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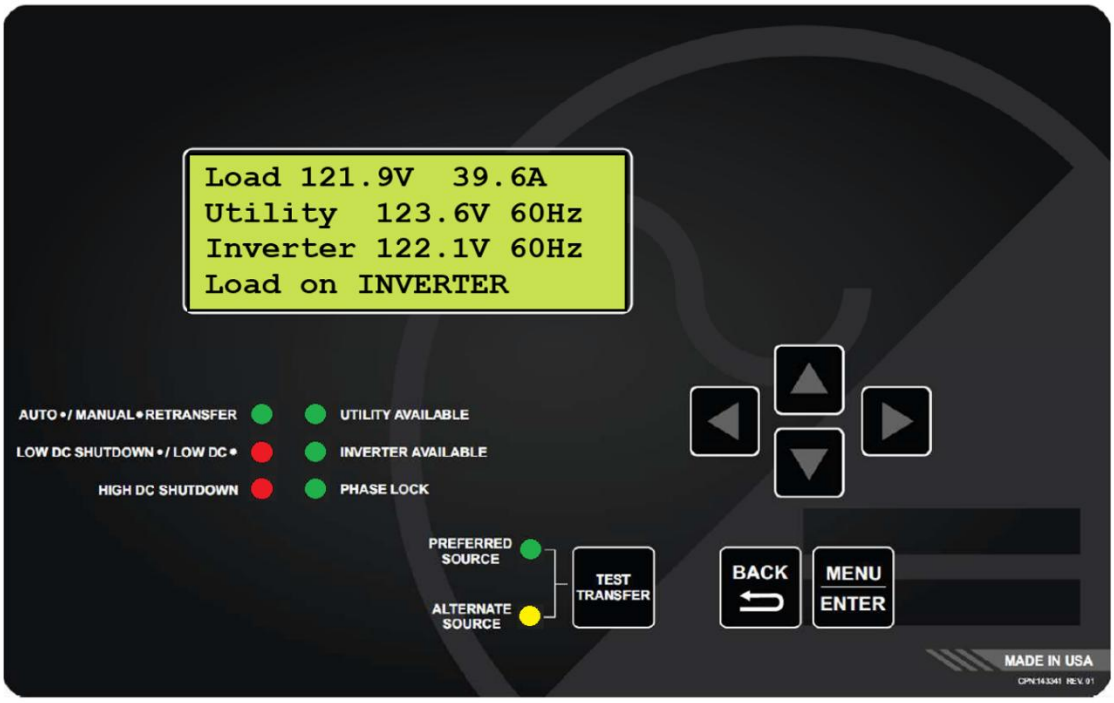
Option 22U

Digital Meter Package for A31 Inverters.



Operation Manual

106 Bradrock Dr. Des Plaines, IL 60018-1967
Tel: 847-299-1188 Fax: 847-299-3061

CPN 147889

Instruction Drawing Number: P25-LOPT22U-2
Revision A03 ECN: 23529-2

1 Option 22U – Operation

1.1 General Description

The 22U option revolves around the electronic static switch; an automatic device which will transfer, in a rapid 1 millisecond, an AC load its primary source to its alternate source in the event of a primary source failure.

The static switch is controlled by the S2A-239DS digital static switch board, working alongside the S2A-526 display assembly on the front panel which provides a user-friendly interface. The S2A-526 display assembly includes a 4-line LCD display, 7 push buttons, and 8 alarm & status LEDs as seen below.

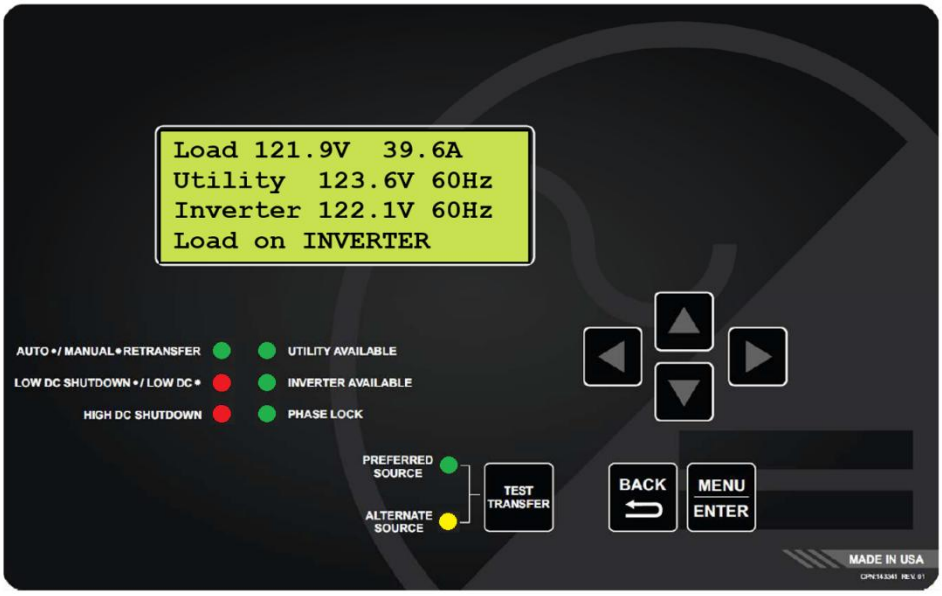


Figure 1 – A31 Front Panel

The display will show the software version and the date code, as well as go through a lamp test. Afterwards, the display will show "Building Envelope Tables" and then show "Waiting for Source to Start..." Once the inverter begins to output, the idle display will read out the following information:

- **Load Voltage**
- **Load Current**
- **Volt-Amps**
- **Utility Voltage**
- **Utility Frequency**
- **Input DC Volts**
- **Inverter Voltage**
- **Inverter Frequency**
- **Input DC Amps (Optional)**
- **Load on Inverter/Utility**
- **Preferred Source**

NOTE: *The Up/Down arrow buttons can be used to scroll through the information.*

Status Indicator LEDs

Auto/Manual Retransfer	LED is ON solid when the inverter is set to automatically transfer back to preferred source when available. LED is ON blinking when the inverter is set to be manually transferred (by the user) back to the preferred source.
Low DC/Shutdown	LED is ON solid when the inverter source has shut down due to very low input DC voltage. LED is ON blinking when the inverter has low input DC voltage.
High DC Shutdown	LED is ON when the inverter source has shut down due to very high input DC voltage.
Utility Available	LED is ON when the utility source is deemed available.
Inverter Available	LED is ON when the inverter source is deemed available.
Phase Lock	LED is ON when both sources are in sync within the phase window.
Preferred Source	LED is ON when the load is operating on the preferred source.
Alternate Source	LED is ON when the load is operating on the alternate source.

The Test Transfer push button allows for transferring the load to the alternate source, if available, to assure static switch functionality.

3.3 Alarm/Status Description

AUTO/MANUAL RETRANSFER LED will be on solid when the inverter is set to automatically transfer back to preferred source when available. The LED will be blinking when the inverter is set to be manually transferred (by the user) back to the preferred source.

PHASE LOCK LED will turn on if the inverter and utility (AC Bypass) sources are synchronized within the phase window.

UTILITY AVAILABLE LED will turn on if the utility (AC Bypass) source is deemed available.

INVERTER AVAILABLE LED will turn on if the inverter source is deemed available.

PREFERRED SOURCE LED will turn on if the A31 is operating on the preferred source. The preferred source may be set to either Inverter or Utility (AC Bypass).

ALTERNATE SOURCE LED will turn on if the A31 is operating on the alternate source. The preferred source may be set to either Inverter or Utility (AC Bypass).

LOW DC VOLTAGE ALARM will trigger and the red "LOW DC/LOW DC SHUTDOWN" LED will blink if the input DC voltage falls below the specified voltage threshold of the alarm for longer than the specified alarm delay setpoint. The alarm will clear once the input DC voltage rises above the Low DC Voltage Reset threshold.

LOW DC SHUTDOWN ALARM will trigger and the red "LOW DC/LOW DC SHUTDOWN" LED will turn on solid if the DC voltage falls below the specified percentage or voltage threshold of the alarm for longer than the specified alarm delay setpoint. If the Low DC Shutdown alarm activates, the inverter source shuts off to prevent irreversible damage to the inverter. The alarm will clear, and the inverter source will power back up once the input DC voltage rises above the Low DC shutdown reset threshold.

HIGH DC SHUTDOWN ALARM will trigger and the red "HIGH DC SHUTDOWN" LED will turn on if the input DC voltage of the charger rises above the alarm threshold for longer than the specified alarm delay setpoint. If the High DC Shutdown alarm activates, the inverter source shuts off to prevent irreversible damage to the inverter. The alarm will clear, and the inverter source will power back up once the input DC voltage falls below the High DC shutdown reset threshold.

NOTE: Most alarms have adjustable time delays to energize; ranging from 0 through 255 seconds. Refer to Table 1 for the factory setting of each alarm.

FAN FAILURE ALARM will trigger and the red "FAN FAILURE" LED on the S2A-407S1 card (inside the A31 unit) will turn on if any of the fans stop rotating. The alarm will clear once the fan starts rotating at a proper speed. The fan failure alarm includes one set of form 'C' contacts, enabling the user to connect remote annunciators using J8 connector of the S2A-407S1 board. The fan failure relay logic is designed to be fail-safe; therefore, the relay is de-energized on fail.

NOTE: The A31 may have zero, one or two fans, depending on the kVA rating of the unit. The fan tachometer signal is linked to J7 connector of the S2A-407S1 board. Pin-1, pin-2 and pin-3 are dedicated for Fan #1. Pin-4, pin-5 and pin-6 are dedicated for Fan #2.

Parameter	Default Value		Delay (secs.)
	Lead Acid	Nickel Cadmium	
Re-Transfer Mode	Automatic		20
Preferred Source	Inverter		
Load Window High	+20%		
Load Window Low	-20%		
Utility Voltage High	+10%		10
Utility Voltage Low	-10%		
Inverter Voltage High	+10%		10
Inverter Voltage Low	-10%		
Low DC Voltage	1.98 V/C	1.20 V/C	5
Low DC Voltage Reset	2.10 V/C	1.25 V/C	
Low DC Voltage Shutdown	1.73 V/C	1.10 V/C	5
Low DC Voltage S.D. Reset	2.05 V/C	1.35 V/C	
High DC Voltage Shutdown	2.45 V/C	1.60 V/C	5
High DC Voltage S.D. Reset	2.40 V/C	1.55 V/C	
Current Limit	150% of Nominal Output Current		
Transfer Time	4 Millisecond		
Hit Counter	18		
S.S. Sensitivity	Low		

Table 1 – Inverter Factory Default Values

NOTE: *V/C – Volts per Cell.*

3 Adjusting Parameters

All equipment is shipped from the factory fully tested and set per model number. Do not make any adjustments unless the equipment has been powered-up and the settings have been determined to be incorrect. If the settings have been determined to be incorrect, adjustments may be made as detailed below.

3.1 Settings Menu

In the Settings Menu, the user can access and change various parameters. Access menus by pressing the ENTER/MENU button on the front panel. Navigate using the UP, DOWN, ENTER, and BACK buttons. To enter a submenu, use the ENTER button. To exit a submenu, use the BACK button. To exit the Settings Menu, continue to press the BACK button until prompted to exit and save settings. Follow the prompts as desired.

NOTE: *It is important to be aware that transfers are disabled in the calibration modes.*

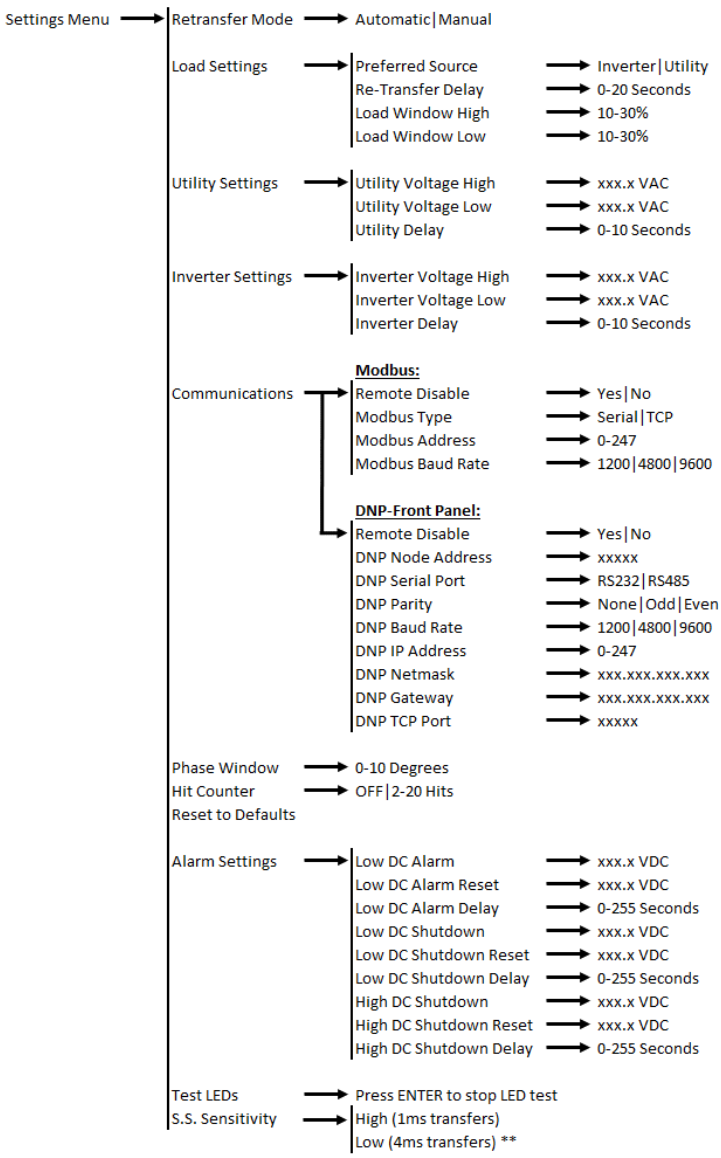


Figure 3 – A31 Settings Menu Structure

The Settings Menu is as follows:

3.1.1 Retransfer Mode

This setting is used for selecting the mode for re-transferring the load. The Automatic setting would cause the load to transfer to the preferred source whenever available. The Manual setting would cause the load to maintain on the present source if both sources are available. The currently used source can be changed in this mode by pressing the Test Transfer button when in the main screen.

NOTE: *When in Manual Retransfer Mode, the user will have to press the Test Transfer button in order to transfer the load from alternate source to preferred source in the event of a preferred source failure or outage.*

3.1.2 Load Settings

Preferred Source

This setting allows the user to select whether the primary source is either the inverter or the utility.

Re-Transfer Delay

This setting is used to set the time the inverter will attempt to retransfer from the Alternate Source back to the Primary Source. The inverter must be in Auto Re-Transfer Mode for this setting to have any effect. The Re-transfer Delay may be adjusted from 0 to 20 seconds in 1-second increments, with 20 being the default.

Load Window High

The upper allowable limit for the Load Voltage signal may be set in terms of percent. The maximum allowable upper setting is +30% and the minimum allowable upper setting is +10%. The default is +20%. The setting is adjustable in 1% increments.

Load Window Low

The lower allowable limit for the Load Voltage signal may be set in terms of percent. The maximum allowable lower setting is -30% and the minimum allowable lower setting is -10%. The default is -20%. The setting is adjustable in 1% increments.

NOTE: *With S.S. Sensitivity set to Low, Load Window Low is automatically set to 30% (fixed value).*

3.1.3 Utility Settings

Utility Voltage High

The maximum allowable/acceptable limit on the Utility Voltage defaults to the Output Voltage setting plus 10% (***EX:*** *The default setting for a 120VAC output inverter is 132VAC RMS*). Once the voltage is out of range, the utility source will be deemed unavailable, and the inverter will transfer to the inverter source if available.

Utility Voltage Low

The minimum allowable/acceptable limit on the Utility Voltage defaults to the Output Voltage setting minus 10% (***EX:*** *The default setting for a 120VAC output inverter is 108VAC RMS*). Once the voltage is out of range, the utility source will be deemed unavailable, and the inverter will transfer to the inverter source if available.

Utility Delay

This setting is used to set the amount of time the Utility Voltage must be within the upper and lower limits described above for the logic to consider the Utility Voltage to be within tolerance. The Utility Delay may be adjusted from 0 to 10 seconds in 1-second increments, with 10 being the default.

3.1.4 Inverter Settings

Inverter Voltage High

The maximum allowable/acceptable limit on the Inverter Voltage defaults to the Output Voltage setting plus 10% (***EX:*** *The default setting for a 120VAC output inverter is 132VAC RMS*). Once the voltage is out of range, the inverter source will be deemed unavailable, and the inverter will transfer to the utility source if available.

Inverter Voltage Low

The minimum allowable/acceptable limit on the Inverter Voltage defaults to the Output Voltage setting minus 10% (***EX:*** *The default setting for a 120VAC output inverter is 108VAC RMS*). Once the voltage is out of range, the inverter source will be deemed unavailable, and the inverter will transfer to the utility source if available.

Inverter Delay

This setting is used to set the amount of time the Inverter Voltage must be within the upper and lower limits described above for the logic to consider the Inverter Voltage to be within tolerance. The Inverter Delay may be adjusted from 0 to 10 seconds in 1-second increments, with 10 being the default.

3.1.5 Communications

The communication settings menu changes depending on the type of communication protocol used in the inverter. For details on connection and operation instructions, refer to the communication instruction manual included with the inverter.

3.1.6 Phase Window

This setting allows the user to adjust the maximum allowable amount of degrees the two sources may have in difference in order for the sources to be considered out of phase. If the difference is greater, the Phase Lock LED will turn off. The Phase Window may be adjusted from 1-10 degrees, with 10 being the default setting.

3.1.7 Reset to Defaults

This setting allows the user to reset all settings to how they were programmed from the factory.

3.1.8 Hit Counter

This setting is used to determine the maximum allowable Load Voltage deviations outside of the predefined envelope that will trigger a transfer. The Hit Counter may be adjusted from 1 to 20 hits, with 15 being the default setting.

NOTE: *With S.S. Sensitivity set to Low, Hit Counter is automatically set to 18 (fixed value).*

WARNING: *Adjusting the Hit Counter setting will affect the 1-millisecond transfer time. The higher the Hit Counter value, the slower the transfer time will be. Only adjust if necessary.*

3.1.9 Alarm Settings

The Alarm Settings menu provides access to adjust basic settings related to the alarms. The user can set the threshold values that trigger an alarm, that clear an alarm, and the alarm time delays. This applies to the following alarms: Low DC Voltage, Low DC Voltage Shutdown, and High DC Voltage Shutdown.

When a value is changed and ENTER is pressed, the inverter immediately uses these new values. However, if the user exits out of the Settings Menu without saving, the threshold values will revert to the previously set thresholds.

3.1.10 Test LEDs

The Test LEDs menu allows the user to run a basic lamp test on the A31. After selecting this menu, press the ENTER button to light all the LEDs on the front panel display. To end the LED test, press the BACK button.

NOTE: *Any additional LEDs on auxiliary boards will not be affected by this LED test.*

3.1.11 S.S. Sensitivity

The S.S. Sensitivity menu allows the user to adjust the sensitivity level of the Static Switch. The Static Switch sensitivity may be set to Low or High, with Low being the default setting. Low sensitivity level makes the static switch more stable due to optimization. "Hit Counter" & "Load Window Low" are not adjustable in the Low sensitivity level. The static switch transfer time is about 4-milliseconds. If the Static Switch transfer time is too slow, the sensitivity level can be set to High level to achieve faster transfers. To change the sensitivity level, select Low or High, then press the ENTER button, a warning message will be shown: "Card will reset, and load will drop momentarily". Press ENTER to confirm. Press BACK to cancel. Before proceeding, read the warning below:

WARNING: *Adjusting the S.S. Sensitivity level requires a reset. Card will reset automatically, and load will drop momentarily. Due to this, it is recommended to set the Manual Bypass Switch on Bypass not to drop the load.*

It is also important to acknowledge the transfer time of the static switch will be affected by changing the sensitivity level. High sensitivity level can achieve 1-millisecond transfers & Low sensitivity level achieves a 4-millisecond transfer.

Document Control and Revision History

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23529-2 – 03/25	23633 – 11/24	23387-5-23	22797-1 – 12/22