
2.2.4.2 Output Regulation and Overload Performance

The inverter is capable of sustaining full output voltage ($\pm 1\%$ of the nominal voltage) for up to 150% overload at the output for as long as 60 seconds without reducing the output voltage. It can also handle at least 125% of the rated current for up to 10 minutes. If an overload exceeds the system capacity and a bypass source is available, the critical load is transferred to the bypass source and the inverter is disconnected from the load.

2.2.4.3 Nonlinear Load Characteristics

Computers and computer equipment with switching power supplies generate nonlinear currents rich in fifth and seventh harmonics.

The inverter pulse-width-modulated waveform, coupled with the output filter, provides a natural path for reducing the fifth and seventh harmonic currents produced by the load. The inverter/filter limits the output voltage THD to less than 3% with up to 100% typical electronic data processing (EDP) loads. EDP equipment characteristically includes both nonlinear and linear load components.

2.2.4.4 Unbalanced Load Characteristics

Unbalanced loads are actively regulated. The phase-to-phase voltage balance is maintained to within 2%, even with a 50% load imbalance.

2.2.5 Static Bypass Switch

A static bypass switch is an integral part of the UPS. An automatic transfer control circuit senses the status of the operator controls, UPS logic signals and alarm messages, and critical bus operating conditions. If the inverter output can no longer supply the critical load, the static bypass switch automatically transfers the critical load to the bypass source without interruption.

2.2.5.1 Static Switch Backfeed Protection

The static bypass system is equipped with redundant disconnect circuits that prevent backfeed of lethal voltage to the bypass input in the event of a shorted static switch SCR. If a shorted SCR is detected, the static bypass switch is isolated and an alarm is annunciated at the UPS control panel, while the critical load remains on UPS output power.

2.2.5.2 Pulsed Parallel Operation

When an overload condition such as magnetic inrush current or a branch load circuit fault exceeds 200% of the full-load current rating, the static bypass switch pulses on for 10 cycles. This allows up to 6000 amperes from the bypass line to clear the overload without a complete transfer to bypass (a Dual-Lite design exclusive). The bypass source is in parallel with the UPS system, permitting the bypass source to carry the initial overload current. If the overload clears before 10 cycles, a load transfer to bypass is not made. If the overload condition continues to exceed the inverter capacity, the automatic transfer is made (maintaining the load voltage within the specified limits).

2.2.5.3 Load Transfers

Transfers to (transfer) or from (retransfer) the bypass may be performed automatically or manually in a make-before-break (MBB) sequence.

Manual load transfers and retransfers are initiated by the Operator from the UPS Control Panel.

Automatic transfers are initiated by the UPS system control logic when an overload is beyond the specified capabilities of the UPS inverter or when a fault occurs within the UPS module. An automatic retransfer is initiated if this function is enabled and if system conditions for a retransfer are present.

2.2.5.4 Transfer and Retransfer Conditions

1. Automatic Transfers to Bypass:

Critical bus conditions that will initiate an automatic transfer of the critical load from the UPS inverter output to the bypass source are:

- a. Output Overload: overcurrent condition in excess of the current-versus-time overload capacity curve.
- b. Over/Under Voltage (OV/UV): critical bus voltage is outside the allowable tolerance.
- c. Inverter Inoperative: inverter diagnostic circuitry senses an imminent inverter output OV/UV condition.
- d. Battery discharged to the shutdown voltage.
- e. Inverter or rectifier fault condition (power, logic, or over-temperature) present or imminent.
- f. Failure of system logic or logic power.

2. Manual Transfers:

Manual transfers may be initiated at any time provided no transfer inhibition conditions are present.

3. Transfer Inhibited:

A manual transfer to the bypass source will be inhibited if any of the following conditions exist:

- a. Bypass frequency deviates ± 0.5 Hz from the nominal.
- b. UPS system to bypass voltage difference (DV) exceeds a predetermined percentage (normally 10%).
- c. OK to Transfer signal from the control logic is not present.

4. Automatic Retransfers to UPS:

Critical bus conditions that must be present to initiate an automatic retransfer (Auto-Rexfer) of the critical load from the bypass source to the UPS system are:

- a. The number of Auto-Rexfer Attempts selected must be greater than zero (0). If zero (0) is selected, no automatic retransfer will occur.
- b. Critical load was initially transferred to the bypass source due to a system overload only.
- c. Overload has since been eliminated (the load has dropped below 100% of the rated load).
- d. Both the Input contactor and Battery (MBD) circuit breakers have remained closed since the overload transfer.
- e. OK to Transfer signal received from the control logic for at least 10 seconds, within 5 minutes of the overload transfer. (A manually initiated retransfer from bypass is required for overloads lasting 5 minutes or more.)
- f. Cyclic-type system overloads, which occur up to five (select range is 0 to 5) times in 60 minutes, are automatically returned to the UPS system for each event including the Nth overload. A manually initiated retransfer from bypass is required for the N+1 overload.

5. Manual Retransfers:

Manual retransfers may be initiated at any time provided no retransfer inhibition conditions are present.

6. Retransfer Inhibited:

A retransfer (automatic or manual) from the bypass source to the UPS system shall be inhibited if any of the following conditions exist:

- a. Retransfer Inhibitions:
 1. Bypass frequency exceeds ± 0.5 Hz of the nominal.
 2. UPS system-to-bypass voltage difference (DV) exceeds a predetermined percentage (normally 10%).
 3. OK-to-Transfer signal from the control logic is not present.
 4. Inverter or rectifier fault.
- b. Automatic Retransfer Inhibitions (in addition to those above):
 1. The load transfer to bypass was not caused by an output overload.
 2. Excessive cyclical overloads within a one-hour period.
 3. Retransfer conditions are not satisfied within 5 minutes of the initial transfer.

3.0 OPERATION

3.1 Operator Controls

The TRN operator controls and indicators are located on the UPS Module Cabinet door and inside the cabinet. See **Figure 2 - 80 kVA UPS Outside and Inside views**. The Operator Control Panel is located in the upper lefthand corner of the door, enabling the Operator to quickly identify the current status of the UPS system and to perform most of the manual operations. The operator display screen is driven by an easy-to-follow menu-prompted software program. The internal control system executes programs which generate messages on this display screen. Screen messages instruct the Operator during start up, operation, and shutdown. The screen also displays status information upon request. Operating the UPS consists of watching the indicators on the operator control panel and making appropriate responses. Further UPS monitoring and testing is achieved by navigating through a series of menu selections on the display screen.

Figure 2 80 kVA UPS Outside and Inside views

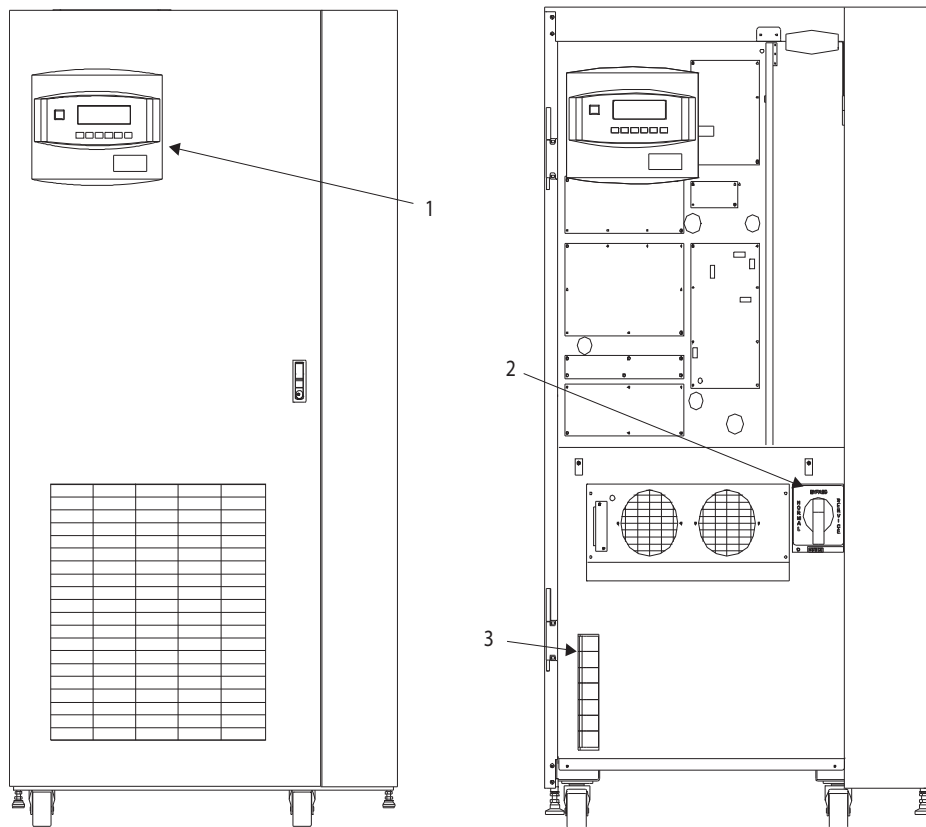


Table 1 Key Locations on UPS

Item	Description	Function
1	Operator Control Panel	Contains Display screen, Navigation buttons, and Emergency Power OFF button.
2	Rotary Switch	Provides manual selection of Normal, Bypass, and Service modes.
3	Fuse Blocks	Contain fuses for UPS control power.

Figure 3 Operator Control Panel

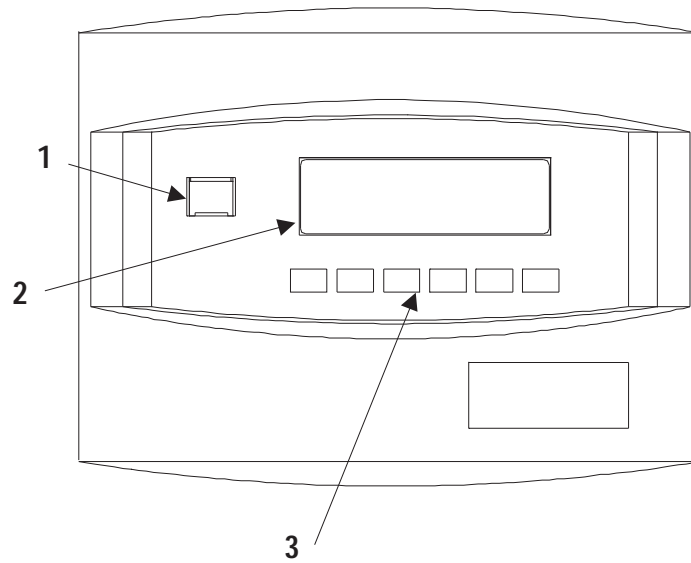


Table 2 Key Locations on Operator Control Panel

Item	Description	Function
1	Emergency Power Off Button	Turns power off in an emergency situation.
2	Display Screen	Enables Operator to monitor power flow and meter readings, receive reports, and execute operational procedures.
3	Navigation Buttons	Enables Operator to access menu screens and make selections.

3.1.1 Operator Control Panel

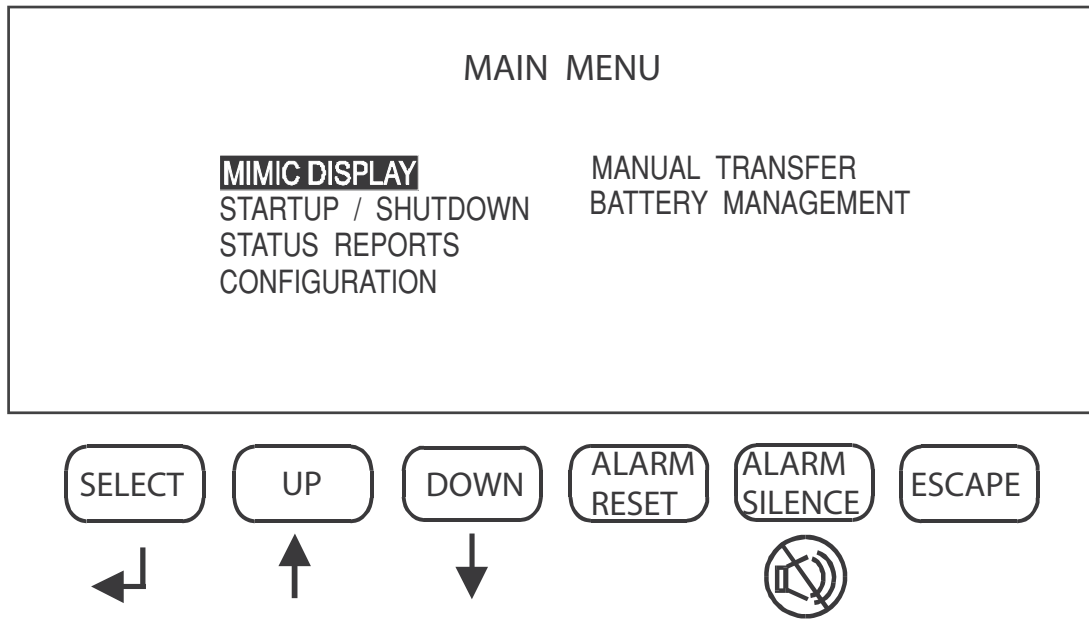
The Operator Control Panel enables the operator to perform the following tasks:

- Obtain a quick indication of operational status:
 - Is the critical bus OK?
 - Is the UPS system OK?
 - Is the battery available?
 - Is the bypass line available?
- Monitor the power flow through the UPS system and monitor all meter readings:
 - Is the critical load being supplied power from the UPS system or bypass?
 - Are input, battery, and output voltage, frequency, and current readings at nominal levels?
 - How much battery time is still available during an outage?
 - Is the battery recharging after discharge?
- Execute operational procedures:
 - Perform critical bus transfer/retransfer between the UPS and the bypass line.
 - Start-up and shutdown the UPS.
 - Shutdown the system instantly in the event of an emergency.
- Access status reports and history files:
 - Obtain a complete listing of the present status of the UPS including input, output, and battery voltage, frequency, and current readings, and any alarms that may be present.
 - Review a complete history report of all events leading up to and immediately after a fault condition.
 - Examine an archive listing of all alarm conditions that have occurred over a period of time.
- Make adjustments to programmable parameters (access limited by Security Access function):
 - Set the date and the time functions.
 - Change the auto-dial phone number and the modem options.
 - Select the number of auto-retransfer attempts.
- Make adjustments to the UPS output voltage before performing a manual load transfer.

3.1.2 Navigation Buttons

The Navigation Buttons are located below the Display Screen.

Figure 4 Navigation Buttons



The SELECT button is used to select a particular item from the options on the screen. When you press this button, the screen that is selected will be immediately displayed.

The UP and DOWN buttons are used to move the cursor around the screen in order to highlight appropriate selections.

The ALARM SILENCE button silences the audible alarm and discontinues the flashing of the alarm messages.

The ALARM RESET button clears a latching alarm after the alarm condition is corrected.

The ESCAPE button is used to exit the screen and return to the Mimic Display.

3.1.3 Rotary Switch

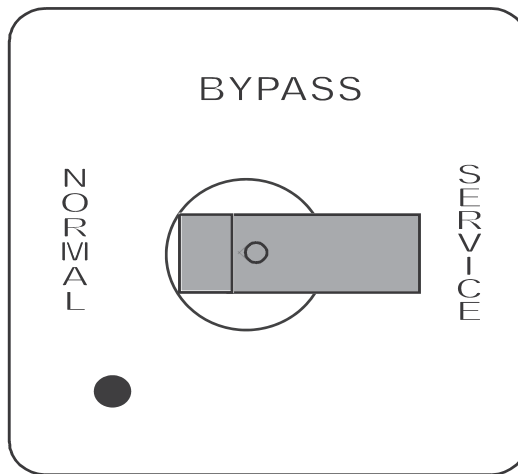
The Rotary Switch is located on the lower right side of the panel inside the cabinet. This switch provides single-point control of the UPS.



NOTE

Improper positioning of the rotary switch can result in unwanted actions. Therefore it is important to read the complete instructions before using this switch, and to follow Operator prompts on the display screen.

Figure 5 Rotary Switch



The Rotary Switch has 3 positions:

- **NORMAL:** The Normal switch position is used under most operational conditions.
- **BYPASS:** The Bypass switch position directs the power flow through the Internal Bypass Circuit. The UPS module may be either on or off. If the UPS module is on and the batteries require charging, charging will take place.
- **SERVICE:** The Service switch position directs the load to the Internal Bypass Circuit so the UPS can be serviced.



NOTE

For purposes of this manual, assume that the rotary switch will always be in the NORMAL position.



NOTE

If the position of the rotary switch must be changed, as in servicing, it is imperative that the Operator observe the light in the corner of the Rotary Switch panel before making any change. The switch position may be changed only if the light is green. Never move the switch if the light is red. Instead, call the Dual-Lite System Services technician.



NOTE

The LED light is positioned in the lower left-hand corner.

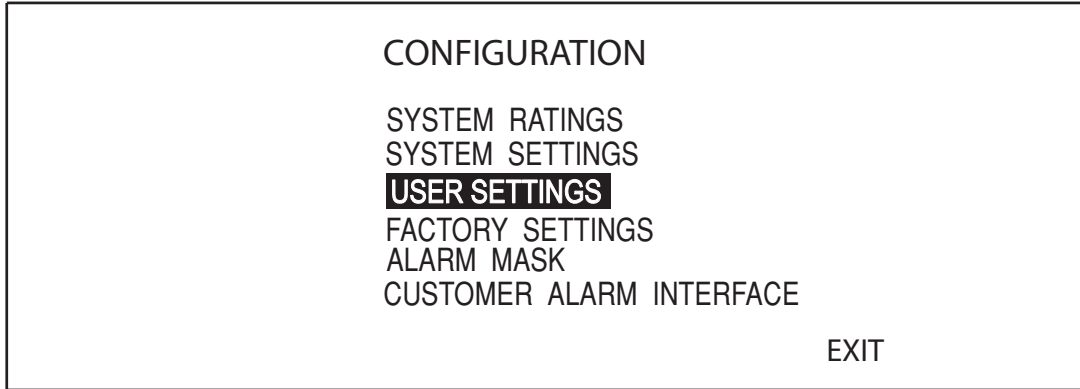
3.2 Security Access and Passwords

Password protection is provided in the TRN UPS system to protect you from any unauthorized configuration of the system. A default password is installed on your system when you receive it. The

default password is NPWR. It is important, however, that you enter your own secure password as soon as possible. The following procedure will enable you to do this.

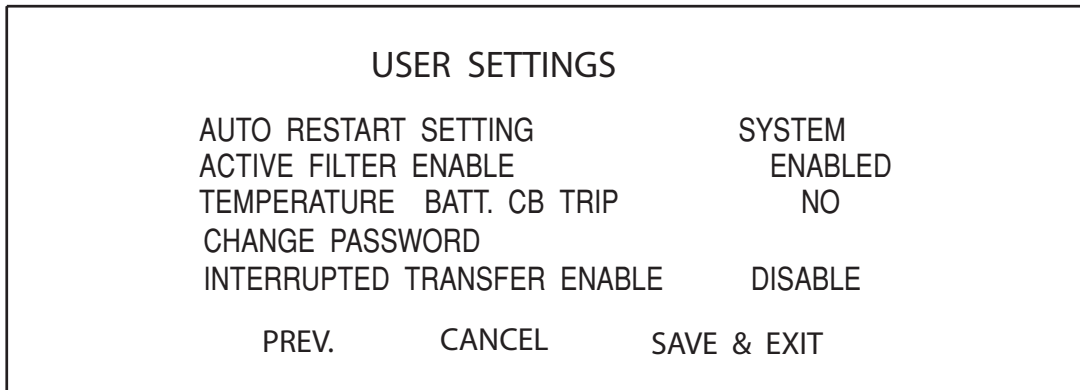
1. From the MAIN MENU on the Display Screen, navigate to the primary CONFIGURATION Screen. It will look like the figure below.

Figure 6 Configuration Screen



2. Highlight USER SETTINGS using arrow keys, and press SELECT.
3. The USER SETTINGS screen will come up.
4. Bracket NEXT using arrow keys and press SELECT five times. This will take you to the sixth page of the USER SETTINGS screen.

Figure 7 User Settings Screen, page 6



Highlight CHANGE PASSWORD. This action will bring up the PASSWORD screen. You must know the current password in order to change it. Next, you will be prompted to enter a new 4-digit password. The new password may contain letters from A through Z and/or digits from 1 through 9.

5. You now have 5 minutes to examine and configure password-protected screens.
6. After five minutes you must re-enter the password in order to unlock further password-protected screens.



NOTE

The TIME and DATE of all password changes are logged in the event log.

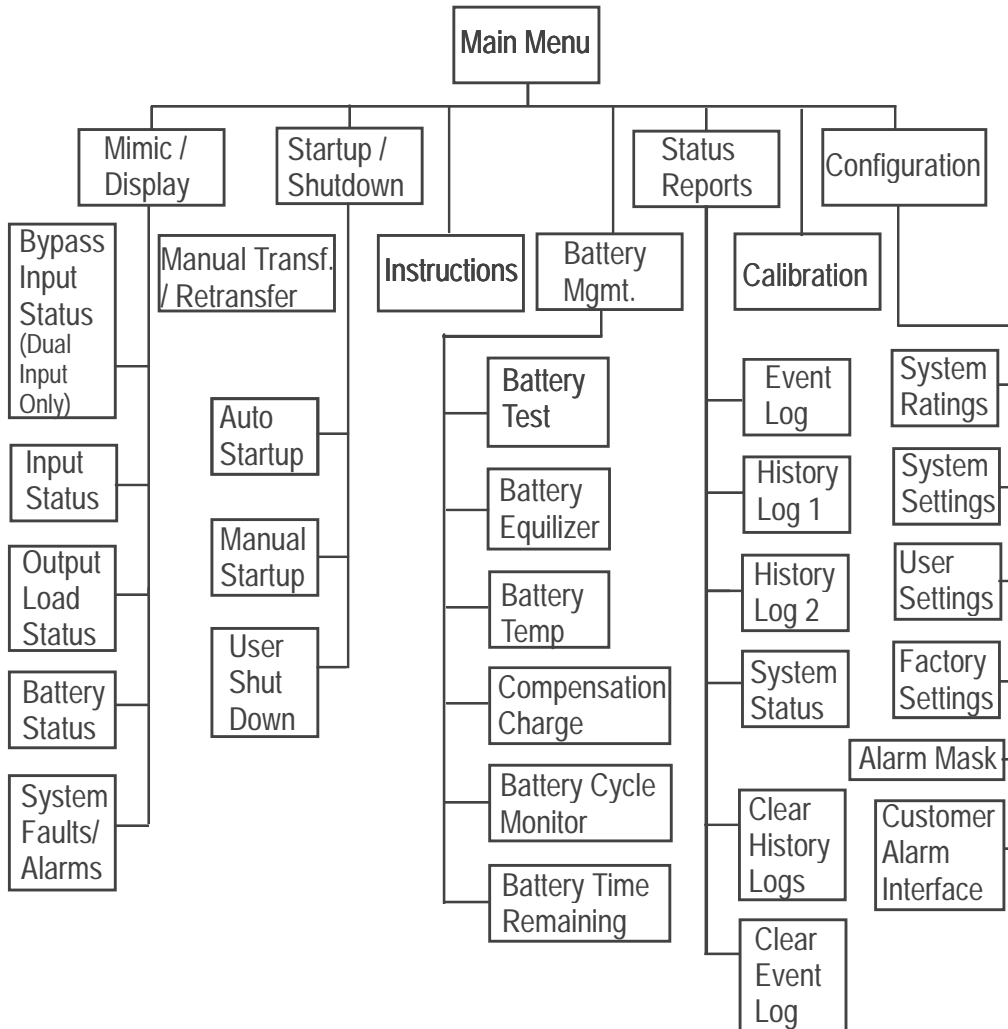
3.3 Display Screens and Procedures

The Operator Interface Display System of the TRN allows quick access to any screen the operator chooses. The default screen is the Mimic Display Screen.

MENU TREE

The figure below shows the primary screens that you can access through the Operator Interface Display System.

Figure 8 Menu Tree



NOTE

Any screens where changes in configuration, settings, or data can be made (including all the Configuration screens) are password-protected.

PRIMARY SCREENS

The Main Menu has eight primary screens. Please note that some screens have multiple pages because not all the information can fit on one page. To access the next page, highlight NEXT and press SELECT. To access the previous page, highlight PREV and press SELECT.

- **Mimic Display.** This graphic portrays the power flow through the UPS. Switch indications, system status, and alarm messages are all displayed on this screen. Detail screens can display input voltage and current readings, battery status, and load characteristics and alarm info.
- **Status Reports.** This display consists of three sub-menu selections: present status, history log and event log. These screens display data on the system's present and past performance. They

also display information about any faults that have occurred in the system. Total operating hours are displayed here.

- **Configuration.** This screen displays the current configuration of the UPS system. It also enables the operator to reset the date, time, dial-out phone numbers and System Options. System Options include Temperature-Compensated Charging, Customer Alarm Definitions and Battery Load Test. The operator can view, but can not change, any of the settings unless the password is entered. See Section **3.2** for more information on Security Access and Passwords.
- **Manual Transfer.** This screen specifies all of the steps required to manually transfer the critical load between the UPS and the bypass source. Comparisons of the voltage, frequency, and phase synchronization of the UPS output and the bypass line are also illustrated to aid in the transfer or retransfer procedure.
- **Startup and Shutdown Procedures.** These screens list step-by-step procedures to start up UPS or to shut it down for maintenance or repairs. Screens include the following: Auto Startup, Manual Startup, and two types of Operator Shutdown procedures.
- **Battery Management.** These screens display information on battery self tests, battery equalization, and battery compensated charging. This enables the operator to immediately see the effects of load shedding on time remaining and to accurately assess his power resources. The battery equalize screen lets the operator change the battery equalize recharging mode from manual to automatic, and to observe or change the equalize time. Battery equalize charge voltage is higher than battery float (constant) charge voltage.



NOTE

The manufacturers of the valve-regulated batteries supplied with Dual-Lite's standard battery cabinets recommend that when first installed the batteries be equalize charged. After that initial equalize charge, they recommend no further equalize charging for their batteries. Other manufacturers may have different recommendations for their products. Consult the battery manufacturer's manual for specific information about equalize charging.

SECONDARY SCREENS

The secondary screens show detailed information relating to the primary screens. These screens are illustrated below under each primary screen. Like the primary screens, the secondary screens may also consist of multiple pages. To get to the next page, highlight and Select the word NEXT. To return to the previous screen, highlight and Select the word PREV.

STATUS INFORMATION

Module status information is available on the display screen when the Control Power is ON, even when the UPS module is not operating. The same system status information is also available at local and remote terminals. See Section **3.3.4** for information on status reports and Section **3.5** for information on Operator communication interfaces.

If a module display screen is blank, either power is not available, the Rectifier Input (RIB) circuit breaker (external to the UPS module) is open, or the Control Power is OFF. If power is available and a display is blank, contact Dual-Lite System Services at 800-848-6439.

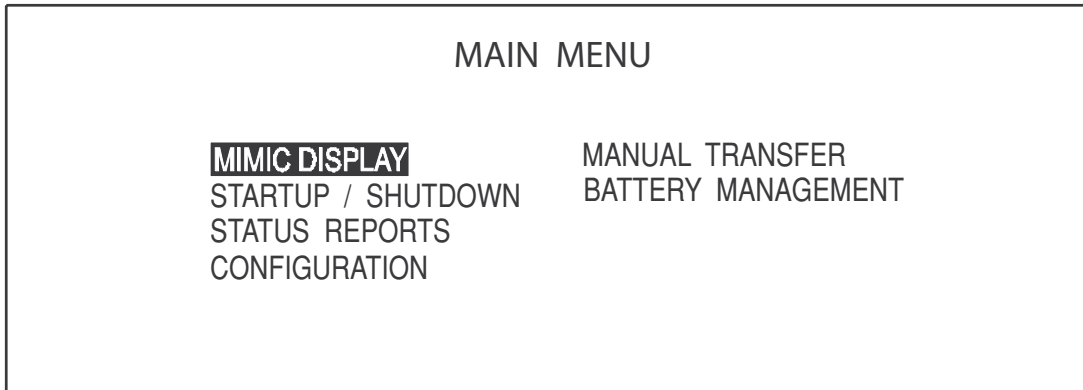
MAIN MENU SCREEN

The Main Menu contains the primary menu selections that monitor and control the operation of the UPS. To access one of these screens, use the NAVIGATIONAL BUTTONS beneath the screen.

First, press the UP or DOWN button until the desired screen is highlighted. Then press the SELECT button.

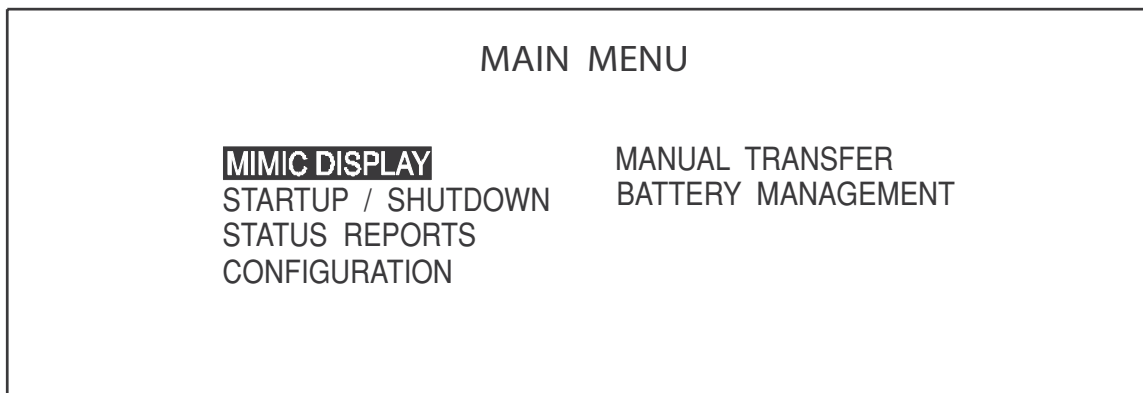
From any screen, pushing the Escape button once will return you to the Mimic Screen.

Figure 9 Main Menu Screen



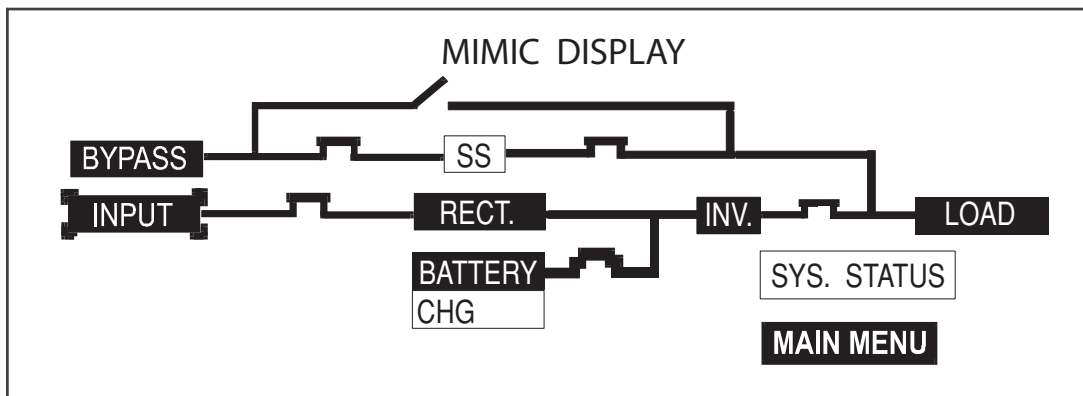
3.3.1 Mimic Display Screen

From Main Menu move the highlighted cursor to MIMIC DISPLAY and press the Select button. This brings up the Mimic Display Screen.



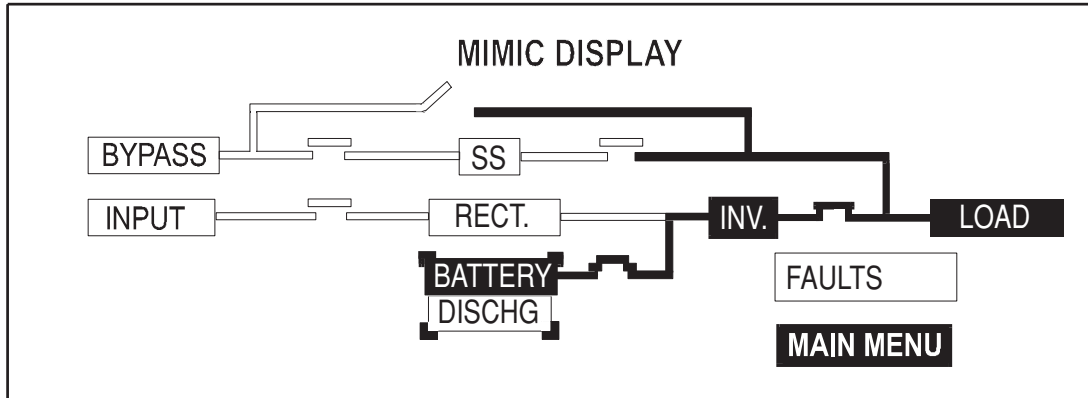
The Mimic Display screen is the default screen on the Operator Display. It is a simplified block diagram showing an overall view of the power flow through the UPS system. Solid lines indicate power flow; white lines with thin black edges indicate that power is not flowing in that area. The following examples illustrate power flow under different conditions.

Figure 10 Monitor / Mimic Display Screen Example: Normal Power Flow



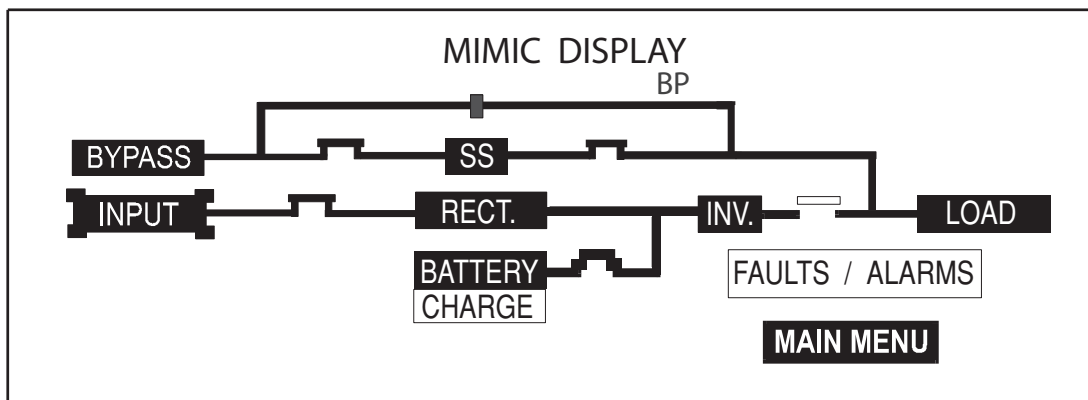
In this example, power is available from the normal and bypass sources, as well as from the battery. Notice that the switching devices are all closed except for the bypass switch at the top. The load is operating on conditioned power from the inverter. The battery is being charged by the rectifier. The static switch is operative and ready to respond to momentary demands for overload current.

Figure 11 Mimic Display Screen Example: Utility Fail



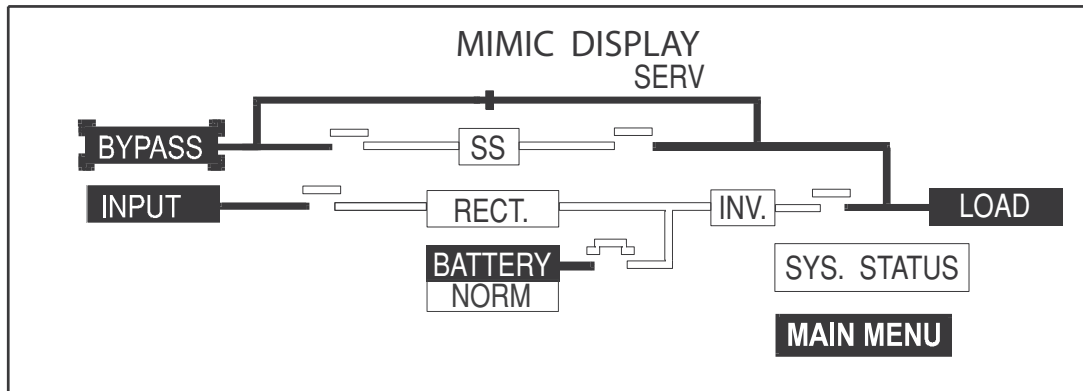
In this example, we see that a utility failure has shut down both the normal and bypass power sources. The battery is connected and supplying power to the load.

Figure 12 Mimic Display Screen Example: Load on Bypass, UPS Module On and Charging Battery



In this example, the load is receiving power through the bypass switch. Notice that the input power source is available and the battery is being charged.

Figure 13 Monitor / Mimic Display Screen Example: Load on Bypass, UPS Module Off, Service Mode

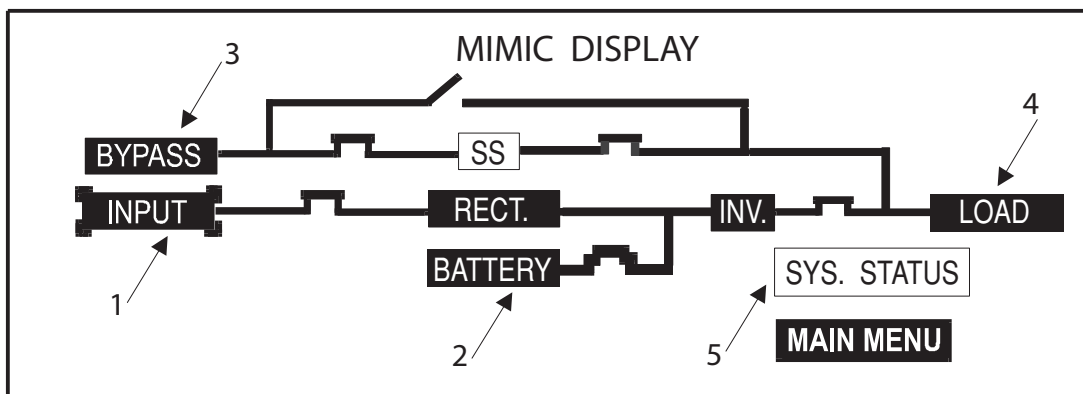


In this example, the power is coming from the bypass source through the bypass switch to the load. The UPS module is off, as shown by the open rectifier and inverter switches. Notice also that the battery circuit breaker is open.

THE MIMIC DISPLAY SCREEN

The illustration below shows the five major sections of the Mimic Display Screen. The numbers in the illustration correspond with the explanation below for each numbered block

Figure 14 Mimic Display Screen Detail



3.3.1.1 Detailed Information Reports

Detailed information reports are available through the following numbered blocks

1. INPUT STATUS. To access this screen, start with the Mimic Display Screen. Using the arrow keys, bracket INPUT and press SELECT. The screen displays the UPS input voltage and current as well as additional information. Press SELECT to return to the Mimic Display Screen.



NOTE

On the Mimic Display Screen, items are bracketed instead of highlighted so as not to confuse highlighting with power pathways.

Figure 15 Input Status Screen

INPUT STATUS						
		A	B	C	FREQ.	60.0 HZ
V	L - L	209	209	210	TEMPS (DEG C)	
I		37	37	35	INLET AIR	24
					OUTLET AIR	27
					HEAT SINKS	
					1:025	2:020 3:020



NOTE

All voltage readings are phase-to-phase measurements (A-B, B-C, and C-A). All current readings are phase measurements (A, B, and C). The metered parameter values on the following screens are updated at one-second intervals

The Input Status screen displays the following real-time data:

- Input AC Volts AB, BC, CA
- Input Current A, B, C
- Input Frequency
- Inlet Air Temperature
- Outlet Air Temperature
- Heat Sink Temperature (100 and 130 kVA will display 3 temperatures, 1 for each heatsink)

2. DC BUS / BATTERY. By highlighting and selecting BATTERY from the Mimic Display Screen, the following screen comes up, displaying DC bus voltage and the charge or discharge current. This screen also shows BATTERY TEMPERATURE. Press SELECT to return to the Mimic Display Screen.

Figure 16 DC Bus / Battery Status

DC BUS / BATTERY STATUS	
NUMBER OF BATT. ONLINE	1
DC BUS VOLT	540
BATT VOLT	472
BATT CURR	4.1 (CHG)
BATT TEMP	25 °C
LAST BATTERY TEST : 07/07/02	

The DC BUS/BATTERY status screen displays the following real-time data:

- DC Bus Volts
- Battery Volts
- Battery Current (Chg/disch)
- Battery Temperature (This reading is the temperature of the ambient air in the battery cabinet.)
- Battery Time Remaining

3. BYPASS INPUT. Selecting BYPASS from the Monitor Mimic Display displays the following screen showing bypass input voltage and the bypass input frequency. Press SELECT to return to the Monitor Mimic Display.

Figure 17 Bypass Input Status

BYPASS INPUT STATUS						
	A	B	C	FREQ.	59.9	HZ
V	L - L	213	213	214	PHASE DIFF	0

The Bypass Input Block displays the following real-time data:

- Bypass AC Volts AB, BC, CA
- Bypass Frequency
- Bypass Phase Difference

4. OUTPUT / LOAD. Select LOAD from the Monitor Mimic Display screen to bring up this block. It displays total output power to the critical load in kVA and kW. The critical load current per phase

is also displayed in this block. Note that kW is not displayed when the load is on the bypass line. During an overload condition, the time remaining before transfer is displayed at the bottom of the load box. Press SELECT to return to the Mimic Display Screen.

Figure 18 Output Load Status Screen

OUTPUT LOAD STATUS						
		A	B	C		
V	L-L	205	203	207	FREQ.	59.9 HZ
V	L-N	120	117	118	<u>% OF RATED LOAD:</u>	
I		5	5	162	KVA	42%
KVA		1	1	19	KW	42%
KW		1	1	15	<u>OVLD COND (SEC.)</u>	

The Output/Load status screen displays the following real-time data:

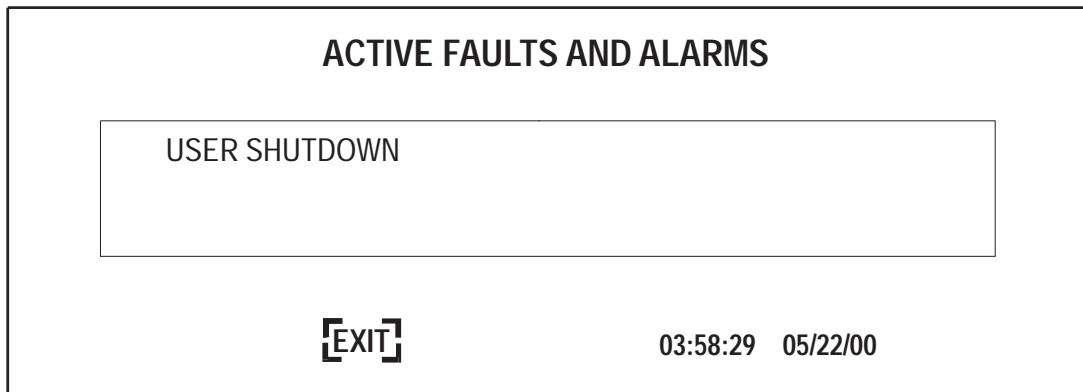
- Output AC Volts AB, BC, CA
- Output AC Volts AN, BN, CN
- Output Current A, B, C
- Output kVA, kW, A, B, C
- Output Frequency
- % rated kVA and kW
- Overload Condition (with timer in seconds)

5. SYSTEM STATUS. When the SYSTEM STATUS box on the Mimic Display Screen (**Figure 14**) shows a flashing FAULTS AND ALARMS message, highlight it and press SELECT. This displays information about faults and alarms. Fault messages are displayed in reverse video (highlighted - light on dark) while alarm messages are displayed in regular video (dark on light). Alarm messages activate the audible alarm until the ALARM SILENCE button is pressed. To clear a latching alarm, you must also press the ALARM RESET button after the alarm condition is corrected.

3.3.1.2 Faults and Alarms

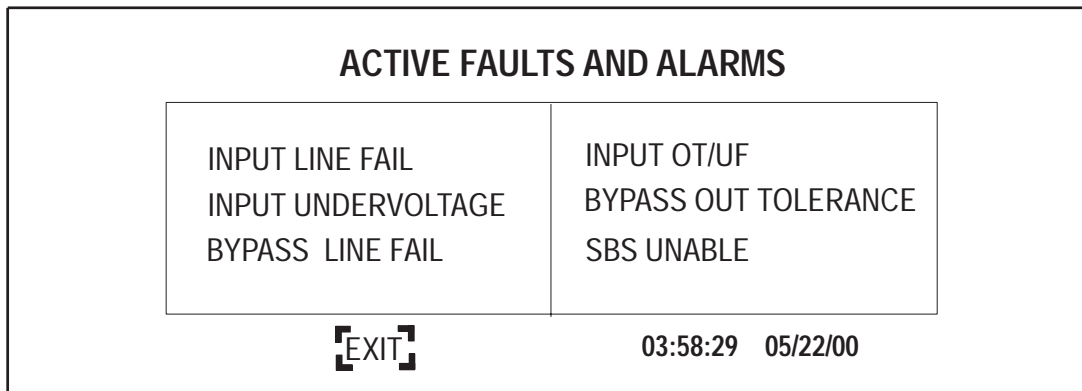
The TRN is designed to alert the Operator to system conditions that warrant careful monitoring and/or corrective action. A fault is an undesirable system condition that can cause further damage to the system or potentially drop the load if not acted upon. An alarm indicates an abnormal system condition significant enough to warrant being annunciated and logged. During normal operation no alarm messages should be present.

Figure 19 Active Faults and Alarms Screen



If input power is lost, the following screen will be displayed:

Figure 20 Active Faults and Alarms, Loss of Power



NOTE

There are 45 different fault messages and 95 different alarm messages. For a complete list refer to Sections 3.4.1 and 3.4.2.

3.3.2 Startup

There are two start up scenarios which can be followed depending on whether there is already power supplied to the UPS and the UPS is on Bypass, or there is no power to the UPS. Follow the appropriate instructions.

First Scenario:

Power is not supplied to the UPS (Upstream breakers are open). Locate the Rotary Switch located on the inside of the cabinet on the lower right side as you face the cabinet. Turn the Rotary Switch to the Normal position. For a Single Input unit close the upstream breaker so that power is applied to the UPS. For Dual Input units close both the Input and Bypass line breakers so that power is

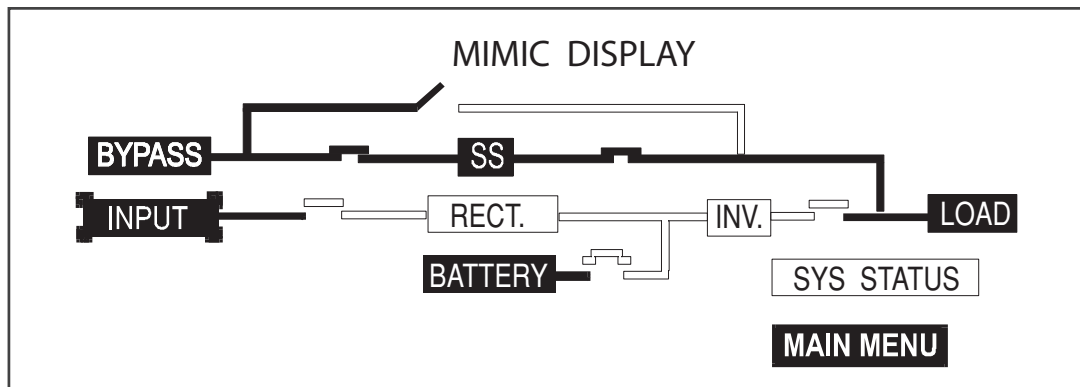
applied to the Input of the UPS and the Bypass line. At this time, power will be applied to the load through the internal static bypass.

Figure 21 System Ratings Screen

SYSTEM RATINGS	
KVA	40
SYSTEM POWER FACTOR	0.8
INPUT VOLTS	480
OUTPUT VOLTS	208
BYPASS VOLTS	480
<input type="button" value="NEXT"/>	EXIT

As soon as power is applied you will see the SYSTEM RATINGS screen (**Figure 21**). These are the ratings of the unit that were programmed in at the factory. Using the arrow keys highlight SAVE & EXIT and push the SELECT button. This will advance you to the USER SETTINGS screen. The USER SETTINGS have been pre-set at the factory. However, they may be customized for your site. See Section **3.3.5** for detail information on configuration screens. You can change these configurations at any time. Use the arrow keys to move the cursor to SAVE & EXIT and push SELECT. This will move you to the MIMIC screen that will look like **Figure 22**. You are now ready to follow the instructions for automatic start up, Section **3.3.2.1**. Service technicians may alternately use the Manual Start Up procedure for trouble shooting purposes, Section **3.3.2.2**.

Figure 22 Mimic Display Screen with load on Bypass and switches closed



Second Scenario

Power is supplied to the UPS and the UPS is supplying the load. (Upstream breakers are closed). The UPS should be showing either the SYSTEM RATINGS screen or the Mimic display. If the SYSTEM RATINGS screen is showing, use the arrow keys to select SAVE & EXIT and push SELECT. This will advance you to the USER SETTINGS screen. The USER SETTINGS have been

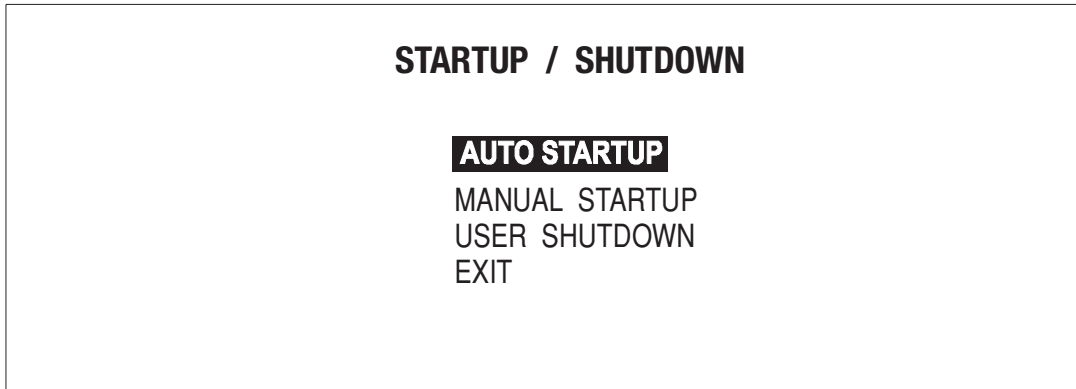
pre-set at the factory. However, they may be customized for your site. See Section **3.3.5** for detail information on configuration screens. You can change these configurations at any time. Use the arrow keys to move the cursor to **SAVE & EXIT** and push **SELECT**. This will move you to the **MIMIC** screen. Check the **MIMIC** screen to make sure the static switch contactors are closed. The screen should look like **Figure 22**. If the Static Switch Contactors are open (**Figure 24**), transferring to the **NORMAL** position will **DISCONNECT THE LOAD**. To close the Static Switch contactors, locate the Rotary Switch located on the inside of the cabinet on the lower right side as you face the cabinet. Turn the Rotary Switch to the **SERVICE** position. Wait for 10 seconds. Return the Rotary Switch to the **BYPASS** position. This should reset the Static Switch contactors to the closed position and the **MIMIC** panel should look like **Figure 22**. If the Static Switch contactors are closed, then the load is supported by Static Switch and you are clear to move the Rotary Switch to the **NORMAL** position and move on to the Automatic Start Up, Section **3.3.2.1**. If the Static Switch contactors are not closed, repeat the above procedure. If this still does not close the static switch, contact Dual-Lite System Services for assistance.



CAUTION

If on Static Bypass, make sure the Static Switch is closed (Figure 22) before turning the Rotary Switch to normal. If the Static Switch is not closed and the Rotary Switch is turned to the normal position, the load will be disconnected.

Figure 23 Startup / Shutdown Procedures Screen



3.3.2.1 Auto Startup

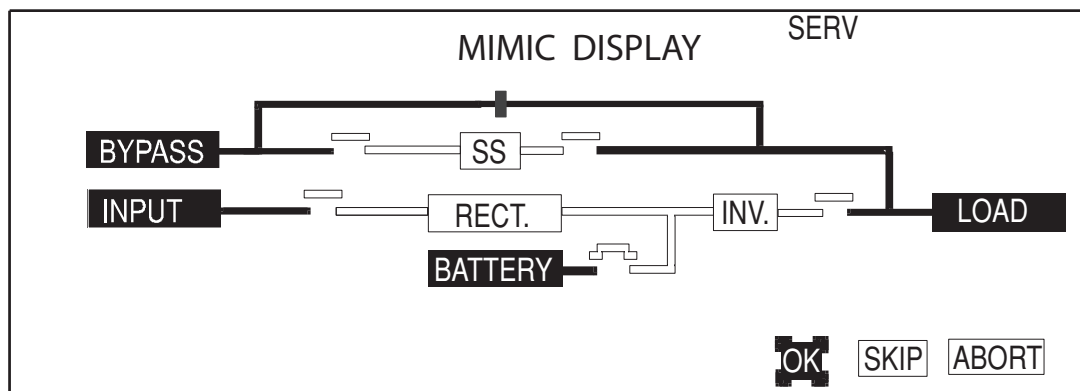
Normally, the Operator will choose to start the system automatically for the sake of convenience. To begin the auto start-up sequence, select MAIN MENU from the MIMIC screen. This will bring up the MAIN MENU Screen (Figure 9). From this screen select STARTUP/SHUTDOWN. This will take you to the STARTUP/SHUTDOWN screen, Figure 23. Move the cursor to AUTO STARTUP and press SELECT. AUTO STARTUP mode starts the rectifier and inverter, and transfers the load to the inverter. The operator needs only perform one action when prompted: CLOSE MANUAL BATTERY BREAKER. This action must be performed promptly (within 90 seconds). Otherwise the startup operation is aborted and an error message will appear stating: UPS OPERATION CANNOT BE PERFORMED. Although no further operator interaction is required, the Operator has the option to abort the Auto sequence.

Once the Operator has manually closed the Battery Breaker, the UPS automatically becomes fully operational, at which point the Mimic Display Screen is displayed showing Normal Power Flow. See Figure 10 - Monitor / Mimic Display Screen Example: Normal Power Flow

3.3.2.2 Manual Startup

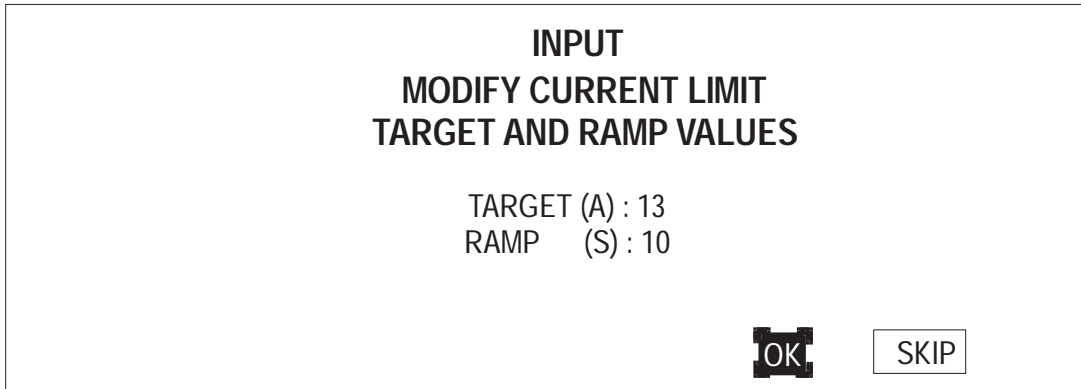
On occasion, a service technician may wish to start the UPS manually while performing diagnostic testing. The manual startup, like the auto startup, requires that the Rotary Switch be in the NORMAL position. To start the system manually, highlight MANUAL STARTUP and press the SELECT button on the navigation bar. This action brings up the MIMIC DISPLAY screen, prompting the Operator to close the Static Switch contactors.

Figure 24 Manual Startup Screen, Close Static Switch Contactors Screen



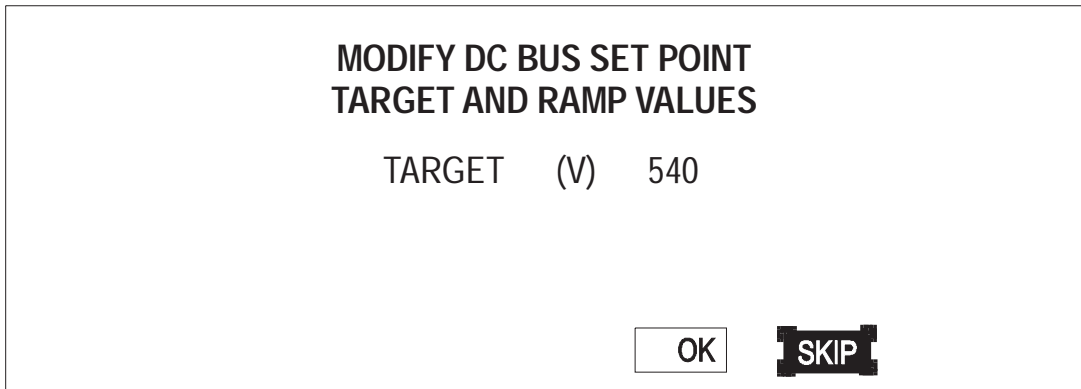
Press OK to close the SS contactors, turning on the Static Switch. Press SKIP only to proceed without closing the Static Switch contactors. Either selection brings up the screen enabling modification of input current limit.

Figure 25 Target and Ramp Values



Press SKIP to proceed or OK to change values. If Operator selects SKIP, the Mimic Display screen is momentarily displayed, followed by the screen enabling modification of DC Bus Setpoint.

Figure 26 DC Bus Setpoint Screen



New Target and Ramp settings are temporary settings for diagnostic testing or special situations. Each time the UPS is placed online, the settings return to the default values. Custom T and R entries are only allowed when rotary switch is in Bypass position.

The Operator normally does not have to change Target and Ramp settings. Therefore, he should select SKIP and proceed to the next step which is to turn on the Rectifier and Inverter.

Operator is issued the prompt on the Mimic Display, “Turn on Rect.” Pressing OK will turn on the rectifier which will take up to one minute. If the rectifier does not turn on within two minutes, the UPS will automatically make a second attempt.

Next, Operator is issued the prompt, “Turn on Inv.” Pressing OK turns on the inverter, taking up to one minute. If it does not turn on within two minutes, the UPS will make a second attempt.

Next, Operator is prompted to “Close Batt CB.” The battery circuit breaker does not have to be closed to bring the unit online. This step can be skipped in both NORMAL and BYPASS positions. The CLOSE BATT CB screen will offer a choice of OK or SKIP. If you wish to move ahead without bringing the battery online, select SKIP.

Last, the Operator will see the MANUAL TRANSFER/RETRANSFER screen. To move the unit from BYPASS to UPS operation use the arrow keys to select RETRANSFER TO UPS and push the SELECT button.

At any time during the above sequences, the Operator can choose to abort the procedure. The load will remain on bypass while the rectifier and inverter are powered down. In addition, any internal failure will automatically inhibit startup.

From here on the Operator may monitor faults/alarms data and other information by navigating to primary screens from the Main Menu screen, or by navigating to secondary screens from any of the primary screens.

3.3.2.3 SIB External Maintenance Bypass

An External Maintenance Bypass Switch can be added by Dual-Lite or supplied by the Customer. The Liebert supplied option is outlined in **Figure 27** and **Figure 28** for the single input and dual input options, respectively. The rotary switch has three independent power contacts on a common shaft. A set of auxiliary contacts is incorporated into the shaft to determine the power switch position. The auxiliary contacts, if provided will be connected to pins 9-10 of TB70 of the UPS module. The UPS module shipped from the factory will have pins 9-10 jumpered so that the UPS internal logic will ignore the External Maintenance Bypass switch conditions.

Figure 27 Single Input External Maintenance Bypass Switch

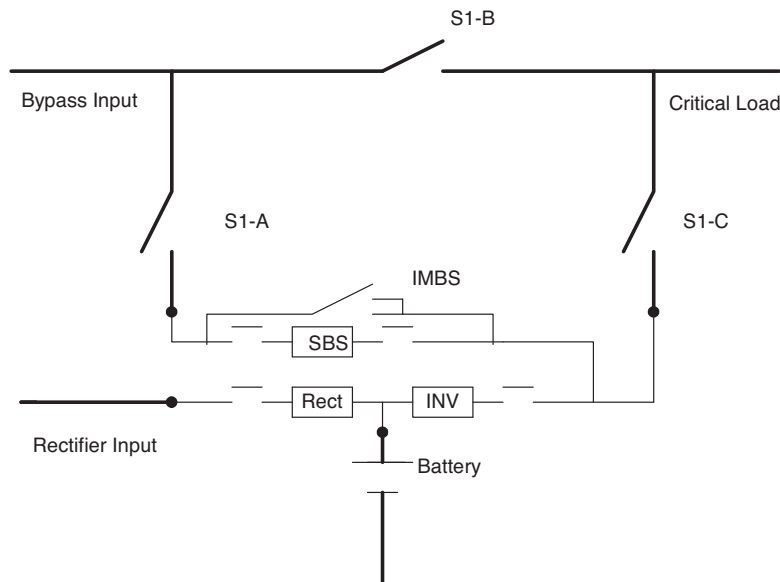
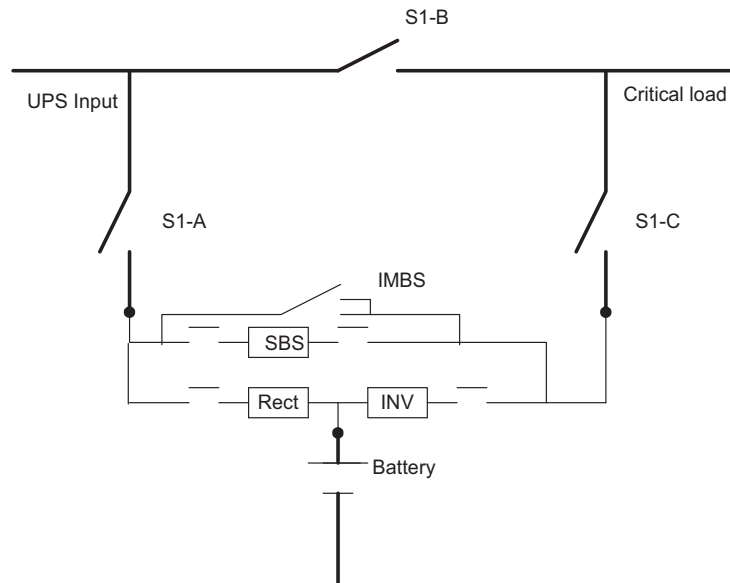


Figure 28 Dual Input External Maintenance Bypass Switch



The table below summarizes the External Maintenance Bypass switch position and action.

Table 3 External Maintenance Bypass Switch Position and Action

Switch position	S1-A	S1-B	S1-C	AUX
Maintenance (Service)	Open	Closed	Open	Open
Test (Bypass)	Closed	Closed	Open	Open
On Line (Transition)	Closed	Closed	Closed	Open
On Line (Normal)	Closed	Open	Closed	Closed

When the External Maintenance Bypass switch is in Bypass or Maintenance position, the UPSC will assert the bypass contactor close signal and the output contactor open signal. It will also turn on the SBS. Automatic Retransfer operations will be disabled.

If the External Maintenance Bypass switch rotates from the Bypass or Maintenance to the Normal position, then the UPSC will keep the bypass in the ON state, thus keeping the critical bus powered via the bypass source. The user will be able to issue a “Manual Transfer to Inverter” command provided the retransfer conditions are satisfied. The user can also issue a shutdown or a start command.

If the External Maintenance Bypass switch rotates from the Normal to the Bypass or Maintenance position, the UPSC will assert the bypass contactor close signal and the output contactor open signal. It will also turn on the SBS. Automatic Retransfer operations will be disabled.