Contact Connections
Details of input contacts for remote access: TN1

Terminals 7 to 8 **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 9 to 10 **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 11 to 12 **"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 13 to 14 **"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 15 to 16 **"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 input 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 2.13.

FIGURE 2.13  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

<table>
<thead>
<tr>
<th>Transportation</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport unit with forklift.</td>
<td>Using the pre-drilled four holes in the UPS channel base, anchor</td>
</tr>
<tr>
<td>Carry with overhead crane using</td>
<td>the unit using appropriate hardware. (Not provided)</td>
</tr>
<tr>
<td>provided screw-eyebolts.</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>UPS Capacity (kVA)</th>
<th>300</th>
<th>500</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (lb.)</td>
<td>2,250</td>
<td>3,330</td>
<td>4,250</td>
</tr>
</tbody>
</table>

B) Minimum clearance required for ventilation
   Right side .......... 25 mm (1 inch) (not required when sidecars are used)
   Left side .......... 25 mm (1 inch) (not required when sidecars are used)
   Back side .......... 0.0 mm (0 inch)
   Top side .......... 600 mm (24 inches) (for air flow)

C) Space requirement for routine maintenance
   Allow for the following space at the time of installation.
   Front .......... 1075 mm (43 inches)
   Sides .......... 0.0 mm (0 inch)
   Back side .......... 0.0 mm (0 inch)
   Top side .......... 500 mm (20 inches)
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>
<thead>
<tr>
<th>UPS Capacity (kVA)</th>
<th>DC Voltage Rating (V)</th>
<th>Maximum Fault Current Permitted (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>480</td>
<td>25,000</td>
</tr>
<tr>
<td>500</td>
<td>480</td>
<td>25,000</td>
</tr>
<tr>
<td>750</td>
<td>480</td>
<td>25,000</td>
</tr>
</tbody>
</table>

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 3.3.

2. Connect the internal control wire and power wire.
   (1) Control wire interconnections
       1. CB2 UVT to terminal TN1-1, 2 of external I/F PCB IOAU-09.
       2. CB2 ON Auxiliary to terminal TN1- 3, 4 of external I/F PCB IOAU-09.

   (2) Power wire (AC input, Bypass input, AC output) interconnections
       a.) From user’s distribution panel
           1. X1 (A-phase) to A bus bar in UPS
           2. X2 (B-phase) to B bus bar in UPS
           3. X3 (C-phase) to C bus bar in UPS
       b.) DC Input to UPS
           1. Positive cable to BP bus bar in UPS
           2. Negative cable to BN bus bar in UPS

   CAUTION: After the completion of the input power cables connection:
   With a phase rotation meter, check that the phase rotation of the AC Input power terminals A, B and C as well as the Bypass Input power terminals A40, B40 and C40 are correct. The proper phase rotation is clockwise
   A → B → C.
3. Connect the grounding conductor from the input service entrance to the UPS Ground Bar (E).

4. Two (2) sources feeding the UPS:
   (1) Connect the AC input power cables from the input service entrance to the AC input power terminals, identified as A, B, C in Figures 3.1 to 3.3. Input cables must be sized for an ampere rating larger than the maximum input drawn by the converter. (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 and C40 in Figures 3.1 to 3.2. 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 2.10 for functional description. 2mm², 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 AC 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 and C40 in Figures 3.1 to 3.3. 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 3.1 to 3.2, connect jumper bypass terminals A40, B40, C40 to AC input power terminals A, B, C as identified in Figures 3.1 to 3.2.

   (3) Connect the external signal terminal block as desired. Refer to section 2.4 and Figure 2.10 for functional description. 2mm², or less, shielded conductor is recommended.
6. Procedure for Cable Connections for Parallel Operation 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 operation systems as shown in the appropriate Figures 3.4 and 3.5.

(2) Connect the external control wire and power wire.
   a.) Control wire connections
       Parallel configuration wiring (Refer to Figure 3.5.)
       - 52L control signal from Critical Load Cabinet (CLC) to UPS-n IOAU-09 (TN1– 5 , 6).
       - Parallel control signal for TLIN, TLOUT, CIN,COUT as shown in Fig. 3.5.
   b.) Power wire connections
       From UPS AC Output Terminals to Critical Load Cabinet (CLC) (Refer to Figure 3.4 and 3.5.)
### TABLE 3.4 Recommended Cable Sizes

<table>
<thead>
<tr>
<th>kVA Capacity</th>
<th>Input Voltage</th>
<th>Output Voltage</th>
<th>Input Side</th>
<th>Output Side</th>
<th>Bypass Side</th>
<th>DC Input Side</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cable Size</td>
<td>Torque in. lbs</td>
<td>Cable Size</td>
<td>Torque in. lbs</td>
</tr>
<tr>
<td>300kVA</td>
<td>480V</td>
<td>480V</td>
<td>3 x 1/0</td>
<td>347 - 469 in. lbs</td>
<td>3 x 1/0</td>
<td>347 - 469 in. lbs</td>
</tr>
<tr>
<td>500kVA</td>
<td>480V</td>
<td>480V</td>
<td>3 x 250MCM or larger</td>
<td>347 - 469 in. lbs</td>
<td>3 x 250MCM or larger</td>
<td>3 x 250MCM or larger</td>
</tr>
<tr>
<td>750kVA</td>
<td>480V</td>
<td>480V</td>
<td>3 x 600MCM or larger</td>
<td>347 - 469 in. lbs</td>
<td>3 x 600MCM or larger</td>
<td>3 x 600MCM or larger</td>
</tr>
</tbody>
</table>

*1 – Use 75 degree C copper wire.
*2 - The cables must be selected to be equal or larger to the sizes listed in the table.
*3 - Voltage drop across power cables not to exceed 2% of nominal source voltage.
*4 - Allowable ampere-capacities based on copper conductors with 75 degree C. insulation at ambient temperature of 40 degree C.

### TABLE 3.5 Recommended Hardware

<table>
<thead>
<tr>
<th>UPS Capacity</th>
<th>Bolt size</th>
<th>Flat washer size</th>
<th>Split lockwasher size</th>
<th>Nut size</th>
</tr>
</thead>
<tbody>
<tr>
<td>300kVA</td>
<td>M12 x 40mm</td>
<td>M12</td>
<td>M12</td>
<td>M12</td>
</tr>
<tr>
<td>500kVA</td>
<td>M12 x 40mm</td>
<td>M12</td>
<td>M12</td>
<td>M12</td>
</tr>
<tr>
<td>750kVA</td>
<td>M12 x 40mm</td>
<td>M12</td>
<td>M12</td>
<td>M12</td>
</tr>
</tbody>
</table>
### TABLE 3.6 Crimp Type Compression Lug

<table>
<thead>
<tr>
<th>WIRE SIZE (CODE)</th>
<th>WIRE STRAND CLASS</th>
<th>RECOMMENDATION</th>
<th>CRIMP TOOL REQUIRED</th>
<th>BURNDY TYPE Y35 OR Y46</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>VENDOR</td>
<td>CAT. NO.</td>
<td>COLOR KEY</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>BURNDY</td>
<td>YA1C</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-1L</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA25-LB</td>
<td>---</td>
</tr>
<tr>
<td>1/0</td>
<td>B</td>
<td>BURNDY</td>
<td>YA25</td>
<td>PINK</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-1/OL</td>
<td>PINK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA25-LB</td>
<td>---</td>
</tr>
<tr>
<td>2/0</td>
<td>B</td>
<td>BURNDY</td>
<td>YA26</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-2/OL</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA27-LB</td>
<td>---</td>
</tr>
<tr>
<td>3/0</td>
<td>B</td>
<td>BURNDY</td>
<td>YA27</td>
<td>ORANGE</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRB-3/OL</td>
<td>ORANGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA28-LB</td>
<td>---</td>
</tr>
<tr>
<td>4/0</td>
<td>B</td>
<td>BURNDY</td>
<td>YA28</td>
<td>PURPLE</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRB-4/OL</td>
<td>PURPLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA29-LB</td>
<td>---</td>
</tr>
<tr>
<td>250 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA29</td>
<td>YELLOW</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-250L</td>
<td>YELLOW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA30-LB</td>
<td>---</td>
</tr>
<tr>
<td>300 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA30</td>
<td>WHITE</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-300L</td>
<td>WHITE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA32-LB</td>
<td>---</td>
</tr>
<tr>
<td>350 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA31</td>
<td>RED</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-350L</td>
<td>RED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA34-LB</td>
<td>---</td>
</tr>
<tr>
<td>400 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA32</td>
<td>BLUE</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-400L</td>
<td>BLUE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA36-LB</td>
<td>---</td>
</tr>
<tr>
<td>500 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA34</td>
<td>BROWN</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-500L</td>
<td>BROWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA38-LB</td>
<td>---</td>
</tr>
<tr>
<td>600 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA36</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-600L</td>
<td>GREEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BURNDY</td>
<td>YA39-LB</td>
<td>---</td>
</tr>
<tr>
<td>750 MCM</td>
<td>B</td>
<td>BURNDY</td>
<td>YA39</td>
<td>BLACK</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>ILSCO</td>
<td>CRA-750L</td>
<td>BLACK</td>
</tr>
</tbody>
</table>

**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
### Location of bus bars and terminal blocks (Bottom/Top/Left Side entry)

- **D=32.7” (831.6mm)**
- **90.6” (2300)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input</td>
<td>A, B, C</td>
</tr>
<tr>
<td>Bypass Input</td>
<td>A40, B40, C40</td>
</tr>
<tr>
<td>DC Input</td>
<td>BP, BN</td>
</tr>
<tr>
<td>AC Output</td>
<td>A50, B50, C50</td>
</tr>
<tr>
<td>Grounding Bar</td>
<td>(not shown)</td>
</tr>
</tbody>
</table>

### Detailed Power Terminals

For power terminals, use 1/2” (12mm) diameter bolts.

- **AC Input**: A, B, C
- **Bypass Input**: A40, B40, C40
- **DC Input**: BP, BN
- **AC Output**: A50, B50, C50
- **Grounding Bar**: E
**FIGURE 3.2(b)** Diagram of input/output bus bars and terminal blocks

<table>
<thead>
<tr>
<th>Location of bus bars and terminal blocks (Bottom/Top/Left Side entry)</th>
<th>Detailed Power Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>D=32.7” (831.6mm)</td>
<td>For power terminals, use 1/2” (12mm) diameter bolts.</td>
</tr>
</tbody>
</table>

**Diagram Notes:**
- AC Input A, B, C
- Bypass Input A40, B40, C40
- DC Input BP, BN
- AC Output A50, B50, C50
- Grounding Bar (not shown)

**UPS module (500kVA)**
FIGURE 3.2(c) Diagram of input/output bus bars and terminal blocks

<table>
<thead>
<tr>
<th>Location of bus bars and terminal blocks (Bottom/Top/Left Side entry)</th>
<th>Detailed Power Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Input A, B, C</td>
<td>For power terminals, use 1/2” (12mm) diameter bolts.</td>
</tr>
<tr>
<td>Bypass Input A40, B40, C40</td>
<td></td>
</tr>
<tr>
<td>DC Input BP, BN</td>
<td></td>
</tr>
<tr>
<td>AC Output A50, B50, C50</td>
<td></td>
</tr>
<tr>
<td>Grounding Bar (not shown)</td>
<td></td>
</tr>
</tbody>
</table>

**UPS module (300kVA)**
FIGURE 3.3  Diagram of Power Wire & Control Wire Interconnections between UPS and Battery
FIGURE 3.4  Diagram of power wire connections  (Parallel Operation system connection )

CRITICAL LOAD CABINET

Bypass input
Bypass
AC input
CB1
Converter /Charger
Inverter
UPS-1
CB2
Battery
AC output
52C

Bypass input
Bypass
AC input
UPS-2
CB1
Converter /Charger
Inverter
CB2
Battery
AC output
52C

Bypass input
Bypass
AC input
UPS-n *1
CB1
Converter /Charger
Inverter
CB2
Battery
AC output
52C

AC input
Charger

*1  n : Maximum = 8
FIGURE 3.5(a)  Diagram of Power Wire & Control Wire Connect (Parallel Operation system connection 2x to 4x)

- Use Ethernet STP/STP twisted pair cable for all communication cabling.
- The use of STP twisted pair cable may cause malfunction.
- Total cable length from UPS1 to UPS2 should be within 100m (300ft).

Legend:
- N: Neutral
- L: Line
- S: Switch
- C: Control
- A: AC Output
- D: DC Input
- N1: Neutral 1
- L1: Line 1
- S1: Switch 1
- C1: Control 1
- A1: AC Output 1
- D1: DC Input 1
- N2: Neutral 2
- L2: Line 2
- S2: Switch 2
- C2: Control 2
- A2: AC Output 2
- D2: DC Input 2
- N3: Neutral 3
- L3: Line 3
- S3: Switch 3
- C3: Control 3
- A3: AC Output 3
- D3: DC Input 3
- N4: Neutral 4
- L4: Line 4
- S4: Switch 4
- C4: Control 4
- A4: AC Output 4
- D4: DC Input 4

Notes:
- 1: Parallel operation
- 2: Return from the last UPS module to the first UPS module (continuous loop)
- 3: DP switch position
- 4: ON
- 5: OFF

Critical Load Center

- UPS1
- UPS2
- UPS3
- UPS4
FIGURE 3.5(b)  Diagram of Power Wire & Control Wire Connect (Parallel Operation system connection 5x to 8x)
3.4 OPERATING PROCEDURES

For Parallel Operation system, refer to section “D) MMS Start-up Procedure”.
(Parallel Operation system is herein after MMS [Multi Module System])

A) Start-up Procedure

CAUTION : Before the UPS startup, the internal Bypass line starts to supply the unconditioned bypass input power to the critical load if the External input (or Bypass) Circuit Breaker is closed. Be extremely careful with closing the External input (or Bypass) Circuit Breaker.

a) Verify that the External Bypass Input Circuit Breaker for each unit is closed (user supplied).

b) Verify that Battery Disconnect Circuit Breaker (CB2) is opened or in tripping position.

c) If a dual source is feeding the UPS, close the External AC Input Circuit Breaker manually (user supplied).

d) The LCD panel boots up automatically, and the screen will show that the Load is powered by bypass line.

e) On the LCD panel, select “OPERATION” tab, and then press the “STARTUP GUIDANCE” button to proceed UPS start-up. (Refer to Figure 2.3).

f) Follow the “STARTUP GUIDANCE” accordingly until the completion of the inverter startup.

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 ONLY" or “REMOTE & LOCAL” in the OPERATION MENU.
B) Shutdown Procedure

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

a.) On the LCD panel, select “OPERATION” tab, and then press the “SHUTDOWN GUIDANCE” icon to proceed UPS shutdown. (Refer to Figure 2.3)
b.) Follow the “SHUTDOWN GUIDANCE” accordingly. During the procedure, UPS will transfer the power feeding from the Inverter supply to the Bypass line supply.
c.) Both Converter and Inverter will remain energized until complete disconnection from all power sources.

**NOTE:** When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter stop operation is required (at the UPS), select "LOCAL ONLY" or "REMOTE & LOCAL" in the OPERATION MENU.

d.) If stopping both the Inverter and Converter is required, open the Battery Disconnect circuit breaker (CB2) manually in accordance with guidance.

**WARNING:** Verify the load is OFF if the next step is to be performed.

**NOTE:** Power to the critical load is supplied through the bypass line. Power to the critical load will be lost after execution of the next step. The load will drop.

e.) If a dual source is feeding the UPS, open the External AC Input Circuit Breaker (user supplied) manually.
f.) If turning off all power to the critical load is desired, open the External Bypass Input Circuit Breaker (user supplied) manually.

**CAUTION:** In bypass mode, all UPS power terminals are still live. Lethal voltages are present. De-energize all external sources of AC and DC power. Before removing the covers, wait 5 minutes after de-energizing. Check no-voltage before handling UPS. Be careful for the devices even when the UPS has been de-energized, still internal devices may be hot.
C) Bypass Operation Procedure

** Transfer from Inverter to Bypass

1. Check for “SYNC” on the LCD.
2. Press the "START/STOP" icon on the LCD.
3. Follow the “SHUTDOWN GUIDANCE” and Press the "STOP" icon on the LCD.

** Transfer from bypass to inverter.

UPS

1. Press the "START/STOP" icon on the LCD.
2. Follow the “STARTUP GUIDANCE” and Press the "START" icon on the LCD.

NOTE : When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start or stop operation is required (at the UPS), select “LOCAL ONLY” or “REMOTE & LOCAL” in the OPERATION MENU.

D) MMS Start-up Procedure

** External Circuit Check

1. Verify that Critical Load Cabinet (CLC) Circuit Breaker SMB is closed.
2. Verify that CLC System Output Circuit Breaker 52L is open.
3. Verify that CLC UPS Circuit Breakers 52L1, 52L2…and 52Ln are closed.

** Start-up from UPS-1 to UPS-n

1. Start-up each UPS in accordance with “A) Start-up Procedure”. Each UPS will start Inverter Operation in synchronization with the bypass input.

** Transfer from Maintenance Bypass to MMS Bypass Operation

1. Closed the CLC System Output Circuit Breaker 52L.
2. Open the CLC Circuit Breaker SMB.

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 ONLY" or “REMOTE & LOCAL” in the OPERATION MENU.
**Transfer from UPS MMS Bypass Operation To UPS MMS Inverter Operation**

1. Transfer MMS Bypass Operation to MMS Inverter Operation from Operation Menu on any UPS LCD as shown in Fig. 3.6.

![LCD Screen (MMS Operation)](image)

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

1. Transfer MMS Inverter Operation to MMS Bypass Operation from Operation Menu on any UPS LCD as shown in Fig. 3.6.
4.0 RESPONSE TO UPS FAILURE

- **UPS FAULT**
  - Depress “SILENCE ALARM” icon on Main Menu.
  - Refer to the list of fault codes in Section 6.0 for error description.
  - Take necessary action according to display guidance.
  - When faults happen, contact the Authorized Mitsubishi Electric Service Representatives or call Mitsubishi Electric 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 Electric 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
UPS components have a defined life expectancy (Fan, Capacitors, Filters, etc).
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.

NOTE: Any parts replacements (including modification) without authorized by Mitsubishi Electric could result in personal injuries, death or destruction of the UPS.
6.0 FAULT CODES

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

In the event of a fault occurring:

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.
<table>
<thead>
<tr>
<th>Code indication (Note 3)</th>
<th>Status message</th>
<th>Meaning</th>
<th>Guidance</th>
<th>Buzzer</th>
<th>External relay contact (Note 1)</th>
<th>Failure lamp (Note 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA801</td>
<td>AC INPUT VOLTAGE OUT OF RANGE</td>
<td>Input line voltage is out of the specific range.</td>
<td>CHECK INPUT POWER SOURCE</td>
<td>Intermittent sound</td>
<td>Alarm AC input abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA802</td>
<td>AC INPUT FREQUENCY OUT OF RANGE</td>
<td>Input line frequency is out of the specified range.</td>
<td>CHECK INPUT POWER SOURCE</td>
<td>Intermittent sound</td>
<td>Alarm AC input abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA803</td>
<td>AC INPUT PHASE ROTATION ERROR</td>
<td>Input line power conductors are not wired in a proper phase sequence.</td>
<td>CHECK INPUT POWER SOURCE</td>
<td>Intermittent sound</td>
<td>Alarm AC input abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA804</td>
<td>CONVERTER OPE. PROHIBITION</td>
<td>The converter interlock is active.</td>
<td>-</td>
<td>Intermittent sound</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>UA805</td>
<td>INVERTER OVERLOAD</td>
<td>The output load current has exceeded 105% of the rated current.</td>
<td>WARNING: DECREASE LOAD</td>
<td>Intermittent sound</td>
<td>Alarm Overload</td>
<td>-</td>
</tr>
<tr>
<td>UA806</td>
<td>INVERTER OVERLOAD</td>
<td>The output load current has exceeded 110% of the rated current.</td>
<td>WARNING: DECREASE LOAD</td>
<td>Intermittent sound</td>
<td>Alarm Overload</td>
<td>-</td>
</tr>
<tr>
<td>UA807</td>
<td>INVERTER OVERLOAD</td>
<td>The output load current has exceeded 125% of the rated current.</td>
<td>WARNING: DECREASE LOAD</td>
<td>Intermittent sound</td>
<td>Alarm Overload</td>
<td>-</td>
</tr>
<tr>
<td>UA808</td>
<td>INVERTER OVERLOAD</td>
<td>The output load current has exceeded 150% of the rated current.</td>
<td>WARNING: DECREASE LOAD</td>
<td>Intermittent sound</td>
<td>Alarm Overload</td>
<td>-</td>
</tr>
<tr>
<td>UA810</td>
<td>INVERTER OVERLOAD</td>
<td>Short time over-current has exceeded 150% of the rated current.</td>
<td>WARNING: DECREASE LOAD</td>
<td>Intermittent sound</td>
<td>Alarm Overload</td>
<td>-</td>
</tr>
<tr>
<td>UA812</td>
<td>BYPASS VOLTAGE OUT OF RANGE</td>
<td>Bypass line voltage is out of the specific range.</td>
<td>CHECK BYPASS INPUT</td>
<td>Intermittent sound</td>
<td>Alarm Bypass Input Abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA813</td>
<td>BYPASS PHASE ROTATION ERROR</td>
<td>Bypass line power conductors are not wired in a proper phase sequence.</td>
<td>CHECK BYPASS INPUT</td>
<td>Intermittent sound</td>
<td>Alarm Bypass Input Abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA814</td>
<td>BYPASS FREQUENCY OUT OF RANGE</td>
<td>Bypass line frequency is out of the specific range.</td>
<td>CHECK BYPASS INPUT</td>
<td>Intermittent sound</td>
<td>Alarm Bypass Input Abnormal</td>
<td>-</td>
</tr>
<tr>
<td>UA815</td>
<td>TRANSFER PROHIBITION</td>
<td>Transfer to bypass is not available due to bypass abnormality.</td>
<td>-</td>
<td>Intermittent sound</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>UA817</td>
<td>EMERGENCY STOP ACTIVATED</td>
<td>The emergency stop was activated by the EPO switch or an external contact.</td>
<td>-</td>
<td>-</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>UA821</td>
<td>TRANSFER PROHIBITION</td>
<td>The UPS cannot transfer to the bypass because the inverter output is not synchronized to the bypass.</td>
<td>-</td>
<td>-</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>Code indication (Note 3)</td>
<td>Status message</td>
<td>Meaning</td>
<td>Guidance</td>
<td>Buzzer</td>
<td>External relay contact (Note 1)</td>
<td>Failure lamp (Note 2)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
<td>---------</td>
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<td>-------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>UA822</td>
<td>TRANSFER PROHIBITION</td>
<td>The UPS cannot transfer to the bypass because of backup generator operation.</td>
<td>-</td>
<td>-</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>UA824</td>
<td>CB2 OPEN</td>
<td>The battery circuit breaker (CB2) is open.</td>
<td>TURN ON CB2</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA827</td>
<td>52C OPE. PROHIBITION</td>
<td>The interlock for the inverter output contactor (52C) is active.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA831</td>
<td>EMERGENCY BYPASS SWITCH ON</td>
<td>Emergency bypass switch has been turned on.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA833</td>
<td>52L OPEN</td>
<td>The load circuit breaker (52L) is turned off.</td>
<td>-</td>
<td>Major End-of-Discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA834</td>
<td>BATTERY DEPLETED/AC OUT STOPPED</td>
<td>The battery voltage has reached the depleted level.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UA835</td>
<td>TRANSFER PROHIBITION</td>
<td>The UPS could not transfer to the bypass because the bypass source has an abnormality.</td>
<td>-</td>
<td>-</td>
<td>Alarm</td>
<td>-</td>
</tr>
<tr>
<td>UA860</td>
<td>REMOTE BUTTON ABNORMAL</td>
<td>Remote start or stop signal is being received continuously for a considerable time.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA861</td>
<td>LOCAL BUTTON ABNORMAL</td>
<td>Local start or stop signal is being received continuously for a considerable time.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA870</td>
<td>BALANCER OVERLOAD</td>
<td>The UPS detected an neutral point voltage unbalance.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UA890</td>
<td>EXTERNAL ALARM</td>
<td>External Alarm relay turned on.</td>
<td>-</td>
<td>Intermittent sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UF001</td>
<td>INPUT CIRCUIT ABNORMAL</td>
<td>Detection of a large variation of the reference error signal.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF002</td>
<td>CONVERTER OVERCURRENT</td>
<td>Detection of converter overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF003</td>
<td>CONVERTER ABNORMAL</td>
<td>Pre-charging circuit is not working properly.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF011</td>
<td>CB1 ABNORMAL</td>
<td>Major discrepancy between reference signal and actual state of contactor CB1.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF052</td>
<td>CB1 ABNORMAL</td>
<td>Minor discrepancy between reference signal and actual state of contactor CB1.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF056</td>
<td>CONVERTER OVERCURRENT</td>
<td>Detection of converter overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF059</td>
<td>INPUT CIRCUIT ABNORMAL</td>
<td>Detection of a large variation of the reference error signal.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF102</td>
<td>DC OVERVOLTAGE</td>
<td>DC voltage surpasses the overvoltage level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>Code indication (Note 3)</td>
<td>Status message</td>
<td>Meaning</td>
<td>Guidance</td>
<td>Buzzer</td>
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<td>Failure lamp (Note 2)</td>
</tr>
<tr>
<td>-------------------------</td>
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<td>--------</td>
<td>-------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>UF103</td>
<td>DC UNDERVOLTAGE</td>
<td>DC voltage dropped below the undervoltage level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF108</td>
<td>CHOPPER OVERCURRENT</td>
<td>Detection of DC overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF109</td>
<td>DC UNBALANCED</td>
<td>Major unbalance of the neutral point voltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF110</td>
<td>ZERO PHASE OVERCURRENT</td>
<td>Detection of converter zero-sequence overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF111</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Battery current overbalance.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF112</td>
<td>DC CIRCUIT ABNORMAL</td>
<td>Sudden change of the DC voltage level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF119</td>
<td>DC GROUND FAULT</td>
<td>Detection of DC ground fault.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF128</td>
<td>CONTROL POWER SUPPLY ABNORMAL</td>
<td>Power supply voltage to IGBT driver PCB is below the specified level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF151</td>
<td>DC VOLTAGE ABNORMAL</td>
<td>24 hours after input power restoration, batteries does not reach float voltage level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF152</td>
<td>DC VOLTAGE ABNORMAL</td>
<td>Unable to equalize the voltage of various batteries after 24 hours.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF154</td>
<td>CB2 ABNORMAL</td>
<td>During UVT, status signal from CB2 is ON.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF156</td>
<td>CHG.STOPPED (BATTERY OVERTEMP.)</td>
<td>UF157 failure persisted for over 2 hours.</td>
<td>CHECK BATTERY</td>
<td>Intermittent sound</td>
<td>Minor Battery abnormal</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF157</td>
<td>BATTERY OVERTEMPERATURE</td>
<td>Detection of overtemperature at the batteries.</td>
<td>CHECK BATTERY</td>
<td>Intermittent sound</td>
<td>Minor Battery abnormal</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF158</td>
<td>BATTERY LIQUID LOW</td>
<td>Low level of battery electrolyte solution.</td>
<td>CHECK BATTERY</td>
<td>Intermittent sound</td>
<td>Minor Battery abnormal</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF159</td>
<td>DC GROUND FAULT</td>
<td>Detection of DC ground fault.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF160</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Abnormal behavior of DC current sensor.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF161</td>
<td>CHG.STOPPED (DC VOLT. ABNORMAL)</td>
<td>UF151 failure is running for over 24 hours.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF162</td>
<td>BATTERY ABNORMAL</td>
<td>Failure detection based on battery self-check.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>Code indication (Note 3)</td>
<td>Status message</td>
<td>Meaning</td>
<td>Guidance</td>
<td>Buzzer</td>
<td>External relay contact (Note 1)</td>
<td>Failure lamp (Note 2)</td>
</tr>
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</tr>
<tr>
<td>UF163</td>
<td>BATTERY VOLTAGE ABNORMAL</td>
<td>Battery voltage is abnormality.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF170</td>
<td>VDB SENSOR ABNORMAL</td>
<td>Detection of a large variation of the difference between control-only and protection-only battery voltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF171</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Battery current unbalance.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF201</td>
<td>INVERTER OVERVOLTAGE</td>
<td>Detection of output overvoltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF202</td>
<td>INVERTER UNDERVOLTAGE</td>
<td>Output voltage dropped.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF203</td>
<td>INVERTER OVERCURRENT</td>
<td>Detection of inverter overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF204</td>
<td>OUTPUT CIRCUIT ABNORMAL</td>
<td>Detection of a large variation of the reference error signal (current reference and actual current).</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF206</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Discrepancy between output voltage and external voltage (bypass, common ac bus)</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF207</td>
<td>ZERO PHASE OVERCURRENT</td>
<td>Inverter zero-sequence overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF208</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cross current is abnormality.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF209</td>
<td>52C ABNORMAL</td>
<td>Error to close the contactor 52C.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF210</td>
<td>52C ABNORMAL</td>
<td>Error to open the contactor 52C.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF211</td>
<td>52C ABNORMAL</td>
<td>No answer from contactor 52C during inverter operation.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF213</td>
<td>OVERTEMPERATURE</td>
<td>Heatsinks temperature exceeds thermal settings.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF214</td>
<td>COOLING FAN ABNORMAL</td>
<td>Thermal relay activated protection.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF217</td>
<td>INVERTER OVERVOLTAGE</td>
<td>Detection of inverter output phase overvoltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF230</td>
<td>ZERO PHASE OVERCURRENT</td>
<td>Detection of zero-sequence overcurrent.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>Code indication (Note 3)</td>
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</tr>
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</tr>
<tr>
<td>UF253</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Discrepancy between output voltage and inverter voltage, or between output voltage and bypass voltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF256</td>
<td>OUTPUT VOLTAGE ABNORMAL</td>
<td>Output voltage is out of the specified range.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF257</td>
<td>52C ABNORMAL</td>
<td>Contactor 52C failed to open during load transfer from inverter to bypass.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF258</td>
<td>LOAD ABNORMAL</td>
<td>Load transfer due to overload for over 4 times within 5 minutes.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF259</td>
<td>ANOTHER UPS ABNORMAL</td>
<td>No detection of another UPS voltage signal.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF301</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>AD reference has an abnormal value.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF302</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Detection of an external interruption during the software execution.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF303</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Timer does not reset in the specified period (WDT settings)</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF305</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Detection of an abnormal clock speed in the DSP or FPGA.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF306</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Control power supply voltage are below the specified level.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF309</td>
<td>INVERTER VOLTAGE ABNORMAL</td>
<td>Inverter voltage is out of the specified range.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF310</td>
<td>CONTROL POWER SUPPLY ABNORMAL</td>
<td>Backup control power supplies exhibit abnormal condition.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF320</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cable disconnection in the parallel interface board during load supply.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF323</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Major communication error during parallel operation.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF331</td>
<td>CONTROL POWER SUPPLY ABNORMAL</td>
<td>Cable disconnection in the main driver PCB (Phase A)</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF332</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cable disconnection in the main driver PCB (Phase B)</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF333</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cable disconnection in the main driver PCB (Phase C)</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF334</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cable disconnection in the main driver PCB (Chopper))</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>Code indication (Note 3)</td>
<td>Status message</td>
<td>Meaning</td>
<td>Guidance</td>
<td>Buzzer</td>
<td>External relay contact (Note 1)</td>
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</tr>
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</tr>
<tr>
<td>UF352</td>
<td>CONTROL POWER SUPPLY ABNORMAL</td>
<td>Backup control power supplies exhibit abnormal condition.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF363</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Synchronization status signal is being received for a considerable time.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF371</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Minor communication error during parallel operation.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF372</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Unable to synchronize the inverter output and the bypass voltage.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF374</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Cable disconnection in the parallel interface board.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF375</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Unable to achieve synchronization for parallel operation.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF376</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>No control response from another UPS although its detection is possible.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF377</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Overload detection signal is being received continuously for a considerable time.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF378</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>No answer for sending synchronizing signal.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF379</td>
<td>UPS CONTROL CIRCUIT ERROR</td>
<td>Abnormal clock speed of the parallel control board processor.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF401</td>
<td>52S ABNORMAL</td>
<td>Error to close the contactor 52S.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF402</td>
<td>52S ABNORMAL</td>
<td>Error to open the contactor 52S.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF420</td>
<td>52L OPERATION ERROR</td>
<td>Load circuit breaker 52L opened during inverter operation.</td>
<td>CHECK 52L</td>
<td>Continuous sound</td>
<td>Major</td>
<td>Lit on</td>
</tr>
<tr>
<td>UF451</td>
<td>52S ABNORMAL</td>
<td>Contact 52S failed during load transfer from inverter to bypass.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
<tr>
<td>UF452</td>
<td>CB3 ABNORMAL</td>
<td>Contact 52S is not working properly.</td>
<td>CALL SERVICE ENGINEER</td>
<td>Intermittent sound</td>
<td>Minor</td>
<td>Flicker</td>
</tr>
</tbody>
</table>

(Note 1) 1) "Major" is defined as a major failure. Load transferred from the inverter circuit 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 2) Indicates one of two possible LED illumination patterns - continuously on (lit on) or intermittent (flicker).
(Note 3) 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%+50 - 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 placed 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.
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.

<table>
<thead>
<tr>
<th>CUSTOMER INFORMATION</th>
<th>Job Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Name:</td>
<td></td>
</tr>
<tr>
<td>Company Name:</td>
<td></td>
</tr>
<tr>
<td>Division / Department:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
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<tr>
<td>City:</td>
<td>State:</td>
</tr>
<tr>
<td>Country:</td>
<td>Province:</td>
</tr>
<tr>
<td>Business Phone:</td>
<td>Ext:</td>
</tr>
<tr>
<td>E-Mail:</td>
<td>Internet Address:</td>
</tr>
<tr>
<td>UPS Model #:</td>
<td>Capacity (kVA):</td>
</tr>
<tr>
<td>Authorized Mitsubishi Service Company (if known):</td>
<td></td>
</tr>
<tr>
<td>Start-Up Date:</td>
<td>Date:</td>
</tr>
<tr>
<td>Signature:</td>
<td></td>
</tr>
</tbody>
</table>

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

- Energy Producer
  - Utility
  - Alternate Energy

- Manufacturing Co.
  - OEM
  - Process
  - Consumer Goods
  - Electronics
  - Power Quality

- Equipment
  - Commercial Business
  - Electrical Contractor
  - Healthcare
  - Internet

- Education/Univ. Service
  - Consulting
  - Engineering
  - Outsourcing

- Government
  - Military
  - Municipal
  - Federal/State/Local

- Communications
  - Distributors/Reps
  - Other

Number of Employees at This Location is:

- 1 – 19
- 20 – 49
- 50 – 99
- 100 – 249
- 250 – 499
- 500 – 999
- 1000 or more

Overall how was Start-Up performed:

- Unsatisfactory
- Satisfactory
- Exceeded Expectations

Would you like to receive future product updates and news?

- Yes
- No

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