



ME-ARC Advanced Remote Control



Owner's Manual

(Version 4.0 or higher: with AGS, BMK, ACLD, and PT info)

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Thank you for purchasing this ME-ARC remote control.

We understand that you have many purchasing options in the marketplace, and are pleased that you have decided on a Magnum Energy product. This ME-ARC remote was proudly assembled and tested in the United States in our Everett, Washington, facility.

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This manual contains safety instructions that must be followed during the installation and operation of this product. Read all instructions and safety information contained in this manual before installing or using this product.

Safety Symbols

To reduce the risk of electrical shock, fire, or other safety hazard, the following safety symbols have been placed throughout this manual to indicate dangerous and important safety instructions.



WARNING: Indicates that failure to take a specified action could result in physical harm to the user.



CAUTION: Indicates that failure to take a specified action could result in damage to the equipment.



Info: Indicates information that emphasizes or supplements important points of the main text.



Remedy: Provides possible solutions for related issues.

Product Safety Alerts

All electrical work must be performed in accordance with local, state, and federal electrical codes.



WARNINGS:

- All electrical work must be performed in accordance with local, state and federal electric codes.
- This product is designed for indoor/compartment installation. It must not be exposed to rain, snow, moisture, or liquids of any type.
- Use insulated tools to reduce the chance of electrical shock or accidental short circuits.
- Remove all jewelry such as rings, watches, bracelets, etc., when installing or performing maintenance on the inverter.
- Always disconnect the batteries or energy source prior to installing or performing maintenance on the inverter. Live power may be present at more than one point since an inverter utilizes both batteries and AC. Turning off the inverter may not reduce this risk on some Magnum inverters. As long as AC power is connected, it will pass through the inverter regardless of the power switch on the inverter or the ON/OFF INVERTER button on the remote.

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Overview

1.0 Overview

The ME-ARC remote control allows you to monitor and customize the operating parameters for your Magnum inverter/charger. This remote can be used on all Magnum inverter/charger models so there is no cross-platform confusion.

The ME-ARC50 comes standard with a 50-foot, 4-conductor (twisted-pair) telephone cable and includes non-volatile memory (preserves adjustable settings, even if power to the remote or inverter is removed).



Info: This manual is for a ME-ARC with software version 4.0 or higher; see the *TECH: 02 Versions* section on page 36 for information on how to determine your version level.

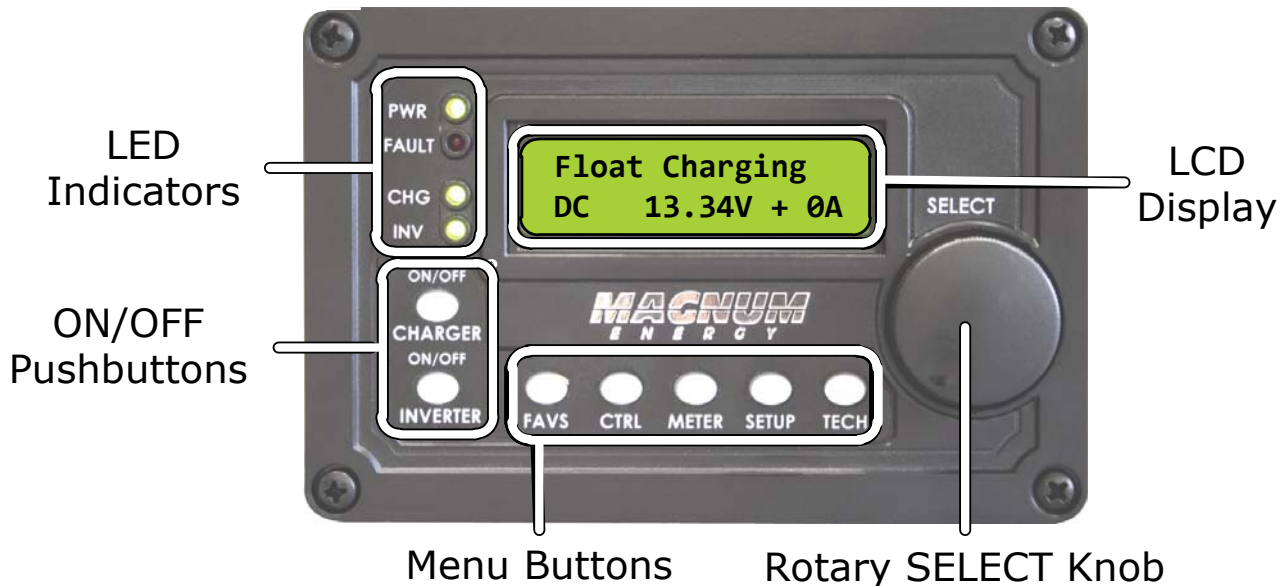


Figure 1-1, Front Panel Features

The ME-ARC is equipped with the following features:

- **LED Indicators** – The at-a-glance LEDs provide the inverter/charger status in a straightforward way.
- **LCD Display** – The LCD display is a 16 x 2 line (32 characters total) alphanumeric display used for setting up the inverter/charger operation, as well as viewing current status or fault messages.
- **ON/OFF Pushbuttons (x2)** – The ON/OFF pushbuttons allow the inverter or charger to be independently and quickly enabled or disabled.
- **Menu Buttons (x5)** – Allow the inverter or charger to be configured to your specific system preferences. These buttons also allow simple access to menu items that can help with monitoring and troubleshooting your inverter/charger system.
- **Rotary SELECT Knob** – The rotary encoder knob is similar to a car dash radio knob and is used to quickly scroll through and select various menu items and settings. Pressing the rotary knob allows you to select a menu item, or to save a setting once it is displayed on the LCD.

2.0 Installation

Review this section and the Important Product Safety Instructions on page ii before proceeding with the installation of your remote.



WARNING: Installations should be performed by qualified personnel, such as a licensed or certified electrician. The installer determines which safety codes apply and ensures all applicable installation requirements are followed. Applicable installation codes vary depending on the specific location and application.



CAUTION: When connecting battery power to the inverter, all battery negative connections must be connected prior to the battery positive connections. When removing battery power from the inverter, the battery positive should be removed before any battery negative connections are disconnected. This prevents any communication chips/lines from becoming the DC return path to the battery—causing permanent damage to all connected accessories.

Summation: Ensure all battery negative circuits are always connected before connecting or disconnecting battery positive.

2.1 Pre-Installation

Before proceeding, read the entire Installation section to determine how best to install your ME-ARC remote. The more thorough you plan in the beginning, the better your inverter needs will be met.

2.1.1 Installation Guidelines

- Before connecting any wires determine the remote's cable route throughout the home or vehicle/boat, both to and from the inverter.
- Always check for existing electrical, plumbing, or other areas of potential damage BEFORE drilling or cutting into walls to mount the remote.
- Make sure all wires have a smooth bend radius and do not become kinked.
- If installing this remote in a boat, RV, or truck ensure the conductors passing through walls, bulkheads, or other structural members are protected. This minimizes insulation damage (such as chafing) which can be caused by vibration or constant rubbing.

2.1.2 Unpacking and Inspection

Carefully remove the ME-ARC remote from its shipping container and inspect all contents. Verify the following items are included:

- The ME-ARC remote display
- Bezel
- 50' remote cable
- Eight #8 x 3/4 Phillips screws
- ME-ARC Owner's Manual

If items appear to be missing or damaged, contact your authorized Magnum Energy dealer or Magnum Energy.

IMPORTANT: Save your proof-of-purchase as a record of your ownership; it is needed if the unit should require in-warranty service.

2.1.3 Tools Required

Installing the remote control is simple and requires the following tools:

- Phillips screwdriver
- Level
- Drill
- Cut-out tool (knife/saw)
- Pencil
- Drill bit (7/64")

Installation

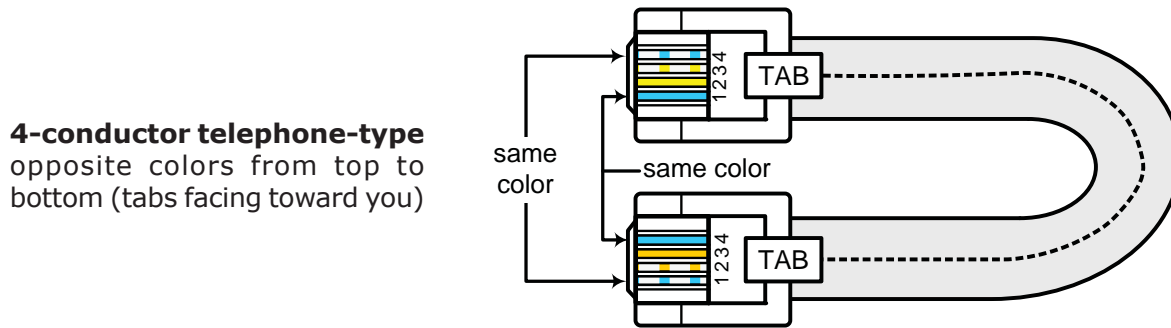
2.2 Connecting the Remote Cable

The ME-ARC comes with a remote cable to enable communication between the inverter and the remote. The cable is a 50-foot, 4-conductor, round twisted-pair, telephony standard with 6P4C (6-position/4-conductor) connectors on each end. When the 6P4C connectors are held side by side with both of the connector tabs facing the same way, the color of the conductors in each connector is the opposite from top to bottom (as shown in Figure 2-1).



Info: This cable has twisted-pair cabling which is a common form of wiring in which two conductors are wound around each other for the purposes of canceling out electromagnetic interference (known as "crosstalk").

Note: The remote cable can be extended up to a length of 200 feet without data degradation.



4-conductor telephone-type
opposite colors from top to
bottom (tabs facing toward you)

Figure 2-1, Remote Cable

2.2.1 Connecting the ME-ARC to a Magnum Inverter

One end of the remote cable plugs into the back side of the ME-ARC, and the other plugs into the REMOTE (blue) port on the Magnum inverter/charger (see Figure 2-2).

Note: Do not connect the remote cable at this time. First, locate and prepare an area to mount the remote (follow directions in Section 2.4).

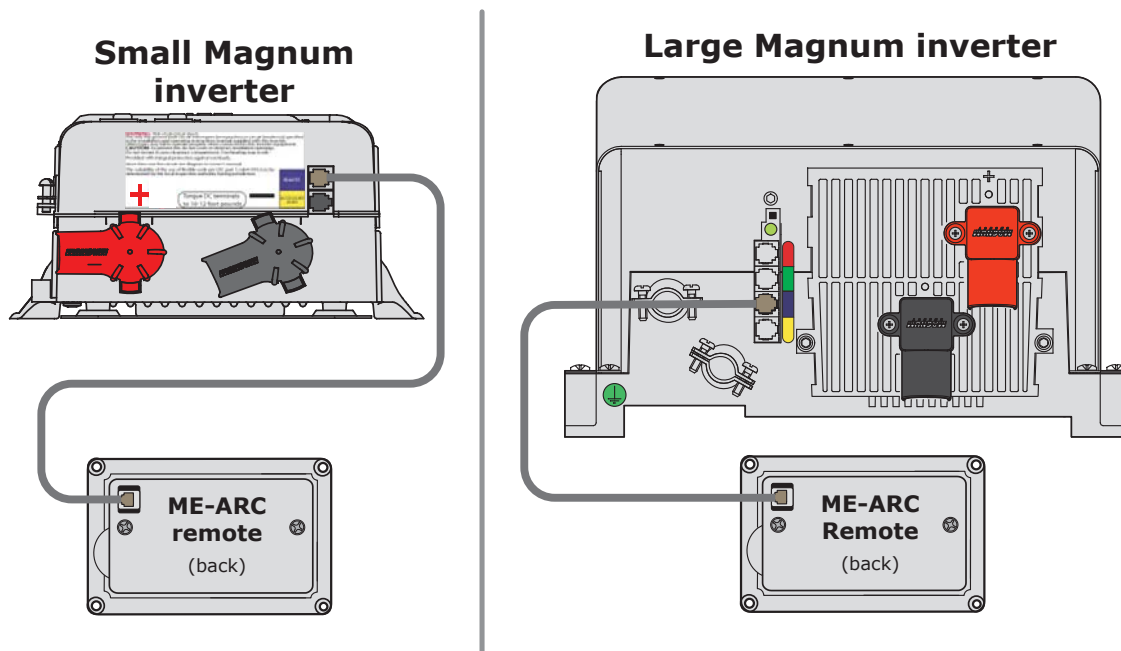


Figure 2-2, Remote Control Connections

2.3 ME-ARC Remote and Bezel Dimensions

Use the information below (Figures 2-3 and 2-4) in preparation for mounting the ME-ARC remote and the bezel (if applicable). Directions for mounting both follow in Section 2.4.

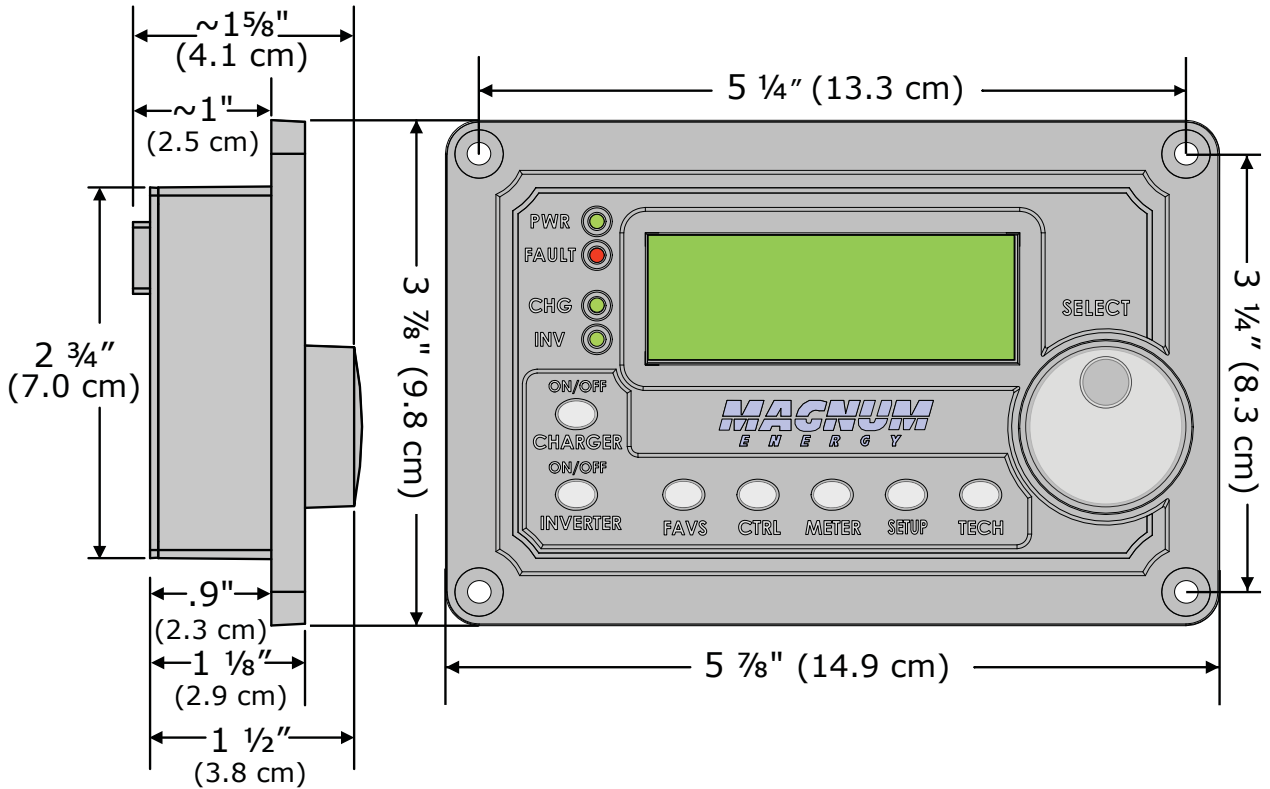


Figure 2-3, ME-ARC Remote Dimensions

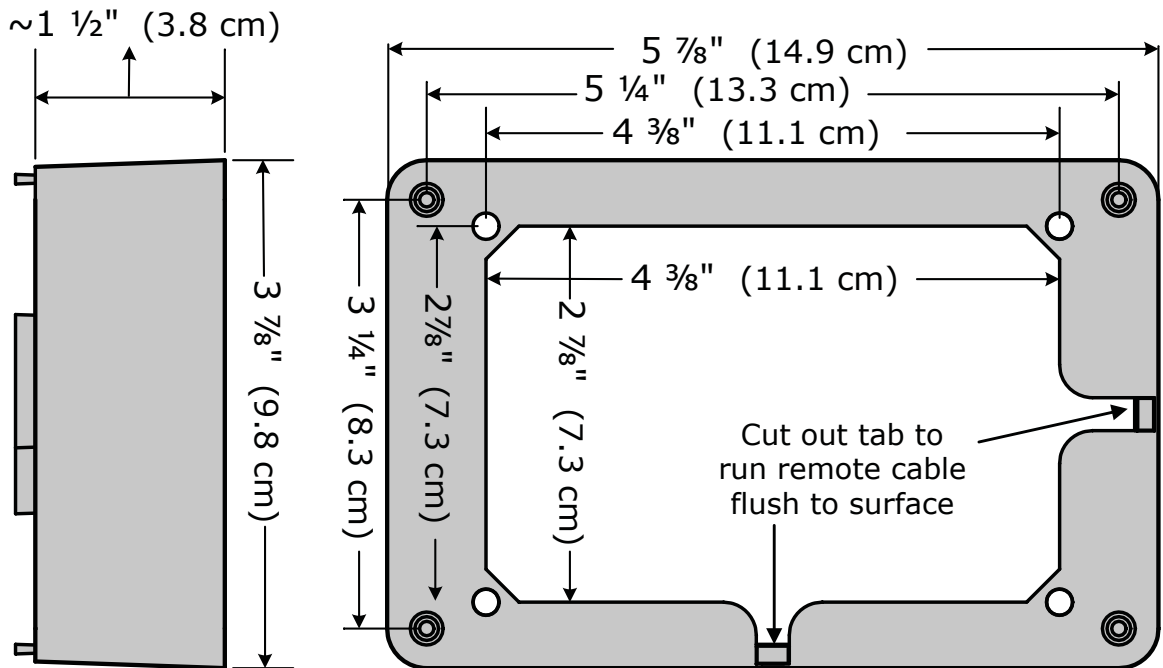


Figure 2-4, Remote Bezel Dimensions

Installation

2.4 Mounting the ME-ARC Remote

The ME-ARC can either be flush mounted (through an opening in the wall), or surface mounted using the provided bezel. Find a location that is clean, dry and protected. Allow room to access the remote's SELECT knob and to view the LEDs/display.



CAUTION: Ensure that no AC power is connected to the inverter, and then according to your inverter owner's manual correctly connect the inverter to the batteries.



CAUTION: Always check for hidden electrical wires, pipes and cables BEFORE drilling, cutting, or screwing into walls or cabinets.

2.4.1 Flush Mount Installation Procedure

To flush mount, the wall opening must have at least a 2" (5 cm) depth to allow room for the remote and the cable.

1. Cut an opening in the wall (Figure 2-5). Ensure there are no openings around the display and enough material for the screws to secure the unit.
2. Drill four pilot holes for the #8-32 screws that will attach the remote to the wall (refer to Figure 2-3 for hole locations and dimensions).
3. Route one end of the cable through the wall cutout to the inverter/charger, and then plug it into the RJ11 REMOTE port (blue label) on the inverter/charger—inverter has DC power, but is OFF. See Figure 2-2.
4. Take the other end of the remote cable and while plugging it into the back of the ME-ARC, view the remote's display to ensure the Power-up Self Test initiates (see Section 2.5).
5. If the self test is successful, secure the ME-ARC to the wall using four of the supplied Phillips screws. If the self test is unsuccessful, refer to the Troubleshooting section.

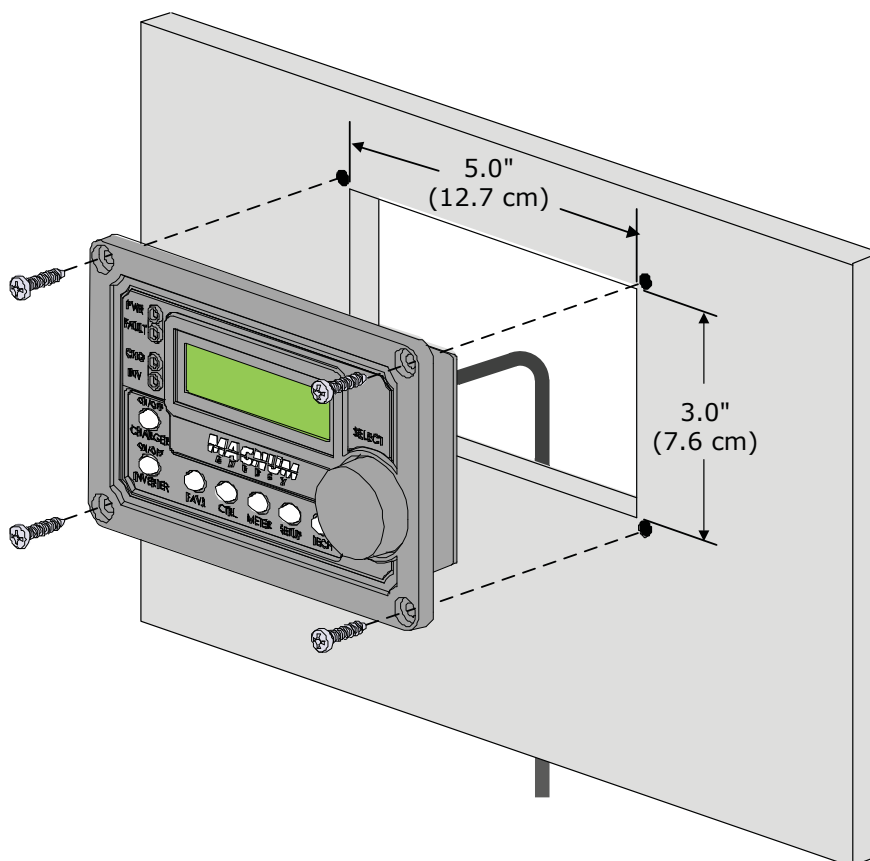


Figure 2-5, Flush Mounting the ME-ARC

2.4.2 Surface Mount Installation Procedure

To surface mount, you must use the supplied bezel (Figure 2-4).



Info: The bezel has tabs at the bottom and side that are made with thinner material (Figure 2-4). They can be cut or broken out to allow the cable to be routed downward or to the side (Figure 2-6).

1. Using the bezel as a template, mark on the wall the location of the four bezel mounting screws, and then drill pilot holes for the #8-32 screws.
2. Cut/break the appropriate tab on the bezel for the planned route of the remote cable.
3. Pull the cable through the bezel and place the bezel side with the removed tab over the cable against the wall.
4. Position the bezel over the drilled mounting holes, and then screw the bezel to the wall using four of the supplied Phillips screws (Figure 2-6).
5. Route the other end of the cable to the inverter/charger, and then plug it into the inverter's RJ11 REMOTE port (blue label)—inverter has DC power, but is OFF. See Figure 2-2.
6. Take the other end of the cable and while plugging it into the back of the ME-ARC, view the remote's display to ensure the Power-up Self Test initiates (see Section 2.5).
7. If the self test is successful, secure the ME-ARC to the bezel using four of the supplied Phillips screws. If the self test is unsuccessful, refer to the Section 6.0 "Troubleshooting".

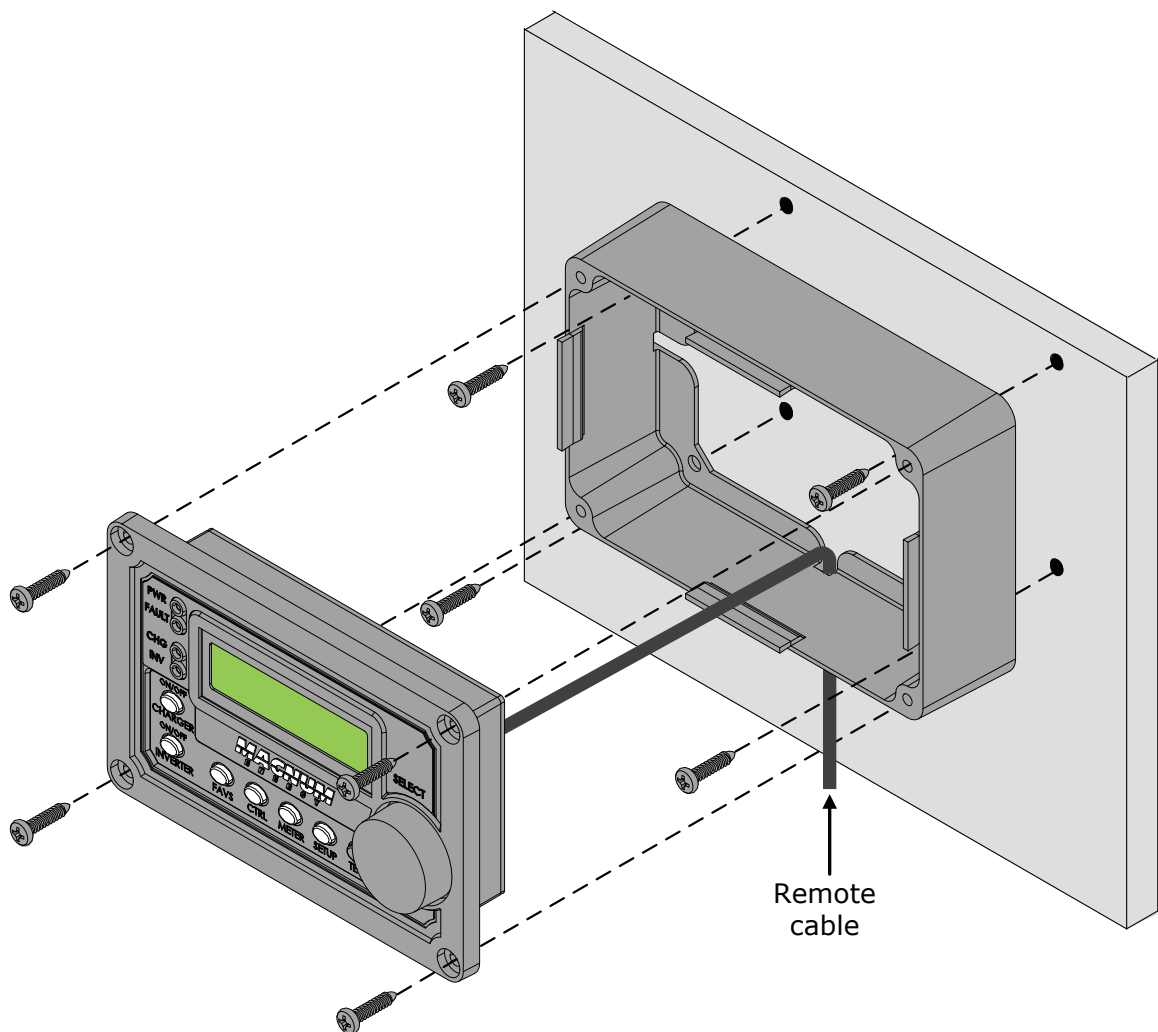


Figure 2-6, Surface Mounting the ME-ARC using the Bezel

Installation

2.5 Power-up Self Test



Info: All power to operate the remote control is provided by the inverter/charger through the remote cable.

When the ME-ARC is first connected to an inverter, a power-up self test is initialized. During the self test, the LCD automatically displays in sequence:

- "MAGNUM ENERGY Self Test", then
- "(C)2010-2013, Connecting to..", and then
- "ME-ARC V 4.0, INV/CHG V #.#"

The remote's LEDs also change with the screens (see Figure 2-7).

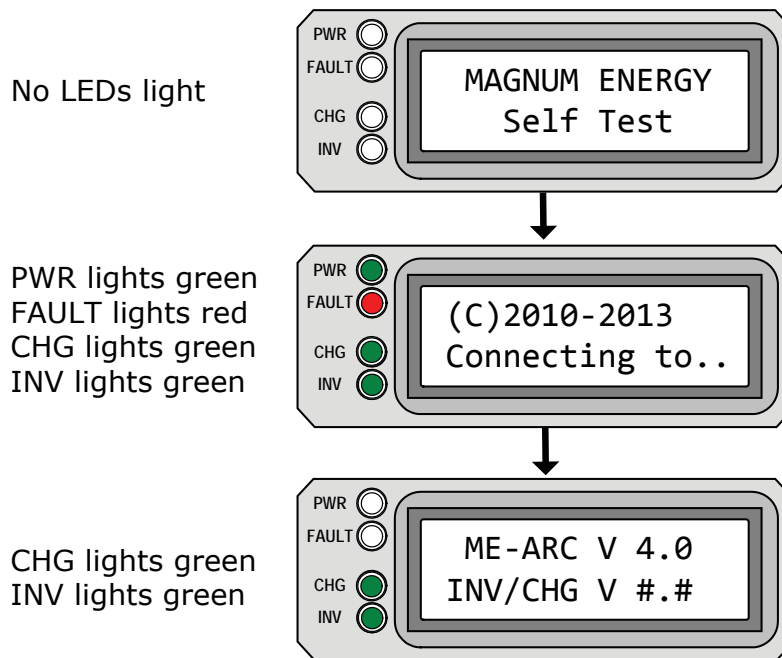


Figure 2-7, Power-up Self Test Screens

After the self test is finished the remote displays "Set Clock". Use the ARC's SELECT knob to set the correct time by selecting hour, minutes, and either AM or PM (see Figure 2-8 below, and the Set Clock procedure on page 19). Once the ARC's clock is set, the inverter Home screen displays.

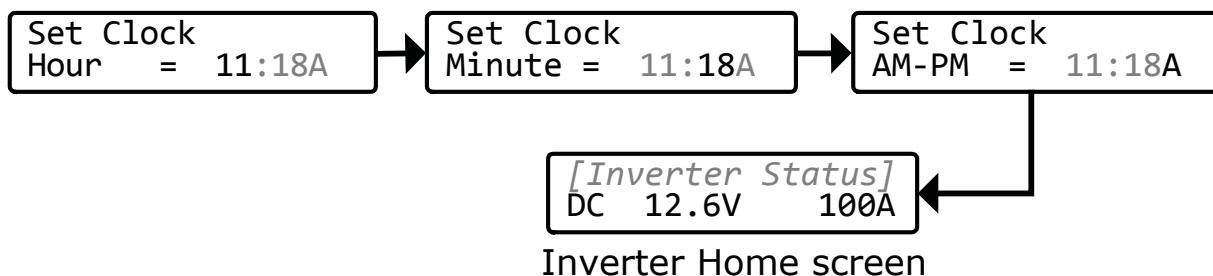


Figure 2-8, Self Test Set Clock Screens

3.0 Setup

When the remote is connected to a Magnum inverter/charger, the settings in the remote control determine the inverter/charger's operating parameters. The default settings in the remote control are adequate for most installations (see Table 3-3); however, you have the option to change some of the operating parameters. This section shows you how to navigate the remote and gives you an understanding of the function of each adjustable setting.

3.1 Navigating the Remote

The ME-ARC has menu items and adjustable settings that provide the ability to configure your inverter/charger to your specific parameters.



Info: See Figures 4-1 through 4-5 for complete maps of the inverter/charger's menu items and adjustable settings.

Familiarize yourself with the display and controls on the remote's front panel that are used to find, adjust, and save the desired settings (see Figure 3-1).

- **LCD Display** – The 2-line LCD display shows status and information for the inverter/charger and any attached accessories. All setup menus and faults also appear on the LCD display.



Info: The LCD display returns to the remote home screen to show DC voltage and current (see Figure 3-1) after five minutes if no buttons have been pressed.



Info: When the ← (left facing arrow) symbol is shown on the display, the displayed setting has been selected and will be used.

- **Menu Buttons (x5)** – These five buttons allow simple access to menu items that can help with configuring, monitoring, and troubleshooting your inverter/charger system.
- **Rotary SELECT Knob** – This rotary knob allows you to quickly scroll through and select various menu items and settings. Pressing the knob selects the menu item to change, or saves the current selection.



Info: Hold down the SELECT knob for 10 seconds to refresh the LCD display.

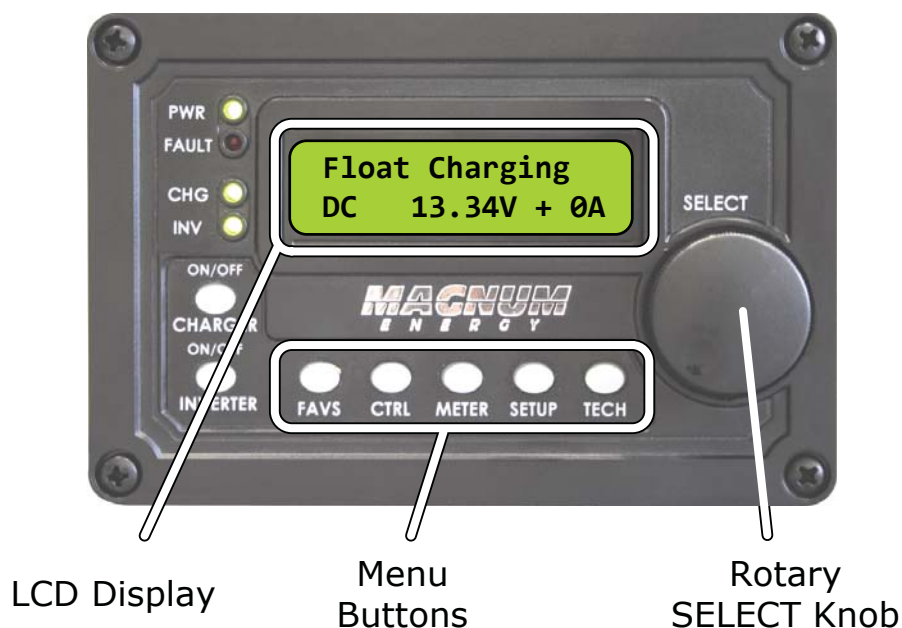
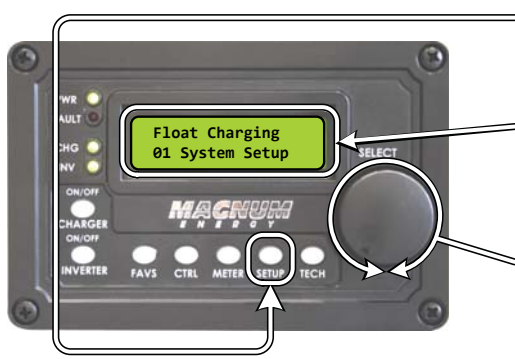


Figure 3-1, Front Panel Setup Features

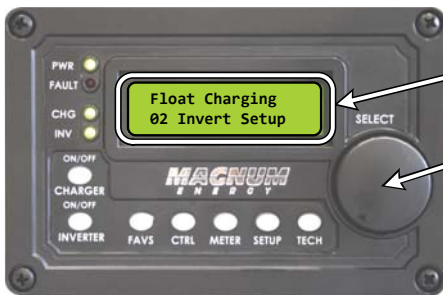
Setup



1. Press the **SETUP** menu button.

Bottom line shows a menu heading.

2. Turn the **SELECT** knob to the desired menu heading.



When the bottom line shows the desired menu heading:

3. Press the **SELECT** knob.



Top line shows menu item.
Bottom line shows current setting.*

*[If this setting is correct, rotate the **SELECT** knob to continue to the next menu item.]

4. Press the **SELECT** knob to change the desired setting.



Rotate the **SELECT** knob to the desired setting.
When the bottom line shows the desired setting:

5. Press the **SELECT** knob to save this setting.

Figure 3-2, SETUP Menu Navigation

3.2 Remote Buttons and Menu Items

The five menu buttons (FAVS, CTRL, METER, SETUP, or TECH) allow the inverter/charger system to be configured to your specific preferences. These buttons also allow you to access menu items that can help with monitoring and troubleshooting your system. Refer to Figure 3-2 for an example on how to navigate the remote.

This section covers each menu button's function and its various configurable settings. This helps optimize the operation of the inverter/charger.

3.2.1 FAVS Button and Menus

The FAVS (FAVORITES) button is similar to a Favorites button on your TV remote. It enables you to store the most frequently used menu items for quick reference, or to make easy changes to the system. The menu items stored under the FAVS button should be those menus most often used. The FAVS button has five factory-stored default menu items. You can also access these menu items using the SETUP and CTRL buttons to make changes. Before changing the default FAVS menu items, it is suggested that you thoroughly review all the menu items on the menu map (see Figures 4-1 through 4-5) and make a short list of the items you think you will use most often. Once you decide which five items you would like to make as your favorites, determine the order in which those menus are to appear under the FAVS button. This is important since you will assign a FAVS position (F1-F5) for each menu item you select.

Menu items can be changed at any time under the FAVS button. Navigate to a menu item that you would like to set as a favorite, then push and hold the FAVS button for three seconds. The screen displays "Select FAV: F1" on the bottom line. Rotate the SELECT knob to select the location for the menu item (i.e., F1 - F5). Once you have decided the location for the menu item, press the SELECT knob to save that menu item at the selected FAVS location. Repeat as necessary to save additional menu items.



Info: The FAVS button can be used to store menu items that would otherwise not be accessible after a PIN has been set for the SETUP menu. See the TECH: 05 SETUP PIN section on page 38 for information on setting a security PIN.



Info: Menu headings cannot be selected and stored in FAVS, only menu items. Menu headings are identified with a number. Menu items are identified by a number followed by a letter. See examples below.



Info: If the menu selected to be stored under the FAVS button is not a valid option, the remote displays "Cannot be FAV".

Example: *02 Invert Setup* is a menu heading.

Status
02 Invert Setup

Example: *02A Search Watts* is a menu item.

02A Search Watts
5 Watts

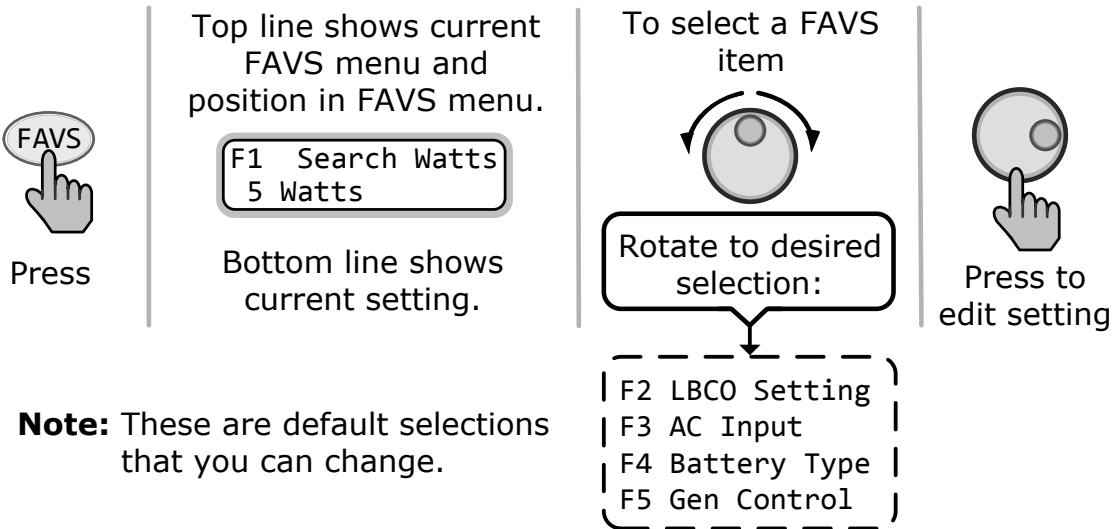
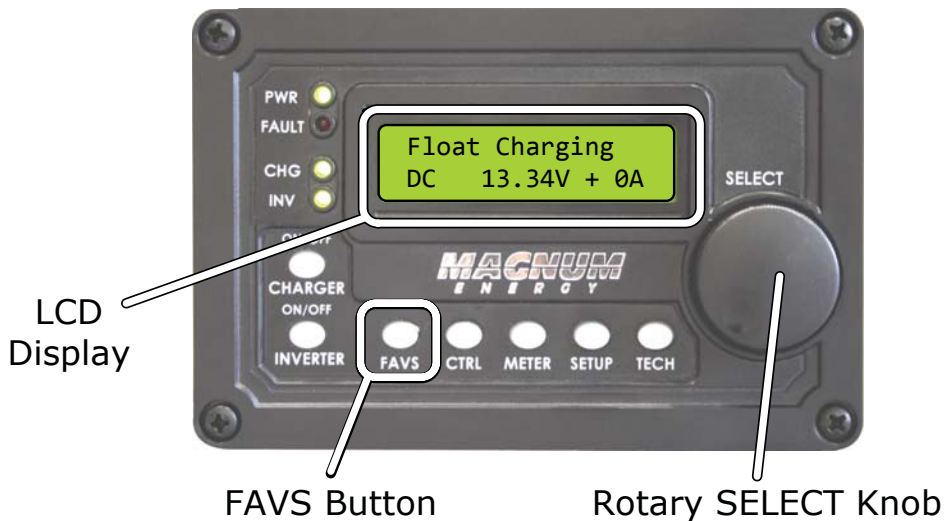


Figure 3-3, FAVS Button and Menus

FAVS Menu Default Settings:

- **FAVS: F1 Search Watts** – This is the F1 default (FAVS #1). Refer to the *SETUP: 02A Search Watts* menu item on page 20 for information on how to adjust the *Search Watts* setting.
- **FAVS: F2 LBCO (Low Battery Cut Out) Setting** – This is the F2 default (FAVS #2). Refer to the *SETUP: 02B LBCO Setting* menu item on page 21 for information on how to adjust the *LBCO* setting.
- **FAVS: F3 AC Input Amps** – This is the F3 default (FAVS #3). Refer to the *SETUP: 03A AC Input Amps* menu item on page 24 for information on how to adjust the *AC Input* setting.
- **FAVS: F4 Battery Type** – This is the F4 default (FAVS #4). Refer to the *SETUP: 03C Battery Type* menu item on page 26 for information on how to set the battery type.
- **FAVS: F5 Gen Control** – This is the F5 default (FAVS #5). Refer to the *CTRL: 03 Gen Control* menu on page 72 for information on how to use the *Gen Control* function.



Info: *F5 Gen Control* is a menu heading. It provides easy access to turn the generator on and off. If another menu item is saved in the F5 location, the only way to bring *Gen Control* back into the F5 location is to reset the remote to its factory defaults using the *TECH: 08 Load Defaults* menu (page 39).

3.2.2 CTRL (Control) Button and Menu

The CTRL button accesses the *01 ACIn Control*, *02 CHG Control*, *03 Gen Control* and *04 PT Control* menus.



Info: An AGS controller or PT charge controller must be connected in order for those device-specific menus under the *03 Gen Control* or *04 PT Control* settings to display, respectively—unless the *TECH: 07 Show all Menus* menu has been set to "YES". Refer to Section 3.2.5 for more information on the *TECH 07* menu. Otherwise, "No AGS Present" appears on the *03 Gen Control* screen and "No PT Present" appears on the *04 PT Control* screen when you press the SELECT knob from these menus.

The CTRL button gives you quick control of some of the main functions of the inverter/charger without having to access the SETUP button's menus in order to change the operation of the inverter/charger (generator and charge controller also if connected). Once the settings have been programmed in the SETUP menus, the features can then be enabled using the CTRL button.

Example: The *SETUP: 02C AC In - Time* setting is used to set what time of day (e.g., 12AM to 8AM) you want the inverter to connect to the incoming AC. Once the time is set, use the CTRL button to access the *Set ACIn Control* menu item and select *Time Connect*. When *Time Connect* is selected, the inverter/charger will only connect to AC when the time is between 12AM and 8AM.



Info: If a ME-ARC remote is connected to a parallel system with a ME-RTR, it acts like a 'display only' device with limited user controls. When the ME-ARC is directly connected to either the inverter or ME-RTR, the CTRL button function of the ME-ARC is defeated. The ME-ARC however, does contain the *03 Gen Control* selection in the FAVS menu. The generator can be controlled via the ME-ARC through the FAVS menu, but not through the CTRL menu.

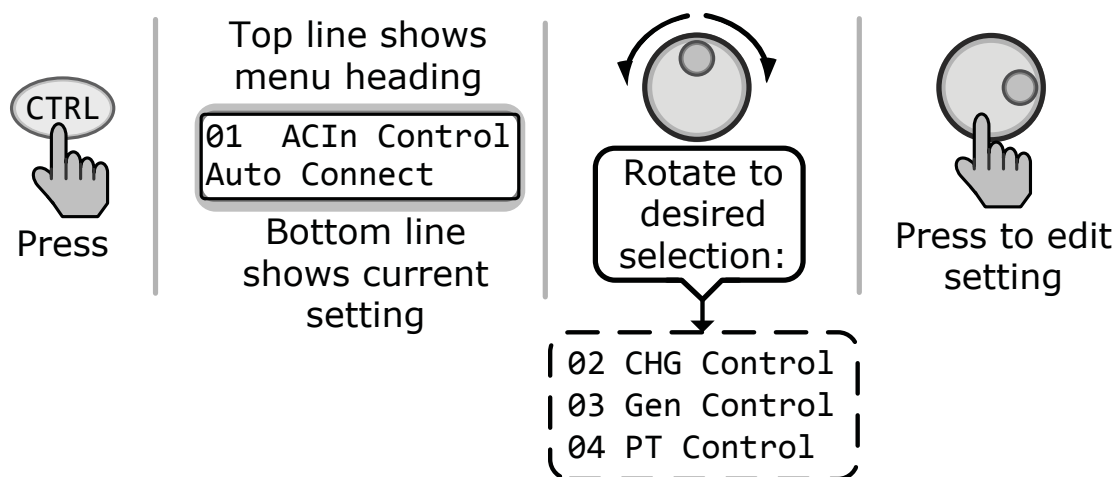


Figure 3-4, CTRL Button and Menu

Setup

CTRL: 01 ACIn Control

01 ACIn Control menu has four different conditions in which the inverter/charger will connect to an incoming AC power source. Only one may be selected at any one time—multiple conditions can be enabled, but only one can be active.



Info: Before the inverter allows the AC input to connect to the AC source (grid or generator), the incoming AC must be qualified by the inverter/charger (voltage is below the high AC input requirements, above the *SETUP: 03B VAC Dropout* setting, and between 50 Hz to 70 Hz for domestic models—40 to 60 Hz for export models).



Info: The top line of the LCD display alternates the inverter/charger status with a secondary AC IN status when AC is present (not connecting as a result of a selection made in the SETUP menu).

Example: AC is present, but *Time Connect* has been selected from the *01 ACIn Control* menu and the current time of day is 6PM. The SETUP menu's *02C AC In - Time* current setting is *2AM-8AM*. The current time of 6PM is outside the connect time, so the inverter/charger will not connect to the incoming AC until after 2AM. The primary status will display "*Inverting*" and the secondary status will display "*Time Connect*" to let you know the reason that incoming AC has not connected.

- **Auto Connect** – Automatically connects to incoming AC power when the incoming AC is qualified by the inverter/charger (voltage is below the high AC input requirements, above the *SETUP: 03B VAC Dropout* setting, and between 50 Hz to 70 Hz for domestic models—40 to 60 Hz for export models).



Info: The *Auto Connect* setting must be selected if the incoming AC source is a generator. There is no benefit from using the AC In Control feature if the AC source is from a generator—the generator power may not be available if an AC In feature is activated. Also, when the generator is turned on (autostarted or manually), it may be prevented from connecting because the criteria to allow the AC input to connect (AC In is based on time, VDC, or SOC) may not have been met.

Note: *This is true unless you are using an inverter that has two independent AC inputs—one for grid and the other for generator (i.e., MSH4024RE)—because the AC In Control features only work with the GRID IN (AC1) input.*

- **VDC Connect** – Only allows the incoming AC to connect when the DC battery voltage falls below the *Connect* volts setting in the SETUP menu's *02D AC In - VDC* menu item. Disconnects from incoming AC when the DC battery voltage rises above the *Disconnect* volts setting, also from the *02D AC In - VDC* menu. See SETUP menu *02D* for more information on the *Connect/Disconnect Volts* menu settings.
- **Time Connect** – Incoming AC only connects when the time of day is between the *Connect* and *Disconnect* time settings in the SETUP menu's *02C AC In - Time* menu item. See SETUP menu *02C* for more information on the *Set Connect/Disconnect* time menu settings.
- **SOC Connect** – Incoming AC only connects when the battery bank State of Charge (SOC) falls below the *Connect* SOC setting in the SETUP menu's *02E AC In - SOC* menu item. Disconnects from incoming AC when the battery bank SOC rises above the *Disconnect* SOC setting, also from the *02E AC In - SOC* menu. This feature requires the optional ME-BMK (battery monitor) to be installed. See SETUP menu *02E* for more information on the *Set Connect SOC* menu settings.
- **ACIn - Disabled** – Disconnects incoming AC when selected. This setting will prevent incoming AC from connecting to the inverter/charger.

CTRL: 02 CHG (Charge) Control

02 CHG Control enables you to set the charge mode to *Multi-Stage*, *Start Float*, or to *Start Bulk*. Generally, the charger should be left in the *Multi-Stage* setting, but to override this setting use the CTRL button and the *02 CHG Control* menu. The charger can be forced to start the Float or Bulk mode using the *Start Float* or *Start Bulk* settings from the *CTRL: 02 CHG Control* menu.



Info: If either *Start Float* or *Start Bulk* is selected and no AC is present or is qualifying, or the *CTRL: 01 AC In Control* menu is set to *AC In - Disabled*, the remote displays "AC Not Present".

- **Multi-Stage** – This selection causes the charger to automatically operate through the multi-stage (Bulk, Absorption, and Final Stage) charge cycles. When AC is connected and the charge mode begins¹, the inverter's battery voltage is monitored to determine the charging stage. If the battery voltage is low, the charger begins Bulk charging. If the DC voltage is high, the charger skips the Bulk/Absorb charge stages and goes directly to the final charge stage (Multi-Stage, Float, or Silent) as selected from the *SETUP: 03G Final Charge Stage* menu.

Note¹ – When AC is connected and the charge mode begins, if the 03C Battery Type is CC/CV the charger enters the Constant Current mode.

- **Start Float** – This selection restarts the Float charge cycle from any stage in the charge cycle as long as the charger is active.



Info: The *Start Float* selection automatically defaults back to the *Multi-Stage* setting once the inverter/charger status displays "Float Charging" (or "Silent" if battery type CC/CV is selected).



Info: When the battery type is CC/CV: the charger enters Silent mode if *Start Float* is selected; or, the charger enters Constant Current charge mode if *Hold CV Chg VDC* is selected.

- **Start Bulk** – This selection restarts the Bulk cycle from any stage in the charge cycle as long as AC is present and the charger is active. The *Start Bulk* setting is useful when a full multi-stage charge cycle does not bring the specific gravity of the batteries to the proper level.



Info: The *Start Bulk* selection automatically returns to *Multi-Stage* once the status displays "Bulk Charging" (or "Constant Current" if battery type CC/CV is selected).



Info: If the current charge mode is Bulk or Absorption, and then *Start Bulk* is selected, "Already in Bulk/Abs" displays on the remote.



Info: If battery type CC/CV is chosen and the charger is in Silent charge mode, the *Start Bulk* selection transfers the charger to Constant Current mode.



Info: If you have to continually restart the bulk cycle in order to bring the batteries to full charge, check the settings from the *SETUP: 03 Charger Setup* menu to ensure the batteries are fully charged at the end of a regular multi-stage charge cycle.



CAUTION: Frequently restarting the Bulk charge cycle may result in overcharging of the batteries.

CTRL: 03 Gen Control

03 Gen Control is used for controlling a standby generator that is connected to the system and you are using the optional ME-AGS-N controller. See Sections 7.1 and 7.2 for information on setting up the ME-AGS-N using the ME-ARC's SETUP and CTRL buttons.


CTRL: 04 PT Control


04 PT Control is used for controlling a charge controller that is connected to the system. See Sections 10.1 and 10.2 for information on setting up the PT charge controller using the ME-ARC's SETUP and CTRL buttons.


Setup

3.2.3 METER Button and Menu

The METER menu button gives you access to the various meters that determine the status of the inverter/charger and battery system (AGS, BMK, ACLD, and PT controller also if connected).

 **Info:** Depending on the inverter, some meter functions may not be accessible. Refer to Appendix A for more information.

 **Info:** Most displays automatically return to the remote's home screen five minutes after the last button push. When using the METER button, the selected menus continue to display and do not return to the remote's home screen.

 **Info:** Pressing the SELECT button once from anywhere within a METER button menu will return you to that menu's main meter display (Exception: *07H PT Data* menu).

Example: From the *03C Since Start* menu, press SELECT. The *03 Timers* menu displays.

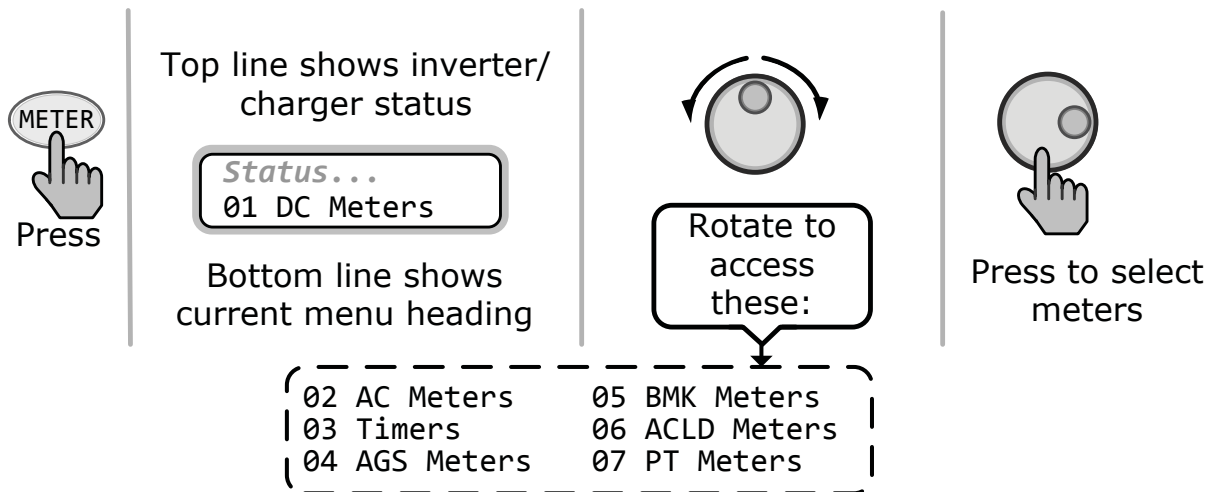


Figure 3-5, METER Button and Menu

METER: 01 DC Meters

DC Meters displays battery voltage and DC amps from the inverter/charger. Use these meters to monitor your battery bank.

- **01A DC Volts** – *DC Volts* provides the voltage from the battery bank connected to the inverter. Accuracy is $\pm 1.5\%$ with a 0.1 VDC resolution.
- **01B DC Amps** – The *DC Amps* meter displays the amount of current going in or out of the battery. A negative number shows the amount of current being removed from the battery. A positive number shows the amount of current delivered to the batteries. This meter converts AC amps to display DC amps, so the accuracy below one amp AC (~ 10 amps DC @ 12 VDC) is not detected. When the current detected is greater than one amp AC, the accuracy of this meter is $\pm 20\%$.

METER: 02 AC Meters

- **02A AC Output** – This meter provides the AC voltage measurement at the inverter's output terminals and the output frequency of the inverter (Hz). If inverting, this meter measures the inverter's output voltage. When in Standby mode, this meter measures the AC voltage that is passing through the inverter from the source (e.g., grid or generator), and displays the frequency of the incoming AC source (i.e., grid or generator) that is passing through the inverter to the inverter's output terminals.

MS-PAE Series (240 VAC output): Even though these inverters provide 240 volts, this meter displays the AC output voltage as a nominal 120-volt value. To calculate: add the voltage from each hot out (i.e., HOT 1 to NEUTRAL and HOT 2 to NEUTRAL) and divide by two.

- **02B Load Amps (MS-PAE, MS-PE and MSH models only)** – This meter displays the total AC current delivered to the loads on the inverter’s AC output terminals. A positive (+) *Load Amps* value indicates power is being pulled from the inverter to run an AC load—either using the batteries in Inverter mode, or from the AC input source in Standby mode.

When I look at the *Loads Amps* display on a remote, how is this value calculated?

For MSH Series inverters: *Load Amps* is determined by subtracting the input current value (*02C Input Amps*) from the current charging the battery (*02D Inv/Chg Amps*).

- ◇ Invert mode example: 0A (input amps) minus -10A (inverter amps) = 10A (load amps), see Figure 3-6. A load amps value of 10A means $10A \times 120V = 1200W$ load on the inverter.
- ◇ Standby mode example: 20A (input amps) minus 10A (charger amps) = 10A (load amps), see Figure 3-7. A load amps of 10A means $10A \times 120V = 1200W$ load on the inverter.
- ◇ Load Support mode example: 10A (input amps) minus -10A (inverter amps) = 20A (load amps), see Figure 3-8. A load amps of 20A means $20A \times 120V = 2400W$ load on the inverter.

For MS-PAE and MS-PE Series inverters: The *Load Amps* value is shown as 120VAC current, even though there may be 240VAC loads, and is calculated differently based on the mode.

- ◇ When in Inverter mode, the *Load Amps* value is the sum of all the 120V currents from both HOT 1 and HOT 2 outputs.

Example: If I have a 5A @ 120V load on the HOT 1 output, a 15A @ 120V load on the HOT 2 output, and a 2A @ 240V load on the HOT 1 and HOT 2 outputs; what would the *Load Amps* menu display? The display shows 24A, which is the 120V equivalent current. Calculated:

- AC1 to Neutral = 5A @ 120V
- AC2 to Neutral = 15A @ 120V
- AC1 to AC2 = 2A @ 240V (2A @ 120V + 2A @ 120V)

Load Amps value = add all 120V currents ($5A+15A+2A+2A=24A$), then, multiply sum by 120V load ($24A \times 120V = 2880W$).

- ◇ When in Standby mode, the *Load Amps* value is determined by subtracting the input current value (*02C Input Amps*) from the current charging the battery (*02D Inv/Chg Amps*).

Example: 20A (input amps) minus 10A (charger amps) = 10A (load amps). A *Load Amps* display of 10A means $10A \times 120V = 1200W$ load on the inverter.

- **02C Input Amps (MS-PAE, MS-PE and MSH models only)** – This meter displays the total AC amps being used by the inverter for charging and for any load connected to the output of the inverter. This meter value is always displayed as a positive (+) number.

Example: If the charger is delivering 20A to the battery from the AC source and the load connected to the inverter output is using another 10A, the combined load on the incoming AC source is 30A. So the *Input Amps* display would show 30A.

- **02D Inv/Chg Amps (MS-PAE, MS-PE and MSH models only)** – This menu displays the inverter or charger amps and is shown as an AC value. A negative (-) amps reading indicates the inverter is powering the inverter loads, and the batteries are discharging (inverter amps). A positive (+) amps reading indicates the inverter is using the AC input source to charge the batteries (charger amps).
- **02E Input AC1 (MSH models only)** – This menu displays the RMS value of the AC voltage at the inverter’s AC1 and NEUTRAL input terminals.
- **02F Input AC2 (MSH-RE models only)** – This menu displays the RMS value of the AC voltage at the inverter’s AC2 and NEUTRAL input terminals.



Info: If the *02F Input AC2* menu displays voltage (~ 50v), but the generator is off or nothing is connected to the AC2 input, the AC2 neutral-to-ground bond connection is not correct or not connected.

Setup

INVERT MODE

Current from the battery is used by the inverter to power the inverter's AC loads.

Example below:

- Current to inverter input (AC Input) = 0 Amps AC
- Current from battery (Inv/Chg Amps) = -10 Amps AC
- Current to power the AC loads (AC Load) = 10 Amps AC

02C Input Amps 0 Amps AC	02D Inv/Chg Amps -10 Amps AC
02B Load Amps 10 Amps AC	

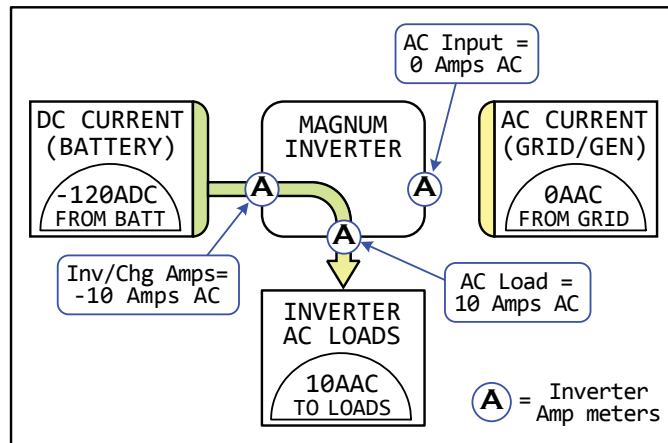


Figure 3-6, Current Flow – Inverter Mode

STANDBY MODE

Current from the grid/generator to the inverter's AC input is used to power the inverter's AC loads and to charge the battery.

Example below:

- Current to inverter input (AC Input) = 20 Amps AC
- Current to power the AC loads (AC Load) = 10 Amps AC
- Current to charge battery (Inv/Chg Amps) = 10 Amps AC

02C Input Amps 20 Amps AC	02B Load Amps 10 Amps AC
02D Inv/Chg Amps 10 Amps AC	

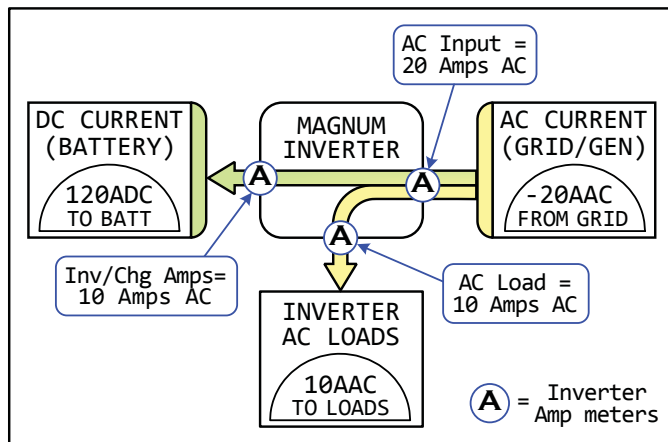


Figure 3-7, Current Flow – Standby Mode

LOAD SUPPORT MODE (MSH Series Only)

The MSH Series uses current from the battery to assist in powering the inverter's AC loads and to reduce the current from the grid/generator.

Example below:

- Current to inverter input (AC Input) = 10 Amps AC
- Current to power the AC loads (AC Load) = 20 Amps AC
- Current from battery (Inv/Chg Amps) = -10 Amps AC

02C Input Amps 10 Amps AC	02B Load Amps 20 Amps AC
02D Inv/Chg Amps -10 Amps AC	

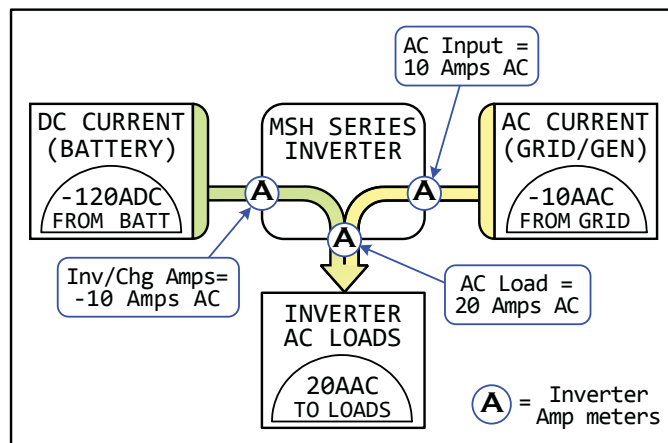


Figure 3-8, Current Flow – Load Support Mode

METER: 03 Timers

- **03A Charge Time** – This meter displays the total time the charger is holding the batteries at a high voltage level—defined as 0.2 volts greater than the float voltage setting. The timer counts when in the Bulk, Absorption, or Equalization charge stages (or in the Constant Current and Constant Voltage charge stages if *CC/CV* is selected under the *SETUP: 03C Battery Type* menu). The meter does not accumulate time when in Float, Charger Standby, Full, or Silent mode. The charge timer resets whenever the charge status goes to “Charging” (AC connected to inverter/charger), or the charger initiates another Bulk, EQ, or Constant Current charge cycle.



Info: The displayed *03A Charge Time* value is used by the Max Charge Time feature to determine when to display “Max Charge Time,” and to blink the CHG LED indicator.



Info: The Max Charge Time safety feature is set and enabled based on the battery type that is selected under the *SETUP: 03C Battery Type* menu:

- a) If battery type is *CC/CV* – the *Set Max CC/CV Time* setting is available once *Set CV Chg Done Time (or Amps)* is selected under the *SETUP: 03C Battery Type/CC/CV* menu.
 - b) If battery type is not ‘*CC/CV*’ – the *SETUP: 03F Max Charge Time* menu is available to set the maximum charge time.
- **03B Since Absorb Done** – This meter displays the number of days since the Absorption charge mode was completed. This menu resets to zero once an Absorb Done parameter is met as per the *SETUP: 03D Absorb Done Time, Amps, or SOC* settings.



Info: The *03B Since Absorb Done* timer also resets to zero if the Absorption charge mode is finished prematurely due to the starting of another charge mode—such as enabling a Start Float charge (using *CTRL: 02 CHG Control/Start Float*).

- **03C Since EQ Start** – This meter displays the number of days since the EQ charge mode has been enabled. This menu resets to zero once equalization has started. The *SETUP: 03H EQ Reminder Days* menu uses the time shown in this menu to determine when to indicate it is time to perform an Equalization charge to the batteries.

METER: 04 AGS Meters

Refer to Section 7.0 for detailed information on the AGS meter menus that are available from the ME-ARC remote’s METER button.

METER: 05 BMK Meters

Refer to Section 8.0 for detailed information on the BMK meter menus that are available from the ME-ARC remote’s METER button.

METER: 06 ACLD Meters

Refer to Section 9.0 for detailed information on the ACLD meter menus that are available from the ME-ARC remote’s METER button.

METER: 07 PT Meters

Refer to Section 10.0 for detailed information on the PT meter menus that are available from the ME-ARC remote’s METER button.

3.2.4 SETUP Button and Menus

Pressing the SETUP button provides access to menu items and settings that enable you to configure the ME-ARC, inverter/charger, ME-AGS-N, ME-BMK, ACLD, and the PT controller. Review each menu item to determine if you need to adjust any settings to meet your system requirements.



Info: The first screen that may appear when the SETUP button is pushed is a password screen. If the PIN has been set under the *TECH: 05 SETUP PIN* menu item, the first screen is the *Setup PIN* menu. The proper PIN must now be entered in order to access the SETUP menus. After five minutes from the last button push, the display automatically returns to the remote’s Home screen and the PIN must be reentered in order to access the SETUP menus. Refer to the *TECH: 05 SETUP PIN* section for more information.

Setup

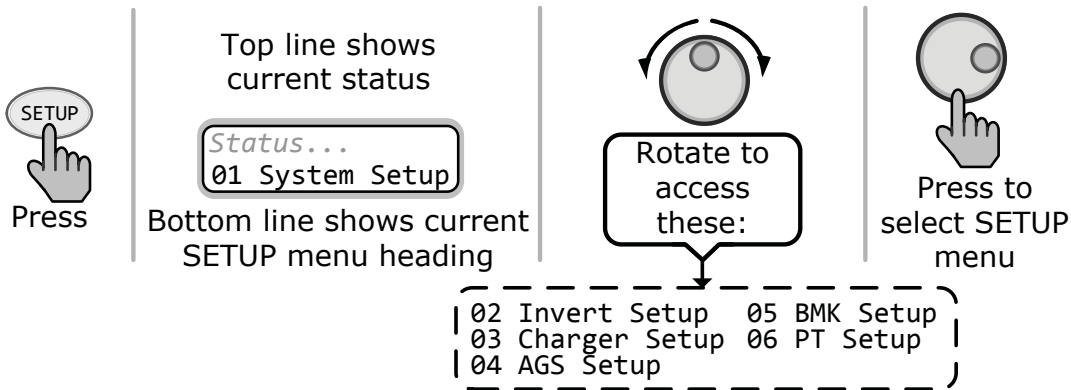


Figure 3-9, SETUP Button and Menu

SETUP: 01 System Setup

The following menus are used to set up the remote's screen and clock.

- **01A Set Clock** – The ME-ARC contains a real time clock that must be set for proper operation of some features. The features are: the *SETUP: 02C AC In-Time*, *04B Gen Run Time*, *04G Quiet Time*, *04H Gen Exercise* menu items, and the *TECH: 04 Fault History* menu item.

****IMPORTANT****

It is important that you set the clock as it is critical in effectively addressing fault issues, as well as for the proper start/stop functions of your AGS device and PT charge controller, if installed.



Info: The clock obtains power from the inverter and resets if the ME-ARC is disconnected from the inverter.

To set the current time:

From the *Set Clock* menu:

1. Rotate the SELECT knob to the correct *Hour* setting, and then press SELECT.
 2. Rotate the SELECT knob to the correct *Minute* setting, and then press SELECT.
 3. Rotate the SELECT knob to the appropriate *AM/PM* setting, and then press SELECT.
- **01B Screen Setup** – This setting enables you to adjust the contrast and brightness of the LCD screen, and to turn off the Power Save™ feature—or to select the time that determines when the display goes into Power Save mode.
Default setting: *Brightness = 50%, Contrast = 100%*
Range: *0-100% (10% increments)*
Default setting: *Pwr Save = 15 Min*
Range: *OFF, 1-60 Min (1-min. increments)*



Info: If DC power is lost to the router, the *01B Screen Setup* setting defaults back to the default settings (*Brightness = 50%, Contrast = 100%*).

What is the Power Save feature? The Power Save feature turns off the remote's LCD backlight and LEDs to conserve energy. The remote enters Power Save mode if there hasn't been a button press or fault message for a set period of time (per the *Pwr Save* setting). When in Power Save mode, the remote's LCD backlight and LEDs can be reactivated by pressing any button. If you have a fault during Power Save mode, the LCD backlight and the FAULT LED will come on and stay on as long as the fault is present.



Info: If you want the LCD backlight and the LED's to always be on (while communicating), turn the Power Save feature off by selecting *OFF* from the *Pwr Save* menu option.



Info: Pressing the SELECT knob causes the remote to exit Power Save mode. However, rotating the SELECT knob will not cause the remote to come out of Power Save mode.

- **01C Temp Display** – This menu item selects whether to display temperatures in Fahrenheit or Celsius. Once you select either Fahrenheit or Celsius, the following menu items will use your selection: the *METER: 04D AGS Temp* menu, the *SETUP: 04E Gen Run Temp* menu, and the *TECH: 01 Temperatures* menu.

Default setting: *Fahrenheit*
Range: *Fahrenheit, Celsius*
- **01D Max Charge Amps** – This menu setting is the maximum current allowed to charge the batteries during Bulk, Absorption, Float, and Equalize charging; and is provided to limit the charge amps.

Default setting: *Amps = 200 ADC*
Range: *OFF, 20-990 ADC*

Note: *If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 03C Battery Type menu.*
- **01E Link PT CHG Settings** – This menu is used to link the PT charging settings (*06A Battery Type* and *06D Absorb Done*) with the inverter's charger settings (*03C Battery Type* and *03D Absorb Done Time*). When linked, the inverter's charger settings are used to determine how the inverter/charger and the PT controller will charge the battery.

Default setting: *YES*
Range: *YES, NO*

Note: *If "YES" is selected, the link feature is enabled and the PT charging settings (06A Battery Type and 06D Absorb Done) display "Linked," and are locked and prevented from being adjusted.*

What is the Link feature? A method of managing common battery charging settings among multiple chargers (i.e., the inverter's charger and the PT controller). The link feature provides the ability to link charger settings and to manage/coordinate all charging devices from a system level perspective; or alternatively, to be unlinked and to allow individual charger device control.

Should I use the Link feature? By linking, you can avoid setting charge parameters that conflict and cause the separate chargers to work against each other. Linking allows access to charger settings in one location—making it easier to configure and to determine the charge settings. There is no need to worry about the other charger settings and how the chargers will behave.

Why turn the Link feature off? You might want to unlink when the inverter's charge voltage is not high enough and the higher PT controller charge voltage setting is required.

SETUP: 02 Invert Setup

The following menus are used to set up those functions that are only related to the inverting mode of the inverter/charger.

- **02A Search Watts** – Allows you to turn off the Search Watts feature, or to adjust the power level to determine when the inverter leaves Search mode. If this feature is not needed, select *OFF*. When search is turned off, the inverter continuously provides full AC voltage to the loads.

Default setting: *5 Watts*
Range: *OFF, 5-50 Watts (in one watt increments)*



Info: When the Search Watts feature is active, "Searching" appears on the top line of the LCD display and the green INV LED will slowly flash.

What is the Search Watts feature? This feature is used to help save battery power by reducing the inverter's output to search pulses when there is no detectable load. If a load greater than the wattage level setting turns on while the inverter is 'searching', the inverter will start 'inverting' to provide full voltage on its output.

Should I use the Search Watts feature? If the inverter can spend a great deal of time searching (to reduce the power drain on your batteries) and you can tolerate small loads (less than 5 watts) being off, then the Search Watts feature should be used. However, if some small loads (i.e., digital clocks, satellite receivers, answering machines, etc.,) are required to be on, then this feature should be turned off (*Set Search Watts = OFF*).

Setup

Where should I set Search Watts? The *Search Watts* setting should be adjusted to the same power level (or the next lower setting) of the smallest load that you plan to run. If you don't know the wattage of the smallest load, turn the switch for the load on and decrease the *Search Watts* setting until the load comes on and stays on.



Info: Even though the Search Watts feature is on, some connected equipment—even if they are off—may draw enough current to keep the inverter in Inverter mode (i.e., not "Searching").

- **02B LBCO Setting** – The *LBCO* menu (Low Battery Cut Out) sets the DC voltage level that turns off the inverter. This protects the batteries from over-discharge damage. If the battery voltage drops below the LBCO set-point continuously for more than one minute, the FAULT LED will come on, the inverter will turn off, and the display will show a "Low Battery" status. If the battery voltage falls below 8.5 volts (12-volt models), 17.0 volts (24-volt models), or 34.0 volts (48-volt models) the FAULT LED and low battery status indications will be immediate.

Default settings: 10.0 VDC (12v), 20.0 VDC (24v) or 40.0 VDC (48v)

Ranges: 9.0-12.2 VDC (12v), 18.0-24.4 VDC (24v), 36.0-48.8 VDC (48v)



Info: The inverter automatically begins inverting when the DC voltage increases to ≥ 12.5 VDC (12-volt models), ≥ 25.0 VDC (24-volt models), or ≥ 50.0 VDC (48-volt models). If AC power is available and connected to the inverter's input, the inverter automatically clears the low battery fault, passes the input AC power to the output, and begins charging the batteries.

Where should I set the LBCO setting? If your goal is to not discharge your batteries more than 20%*, then set the *LBCO* setting from 11.5 - 12.2 VDC (12-volt models), 23.0 - 24.4 VDC (24-volt models), or 46.0 - 48.8 VDC (48-volt models). In some applications, such as those installed in an off-grid home or when doing a lot of RV dry-camping, you may want to cycle down to 50%* by setting the LBCO from 10.0 to 11.4 VDC (12-volt models), 20.0 - 22.8 VDC (24-volt models) or 40.0 to 45.6 VDC (48-volt models). In extreme circumstances, you have the ability to discharge the batteries to 80%* by setting the LBCO to 9.0 or 9.5 VDC (12-volt models), 18.0 - 19.0 VDC (24-volt models), or 36.0 or 38.0 VDC (48-volt models) before recharging.

* *These are rough estimates. For accurate battery monitoring, use the ME-BMK battery monitor.*



Info: The higher the *LBCO* setting, the less the inverter discharges the batteries; which allows the batteries to have a longer life. The down side to a higher *LBCO* setting is that you need to charge more often to prevent the inverter from shutting off in Fault mode.

****IMPORTANT****

1. To use the *AC In* control settings (*AC In - Time*, *AC In - VDC*, and *AC In - SOC*), the AC source must always be connected and available for use at the inverter's AC input—such as utility power. There is no benefit from using the *AC In* control features if the AC source is from a generator, because the generator power may not be available when the *AC In* control feature becomes activated.
2. When an *AC In* control setting (*AC In - Time*, *AC In - VOC*, *AC In - SOC*) is established, that feature is active whether or not there is any AC power on the inverter's input. If no AC power is available, the inverter continues in Inverter mode. However, if AC power becomes available on the inverter's input after the connect setting (*Time*, *VDC*, or *SOC*) has been reached, the inverter continues to allow the incoming AC power to be connected and used until the disconnect setting is reached.
3. When using a dual source inverter/charger such as the MSH4024RE, the *AC In* control features only work with the GRID IN (AC1) input.

- **02C AC In - Time** – This feature allows you to connect to the local power utility at a predetermined time of day. When the current time falls within the set times, the inverter/charger connects to the AC that is connected to the AC input terminals. Once outside the set times, the inverter/charger disconnects from the AC source.
 - ◇ **Connect Time** – Determines what time each day the inverter/charger allows the incoming AC to connect and transfer the loads from the inverter’s battery power to the utility grid.
Default setting: 6:00 AM
Range: 12:00AM-11:45PM (15 min intervals)
 - ◇ **Disconnect Time** – Determines what time each day the inverter/charger disconnects from incoming AC and resumes powering the AC loads from the inverter’s battery power.
Default setting: 6:00 PM
Range: 12:00AM-11:45PM (15 min intervals)

What is the AC In - Time feature? This feature allows the incoming AC to connect to the inverter/charger and to charge the batteries only during the time of day as set in the *02C AC In - Time* menu item. Even if AC is present on the AC input terminals of the inverter/charger, it can only connect during those times previously set. The most common use of *AC In - Time* is when your local utility company offers peak rate savings (or “time of day billing”). The utility company offers the peak rate savings with a lower rate per KWH (kilo Watt hour)—usually available at night when there is less demand on the local utility grid. The AC In - Time feature may save you money by only connecting to the utility when rates are the least expensive.

Where should I set AC In - Time? Check with your local utility company or installer and see if they offer lower rates at particular times of the day. If a lower rate is offered, try setting your connect/disconnect times to coincide with the utility companies lower rates to save you money.

- **02D AC In - VDC** – These settings determine when the inverter/charger automatically connects and disconnects the incoming utility power (based on the inverter’s battery voltage).
 - ◇ **Connect Volts** – This setting determines at what DC voltage the inverter/charger connects to incoming AC and transfers the loads from the inverter battery power to the utility grid. The transfer occurs only if the battery voltage remains below this setting for 10 seconds.
Default settings: 11.0 VDC (12v), 22.0 VDC (24v), or 44.0 VDC (48v)
Ranges: 9.0-15.9 VDC (12v), 18.0-31.8 VDC (24v), 36.0-63.6 VDC (48v)
 - ◇ **Disconnect Volts** – Once the inverter has connected to the incoming AC—based on the VDC *Connect* setting—this setting determines at what DC voltage the inverter/charger disconnects from incoming AC and resumes powering the AC loads from the inverter’s battery.
Default settings: 14.1 VDC (12v), 28.2 VDC (24v), or 56.4 VDC (48v)
Ranges: 9.1-16.0 VDC (12v), 18.2-32.0 VDC (24v), 36.4-64.0 VDC (48v)



Info: The *02D AC In - VDC (Connect and Disconnect)* settings are not temperature compensated.



Info: If you have a ME-BMK battery monitor, use the AC In - SOC feature instead. The AC In - SOC feature takes temperature compensation into account and is a more accurate way to identify when your battery is discharged/charged—to determine when to transfer to/from utility power.

What is the AC In - VDC feature? This feature allows the inverter system to automatically switch between utility connected and standalone battery operation—based on the VDC voltage (i.e., battery) to the inverter. When using this feature, the inverter loads are powered from the battery—which is normally charged from an energy source such as solar, wind, and/or hydro. In the event the energy source cannot keep the battery voltage from falling, once the battery voltage drops to the *Connect* volts setting the inverter connects to the utility to continue powering the loads connected to the inverter’s output (and to charge the battery). When the energy source can again deliver enough power to raise the battery voltage to the *Disconnect* volts setting, the inverter disconnects from the utility and again powers the inverter loads from the battery.

Setup

Where should I set AC In - VDC? Check with your battery manufacturer to determine the correct settings for your batteries. Typically, manufacturers do not recommend discharging the batteries below 50% (i.e., a voltage setting of approximately 12.0-12.2 VDC, 24.0-24.4 VDC and 48-48.8 VDC for 12, 24, and 48-volt batteries, respectively). To protect the batteries from over-discharging, set to 12.2 VDC (12v), 24.4 VDC (24v), or 48.8 VDC (48v).

Set the disconnect voltage setting higher than the absorb voltage setting in order to reduce cycling of the system. A setting higher than the absorb voltage requires the energy source (solar, wind, etc.,) to raise the DC voltage above the charger settings. This ensures the battery gets at least an 80-85% charge (preferably 100%) before the AC is disconnected and the inverter resumes powering from the batteries.

- **02E AC In - SOC** – These settings determine when the inverter automatically connects/disconnects the incoming utility power based on the State of Charge (SOC) of the inverter's battery bank.

- ◆ **Connect SOC** – This setting determines at what battery SOC% the inverter/charger connects to incoming utility power and transfers the loads from the inverter battery power to the utility grid.

Default setting: 80% SOC

Range: 20-99%

- ◆ **Disconnect SOC** – Once the inverter has connected to the incoming AC—based on the SOC *Connect* setting—this setting determines at what battery SOC% the inverter/charger disconnects from incoming utility power and resumes powering the loads from the inverter's battery power.

Default setting: 100% SOC

Range: 21-100%



Info: If *Connect SOC* is selected and the incoming AC connects, the router issues a one-time "Start Bulk" command to the inverter/charger. This ensures the charger enters the Bulk/Absorb charge cycle regardless of battery voltage.



Info: The transfer to/from incoming AC occurs immediately when the *Connect SOC* or *Disconnect SOC* setting is reached.



Info: A ME-BMK is required in order to use the *02E AC In - SOC* setting. If this setting is established and there is no ME-BMK installed in the system, or if a valid SOC number is not displayed under the *METER: 05 BMK Meters/05B Battery SOC* menu (i.e., *Think'n*, *No Comm*, *Power-up Fault* and *Factory Fault* are not valid SOC numbers), then the inverter will not connect to the incoming AC power.

What is the AC In - SOC feature? This feature allows the inverter/charger system to automatically switch between utility connected and standalone battery operation based on the inverter's battery SOC (per the ME-BMK battery monitor). When using this feature, the inverter loads are normally powered from the battery and a solar array (or wind, and/or hydro). In the event the solar array cannot deliver enough power and the battery's SOC drops to the *Connect SOC* setting, the inverter connects to the utility to continue powering the loads connected to the inverter's output and to charge the battery. Once the solar array can again deliver enough power to charge the battery to the *Disconnect SOC* setting, the inverter disconnects from the utility and again powers the inverter loads from the battery.

Where should I set AC In - SOC? Check with your battery manufacturer to determine the correct settings for your batteries. For the *Connect SOC* setting, most manufacturers do not recommend discharging the batteries below 50% to maintain the life of the battery. Set the *Disconnect SOC* value to get at least an 80-85% charge (preferably 100%) before the AC is disconnected and the inverter resumes powering from the batteries.



Info: When using the *AC In - SOC* setting, ensure the *SETUP: 03D Absorb Done SOC* setting is higher than the *Disconnect SOC* setting or the inverter may not disconnect from the incoming AC because the battery may not be charged to a high enough SOC level to meet the *Disconnect SOC* setting.

Notes on using the AC In control settings based on VDC or SOC:

1. The *AC In - VDC* or *AC In - SOC* settings allow you to optimize the use of another energy source (i.e., solar, wind, and/or hydro), and only allow the use of the utility power when the energy source is not able to keep up with the load demands under normal conditions (i.e., cloudy day).
 2. The energy source should be sized to meet the daily power requirements of the loads being operated under normal conditions. Otherwise, the inverter would be connected to utility power most of the time, resulting in excessive energy consumption from the utility.
 3. The inverter system should not be configured for use in a utility back-up scenario. Otherwise, the battery may be in a highly discharged state when grid power goes down—preventing the critical loads from running during a power outage.
 4. The incoming AC is normally disconnected from the inverter. The *Connect* setting (VDC or SOC) must be reached before the inverter will allow the incoming AC to connect.
- **02F Power Up Always** – Forces the inverter to turn on when DC voltage to the inverter is applied. Allows the inverter to power up and provide AC power automatically once the battery is connected to the inverter.
Default setting: *OFF*
Range: *OFF, ON*

What is the Power Up Always feature? Normally, when DC power is connected to the inverter, the user is required to press the inverter's or the remote's power button to turn on the inverter. When this feature is activated by selecting "ON", the inverter is automatically turned on and starts searching or inverting—per the *SETUP: 02 Invert SETUP: 02A Search Watts* setting. Once the inverter has connected to DC power and is automatically turned on, the power button—on the inverter or remote—can be used to turn the inverter on or off.

Why use the Power Up Always feature? Uninterruptible Power Supplies (UPS) power-up automatically when DC power is connected. The Power Up Always feature can be used by customers that want to duplicate this automatic power-up functionality.

SETUP: 03 Charger Setup

- **03A AC Input Amps** – This setting ensures that the combined current draw from the battery charger and the AC loads does not exceed the maximum input current that is available from the incoming AC power. This setting is used to set that maximum input current level.
Whenever the incoming AC is connected and passing through the inverter, the current used to power the AC loads and charge the batteries is monitored. If this current begins to approach the *AC Input Amps* setting, the charger current is automatically reduced. This ensures the AC loads have all the available current from the incoming AC power when needed.
If using a MSH-M or MSH-RE (Hybrid) inverter, the AC input settings also determine when the battery current begins to operate in parallel with the incoming AC power to support the inverter loads (i.e., Load Support). The Load Support feature uses additional power from the inverter's battery to run loads greater than what the incoming AC power can run alone, and prioritizes the power of any external DC source (i.e., solar, wind, etc.,) over the incoming AC power to run inverter loads. For more information, see the Load Support Mode section in the MSH-M or MSH-RE Series owner's manual.

Setting for all models except MSH4024RE:

- ◇ **Set AC Input Amps**
Default setting: *30 Amps*
Ranges: *5-60 Amps (one amp increments)*

Settings for MSH4024RE:

- ◇ **Set AC Input Amps (AC1 and AC2)**
Default settings: *AC1=30 Amps, AC2=20 Amps*
Ranges: *5-60 Amps (one amp increments)*

Setup



CAUTION: Unless you have an MS Hybrid Series inverter/charger—which has the Load Support feature—the *AC Input Amps* setting only limits the current to the battery; it does not limit the current to the inverter loads. If the current from the loads on the output of the inverter is greater than the circuit breaker rating on the incoming AC source, you will experience nuisance tripping.

Where should I set AC Input Amps? This setting needs to be set differently depending on your inverter/charger model—as described below:

ME, MS, and RD Series: These models connect to a single AC source and have two inputs (HOT IN 1 and HOT IN 2), but the current is only monitored on HOT IN 1. On these models—when wired as a dual-in configuration or as a single-in configuration with only the HOT IN 1 connected—the *AC Input Amps* setting should be set to the size of the AC circuit breaker that feeds the HOT IN 1 input. On these models, when wired as a single-in configuration with HOT IN 1 and HOT IN 2 jumped together, set the *AC Input Amps* setting to half ($x\frac{1}{2}$) the input breaker size—as half the current will pass through HOT IN 1 and the other half through HOT IN 2 simultaneously.

MS-AE and MS-PAE Series: These models connect to a single AC source and have two inputs (HOT IN 1 & HOT IN 2), with the current monitored on both inputs at the same time. Since the input is from a single AC source, both of the input currents are added, then divided in half to determine the *AC Input Amps* setting. If the input breaker is a dual-pole (120/240 VAC input), set the *AC Input Amps* setting to the value of only one of the breaker poles (i.e., 30A dual-pole = 30A setting). If the input breaker is a single-pole (120 VAC input) and connected to only one input, set the *AC Input Amps* setting to one-half the input breaker size (i.e., 30A single-pole = 15A setting).

MS-E, MS-PE, MSH-M and RD-E Series: These models connect to a single AC source and have one input. Set the *AC Input Amps* setting to match the input AC circuit breaker size.

MSH-RE Series: These models can connect to two AC sources and have two inputs (AC1 & AC2), with the current monitored on each input separately. AC1 is set to the size of the utility breaker feeding the AC1 input, and the AC2 is set to the size of the gen's breaker feeding the AC2 input.

MM, MM-AE and MMS Series (and any export version of these models): These models do not monitor current on the input, therefore cannot benefit from the *AC Input Amps* setting or feature. On these models, even though the *AC Input Amps* setting may display and allow selection/adjustment, this setting will not do anything to reduce the battery charger current.



Info: If you are supplying two AC sources (utility and generator) to the inverter's single input through an AC transfer switch, adjust the *AC Input Amps* setting to the smaller AC circuit breaker size of the two AC sources.



Info: The *AC Input Amps* setting is dependent on the stability of the AC source. If using a generator, factors such as altitude and output voltage regulation may require a lower setting than the generator's circuit breaker size. For best performance, lower the *AC Input Amps* setting to 1/3 of the generator's rated capacity, and then while the generator is heavily loaded, gradually increase the setting as high as possible, but ensure the voltage level stays above the *03B VAC Dropout* setting.

- **03B VAC Dropout** – Selects the minimum AC voltage that must be present on the input before the inverter/charger connects to the AC input and switches from Inverter mode to Standby mode. This setting also determines the lowest AC voltage that is allowed before the charger disengages and the inverter (if enabled) resumes powering the AC loads from the inverter's battery power—to protect AC loads during utility outages.

Example: If the *VAC Dropout* setting is 60 VAC, then the AC input voltage must be above 60 volts before the inverter connects and switches from Inverter mode to Standby mode. Once the AC is connected, the AC voltage must drop below 60 VAC to switch back to Inverter mode.

Settings for all models except MSH4024RE:

◇ **Set VAC Dropout** (AC1 only) – Sets at what AC voltage—from the HOT IN 1 to NEUT IN 1 terminals—the inverter/charger will connect to or disengage from the incoming AC.

Default setting: 80 VAC (150 VAC for export models)

Range: 60-100 VAC, UPS Mode

Settings for MSH4024RE:

Info: The MSH4024RE is a dual input source inverter/charger having two independent AC source inputs (AC1/GRID and AC2/GEN) with independent *VAC Dropout* settings for each input. The *Set VAC Dropout* menu only displays both the *AC1* and *AC2* fields if the remote is connected to a MSH4024RE model.

◆ **Set VAC Dropout (AC1 and AC2)** – The *AC1* setting determines at what AC voltage—from the AC1 to NEUT terminals—the inverter/charger will connect to or disengage from the incoming AC. The *AC2* setting determines at what AC voltage—from the AC2 to NEUT terminals—the inverter/charger will connect to or disengage from the incoming AC.

Default setting: *AC1=80 VAC, AC2=70 VAC*

Range: *60-100 VAC, UPS Mode (AC1 only)*

Where do I set my VAC Dropout? It depends on the application and what you are using as the AC source. The settings not only look at the incoming voltage level to determine when to transfer, but also determine how quickly the charger disconnects and starts inverting based on the fluctuations of the incoming AC voltage.

Dropout = 60 VAC to 100VAC (Export inverter models: Dropout = 110 VAC to 190 VAC)

– Use a *VAC Dropout* setting from 60-100 VAC (export models use from 110-190 VAC) when the AC source may have fluctuations in RMS voltage. These settings attempt to prevent the charger from disengaging unnecessarily due to poor quality voltage, and are highly recommended if using a generator for charging. The transfer time from Standby mode to Inverter mode is >16 milliseconds when using these settings.

Dropout = UPS Mode – Use the *UPS Mode* setting when the AC source is well regulated above 105 VAC (200 VAC for export models), and the inverter loads are sensitive to voltage fluctuations. This setting is intolerant of voltage fluctuations and will provide a quick transfer. The transfer time from Standby mode to Inverter mode is ≤16 milliseconds when using this setting.

Note: *Do not use this setting if using a generator as your AC source.*



Info: If you get nuisance AC disconnects, either change the setting to 100 VAC or less (export models 190 VAC or less), or obtain a better voltage-regulated AC source.

- **03C Battery Type** – This setting selects the battery type, which determines the battery charge profile and ensures the batteries are receiving the proper charge voltage. The charge voltage settings are fixed when using the *GEL*, *Flooded*, *AGM1*, or *AGM2* selections, but can be adjusted if using the *CC/CV* or *Custom* selections.

Default setting: *Flooded*

Range: *AGM1, AGM2, Flooded, GEL, CC/CV, Custom*

◆ **Set Battery Type (GEL, Flooded, AGM1, or AGM2)** – When the battery type selection is *GEL* (for Gel batteries), *Flooded* (for liquid lead acid batteries), *AGM1* (for Lifeline AGM batteries), or *AGM2* (for East Penn/Deka/Discover/Trojan AGM batteries), the charge voltage level for the Absorption, Float, and EQ charge modes are fixed and shown in Table 3-1—depending on the battery type selected and the nominal inverter battery voltage.



Info: The voltage settings shown in Table 3-1 are based on the Battery Temperature Sensor (BTS) at a temperature of 77°F (25°C), or not connected. If the BTS is connected, the actual charge voltage will increase if the temperature around the BTS is below 77°F (25°C), and decrease if higher than 77°F (25°C). This ensures the batteries receive the correct charge voltage regardless of temperature.

Table 3-1, Battery Type to Charge Voltages (fixed voltage)

Battery Type	Inverter Voltage	Absorption Voltage	Float Voltage	Equalization Voltage
GEL	12 VDC	14.1 VDC	13.6 VDC	14.1 VDC ¹
	24 VDC	28.2 VDC	27.2 VDC	28.2 VDC ¹
	48 VDC	56.4 VDC	54.4 VDC	56.4 VDC ¹
Flooded	12 VDC	14.6 VDC	13.4 VDC	15.5 VDC
	24 VDC	29.2 VDC	26.8 VDC	31.0 VDC
	48 VDC	58.4 VDC	53.6 VDC	62.0 VDC
AGM 1 ²	12 VDC	14.3 VDC	13.1 VDC	15.5 VDC
	24 VDC	28.6 VDC	26.2 VDC	31.0 VDC
	48 VDC	57.2 VDC	52.4 VDC	62.0 VDC
AGM 2 ³	12 VDC	14.5 VDC	13.5 VDC	14.5 VDC ¹
	24 VDC	29.0 VDC	27.0 VDC	29.0 VDC ¹
	48 VDC	58.0 VDC	54.0 VDC	58.0 VDC ¹

Note¹: Voltage same as absorption voltage—to prevent equalization.

Note²: Charge voltages for Concord (Lifeline Series) AGM batteries.

Note³: Charge voltages for East Penn, Deka, Discover, and Trojan AGM batteries.

◆ **Set Battery Type (CC/CV)** – The CC/CV selection provides a Constant Current/Constant Voltage (CC/CV) charging method with an adjustable charge voltage and a setting that limits output current—if needed. It consolidates all the battery charge settings that are required for a 2-stage charging cycle (i.e., Constant Current and Constant Voltage).

Note: CC/CV settings only display if CC/CV has been selected from the 03 Battery Type menu.



Info: If CC/CV has been selected from the 03C Battery Type menu, the following menus are no longer accessible and display “CC/CV Controlled” when selected: 01D Max Charge Amps, 03D Absorb Done, 03F Max Charge Time, 03G Final Charge Stage, 03H EQ Reminder Days. This is to prevent charging conflicts that could occur while in the CC/CV profile.



CAUTION: Whenever the CC/CV battery type is selected, some settings—within the menus that are no longer accessible—are internally linked to the CC/CV settings and can be automatically changed. Because settings can be automatically changed once CC/CV has been selected, if a different battery type is selected all charge settings must be reviewed to ensure they are correct for the new battery type selection.

■ **Set Max Charge Amps** – Sets the maximum charge amperage allowed to charge the batteries during the CC/CV charge cycles. The range of settings are provided to limit the charge current to the battery bank, which helps prevent battery overheating caused by charging at too high a charge rate.

Default: 200 ADC

Range: 20 - 990 ADC

■ **Set CV Charge Volts** – Sets the voltage level at which the charger will hold the batteries during the Constant Voltage cycle.

Default: 13.8 VDC (12v), 27.6 VDC (24v), 55.2 VDC (48v)

Range: OFF, 12.0-16.0 VDC (12v), 24.0-32.0 VDC (24v), 48.0-64.0 VDC (48v)



Info: If the BMK (Battery Monitor Kit) is connected, the DC amps value determined by the BMK (under METER: 05D DC Amps-BMK) will be used by the CC/CV's Max Charge Amps setting instead of the inverter's DC calculated current (shown under METER: 01B DC Amps)—as it is more accurate (+/- .1 ADC).

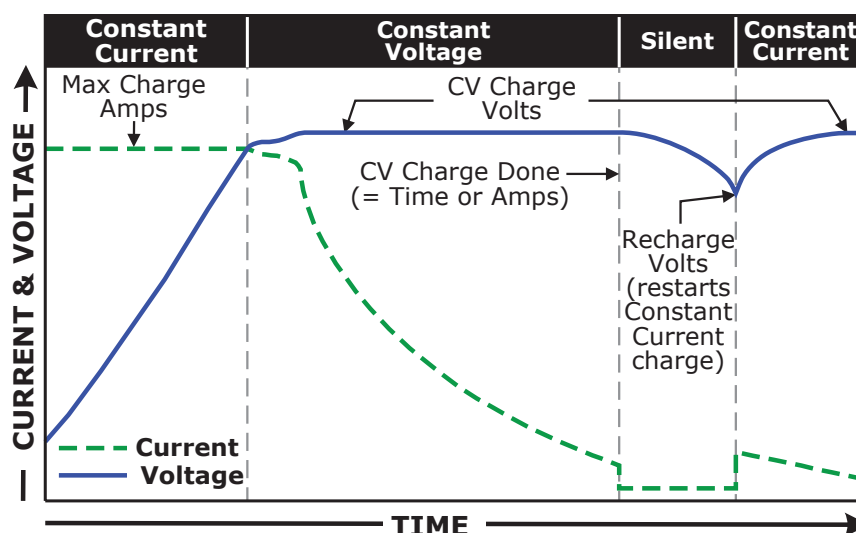


Figure 3-10, CV Charge Done Time/Amps Stages (INV/CHG)

✘ **Set CV Charge Done** – These selections determine when the second stage of charging (Constant Voltage) is finished. If using the *CV Chg Done Time* or *CV Chg Done Amps* selections, once the Constant Voltage charge cycle is finished, it transitions to a Silent charge stage. After entering the Silent charge mode, the charger automatically stops charging, but is still actively monitoring the battery voltage. The charger will remain “Silent” until the battery voltage drops to the *Set Recharge Volts* setting, at which time the charger will start another Constant Current/Constant Voltage charge cycle (see Figure 3-10).

Default: *CV Charge Done Time*

Range: *Time, Amps, Hold CV Chg VDC*

* **Set CV Chg Done Time** – The *CV Chg Done Time* selection is used when a specific time is selected to be the best solution for determining when the batteries are fully charged and the Constant Voltage stage needs to end. This setting determines how long the charger will hold the battery voltage at the *CV Charge Volts* setting—based on a set time period. When using time, the battery bank size will typically determine the length of the *CV Chg Done Time* setting. The larger the battery bank, the longer the time needed to ensure a full charge to the batteries. If the setting is from 0.1 to 25.5 hrs, the charger transitions to the Silent charge mode after the battery voltage has been at the charge voltage setting for the selected time. Refer to Table 3-2 to assist you in selecting the *CV Chg Done Time* setting based on the AHr capacity of your battery bank.

Note: *After choosing Set CV Chg Done Time, the Set Max CC/CV Time and Set Recharge Volts settings must be determined (see next page).*

Default: *2.0 Hrs*

Range: *0.1-25.5 Hrs*

* **Set CV Chg Done Amps** – The *CV Chg Done Amps* setting is used when the DC amperage supplied to the batteries (also known as “return amps”) determines when the batteries are fully charged and the Constant Voltage stage needs to end. This setting determines how long the charger will hold the battery voltage at the *CV Charge Volts* setting—based on a minimum current setting (i.e., return amps). During the Constant Voltage charge mode, as the battery charges, the current from the charger slowly decreases. When this current decreases below the *CV Chg Done Amps* setting, the charger transitions to the Silent charge stage. Most battery manufacturers use a specific formula to determine the return amps that indicate a full charge for their particular type of battery. The formula used by most manufacturers to absorb the batteries is $C/20$, where C =Battery Bank’s Total Amp Hours. Basically, they take approximately 5% of the total battery bank size and consider the battery totally charged when the charger’s return amps drops to this level.

Table 3-2, Battery Amp/Hrs Capacity to Suggested Absorb Time

Battery A/H Capacity	Suggested Absorb Time	Battery A/H Capacity	Suggested Absorb Time
200 to 300	1.0 Hrs	1310 to 1500	4.0 Hrs
310 to 500	1.5 Hrs	1510 to 1700	4.5 Hrs
510 to 700	2.0 Hrs	1710 to 1900	5.0 Hrs
710 to 900	2.5 Hrs	1910 to 2100	5.5 Hrs
910 to 1100	3.0 Hrs	2110 to 2300	6.0 Hrs
1110 to 1300	3.5 Hrs	2310 to 2500	6.5 Hrs

Continuing to charge past this level may overcharge the batteries. Check with your battery manufacturer to find out what the correct return amp settings are for your batteries.

Note: After choosing Set CV Chg Done Amps, the Set Max CC/CV Time and Set Recharge Volts settings must be determined (see below).

Default: 20 ADC

Range: 0-250 ADC



Info: Install a battery monitor if the *CV Chg Done Amps* setting is used. If a battery monitor is not installed, the *CV Chg Done Amps* setting relies on the *METER: 01B DC Amps* value to determine when to transfer out of the Constant Voltage charge mode. When a battery monitor kit (ME-BMK/ME-BMK-NS) is installed, the *CV Chg Done Amps* setting relies on the *METER: 05D DC Amps-BMK* value to determine when to transfer out of the Constant Voltage charge mode. This is the most accurate DC amperage measurement. The DC amps reading from the battery monitor is accurate to +/- .1 ADC.



Info: Setting *CV Chg Done Amps* to zero keeps the charger in Constant Voltage charge mode until the *Max CC/CV Time* setting is reached.



Info: When using the *CV Chg Done Amps* setting, the charger will stay in the Constant Voltage charge mode for a minimum of two minutes— independent of the actual *CV Chg Done Amps* setting.



Info: If DC loads are connected directly to the batteries, it is not recommended that you use the *CV Chg Done Amps* setting. DC loads cause the charger to increase the amperage delivered to the battery bank in order to charge the batteries and to run the DC loads. This scenario could result in overcharging the batteries since the return amps reading will be skewed by the DC loads.

- **Set Max CC/CV Time** – This setting is a safety feature that ensures abnormal conditions do not cause the charger to hold batteries at a high voltage for a prolonged period of time. This menu sets a maximum time the charger is allowed to operate in either the Constant Current or Constant Voltage charge modes. If the charger reaches the *Max CC/CV Time* setting, it will transition to the Silent charge stage. The *OFF* selection can be used if there is an application where 25.5 hrs is not long enough.

Default: 12.0 Hrs

Range: OFF, 0.1-25.5 Hrs



CAUTION: If using "OFF", the batteries can be held at a high voltage for an extended time. Monitor the batteries to ensure they are not overcharged.

- **Set Recharge Volts** – This setting determines the DC voltage set-point to which the batteries are allowed to fall—while the charger is in the Silent charge cycle—before the charger restarts and recharges to the *CV Charge Volts* setting. This setting should be at the lowest DC volts level that you want the batteries to fall before starting a new charge.

Default: 12.0 VDC (12v), 24.0 VDC (24v), 48.0 VDC (48v)

Range: 12.0-16.0 VDC (12v), 24.0-32.0 VDC (24v), 48.0-64.0 VDC (48v)

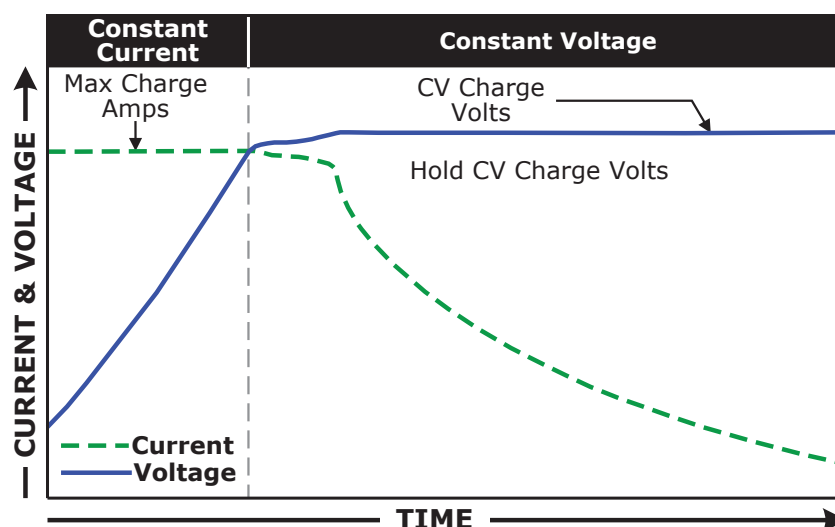


Figure 3-11, Hold CV Chg VDC Charge Stages (INV/CHG)

* **Hold CV Chg VDC** – This setting holds the battery voltage at the *CV Charge Volts* setting. This is for a system that requires a constant charge voltage to be present at all times (see Figure 3-11).

◇ **Set Battery Type (Custom)** – This selection allows you to individually adjust the Float, Absorb, and Equalization charge voltage settings and to set an equalization time for your batteries. The following Custom battery settings display only if *Custom* has been selected from the *03 Battery Type* menu. Use these settings to determine the battery's absorption, float, and equalization voltages, and the maximum amount of time spent equalizing.



CAUTION: To avoid damage during battery charging or equalization, consult the battery manufacturer to ensure the best charge settings are used for your type of batteries.

■ **Absorb Volts** – Sets the level at which the charging voltage is held constant during an Absorption cycle.

Default: 14.4V (12v), 28.8V (24v), 57.6V (48v)

Range: 12.0-16.0V (12v), 24.0-32.0V (24v), 48.0-64.0V (48v)

■ **Float Volts** – Sets the level at which the charging voltage is held constant during a Float cycle.

Default: 13.2V (12v), 26.4V (24v), 52.8V (48v)

Range: 12.0-16.0V (12v), 24.0-32.0V (24v), 48.0-64.0V (48v)

■ **EQ Volts** – Sets the level at which the charging voltage is held constant during an Equalization cycle.

Note: The EQ Volts setting cannot be set lower than the Absorb Volts setting, or more than 2 volts (12v systems), 4 volts (24v systems), or 8 volts (48v systems) above the Absorb Volts setting.

Default: 15.6V (12v), 31.2V (24v), 62.4V (48v)

Range: 12.0-16.0V (12v), 24.0-32.0V (24v), 48.0-64.0V (48v)

■ **EQ Done Time** – Sets the time (duration) the battery will charge at the EQ Volts setting.

Default: 4.0 Hrs

Range: 0.1-25.5 Hrs



Info: The timer for the EQ Done Time setting: a) Counts when EQ is enabled and the voltage is close to the EQ Volts setting ($\leq 0.1\text{v}/12\text{-volt}$ systems, $\leq 0.2\text{v}/24\text{-volt}$ systems, or $\leq 0.4\text{v}/48\text{-volt}$ systems); b) Pauses when in Charger Standby; c) Clears when EQ is finished, the battery goes to Bulk/Absorb or Float, or EQ is stopped.

Setup

- **03D Absorb Done (Time, Amps, SOC)** – This setting identifies whether time, amps, or SOC are used to determine when the second stage of battery charging (Absorption) is finished. The charge cycle transitions to the final charge stage (*03G Final Charge Stage*) afterwards. Absorption is the second stage of the charge process that attempts to fully charge the batteries.

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 03C Battery Type menu.



Info: If the Absorption stage is short or terminated, the batteries may not receive a full charge. In contrast, if the Absorption stage is too long the batteries may be overcharged. Either scenario may lead to damage to the batteries. Contact your battery manufacturer to ensure the best charge settings are used for your type of batteries.

- ◇ **Set Absorb Done Time** – *Absorb Done Time* is used when a specific time is determined to be best for ending the Absorption stage. When using time, the battery bank size typically determines the length of the *Absorb Done Time* setting. The larger the battery bank, the longer the absorption time needed to ensure a full charge to the batteries. Taking specific gravity readings of the batteries and adjusting the absorption time may be needed in order to obtain the appropriate absorb time for your battery type and battery bank size. See Table 3-2 to help select the *Absorb Done Time* setting based on the AHr capacity of your battery bank.

Default setting: 2.0 Hrs

Range: 0.1-25.5 Hrs



Info: This setting's range is dependent on the inverter's compatibility level (Appendix A). Inverters with a compatibility level of 4.0 or greater, the available range is 0.1-25.5 hours. However, if the inverter compatibility level is less than 4.0—even though you can adjust the setting from 0.1-25.5 hours—the available range may not be recognized by the inverter and will cause the charger to revert to the default setting of 2.0 hours.

- ◇ **Set Absorb Done Amps** – This setting is used when the DC amperage supplied to the batteries (also known as "return amps") is used to determine when the batteries are fully charged. During Absorb charge mode—as the battery charges—the current required by the battery decreases. When the return amps decreases below the *Absorb Done Amps* setting for two minutes, the charger transfers from the Absorption charge cycle to the final charge stage (see *03G Final Charge Stage*). Most battery manufacturers use a specific formula to determine the return amps that indicate a full charge for their particular type of battery. The formula used by most manufacturers to absorb the batteries is $C/20$, where C =Battery Bank's Total Amp Hours. Basically, they take approximately 5% of the total battery bank size, and consider the battery totally charged when the charger's return amps drops to this level. Continuing to charge past this level may possibly overcharge the batteries. Check with your battery manufacturer to find out what the correct return amp settings are for your batteries.

Default setting: 20 ADC

Range: 0-250 ADC



Info: Setting the *Absorb Done Amps* value to 0 (zero) keeps the charger in the Absorb charge mode until the *03F Max Charge Time* setting is reached (if no BMK installed).



Info: When using *Absorb Done Amps*, the charger stays in the Absorption charge mode for a minimum of two minutes— independent of the actual *Absorb Done Amps* setting.



Info: If DC loads are connected directly to the batteries and a Magnum battery monitor is not installed, the *Absorb Done Amps* setting should not be used. To charge the batteries—plus run the DC loads—the charger must increase the current delivered to the battery bank. This may result in overcharging the batteries since the return amps reading will be skewed by the DC loads.



Info: It is highly suggested that you install a battery monitor if the *Absorb Done Amps* setting is used. If a battery monitor is not installed, the *Absorb Done Amps* setting relies on the *METER: 01B DC Amps* value to determine when to transfer out of the Absorption charge mode. This is the most accurate DC amperage measurement.

◆ **Set Absorb Done (SOC)** – This setting can be used if a battery monitor kit is installed and you want to use the SOC (State of Charge) of the battery bank to determine when the batteries are fully charged. During the Absorption charge mode, once the *METER: 05B Battery SOC* menu reaches the *Absorb Done SOC* setting, the charger transfers to the final charge stage (see *03G Final Charge Stage*).

Note: *The SOC is the best way to determine when the batteries are fully charged, and is helpful because any DC loads or other charge sources connected to the battery bank will not affect the SOC reading.*

Default setting: 100%

Range: 50-100%



Info: A ME-BMK is required in order to use the *Absorb Done SOC* setting. If a *Absorb Done SOC* setting is selected and there is no ME-BMK installed in the system, or if a valid SOC number is not displayed under the *METER: 05B Battery SOC* menu (i.e., *Think'n*, *No Comm*, *Power-up Fault*, or *Factory Fault* are not valid SOC numbers), then the inverter/charger will not connect to the incoming AC input.



Info: If the *Absorb Done SOC* setting is used when charging from a generator source, then it is recommended that a setting of less than 100% be used (usually around 90% is acceptable). Running the generator higher than the 90% setting is sometimes considered an inefficient use of fuel. However, if a setting lower than 100% is used, then at least once a week the batteries should be charged to 100% to ensure damage is not done to the batteries by not bringing them to a full charge state.



Info: If the *Absorb Done SOC* setting is active, the charger will go into Bulk charge mode each time AC is connected.

- **03E Max Charge Rate** – This setting is the maximum charge rate allowed to charge the batteries during Bulk, Absorption, Float, and Equalize charging; and is provided to limit the charge rate to the battery bank to prevent battery overheating caused by charging at too high a charge rate. A 100% setting uses the maximum charging capability of the inverter/charger to charge the batteries if needed, while a 0% setting minimizes the charging current while continuing to allow pass-thru current.

The *Max Charge Rate* setting is provided as a percentage of the inverter/charger's maximum charging capability. Refer to the label on the side of the inverter (or owner's manual) to determine the inverter's maximum charge rate. See the example below for information on how to determine your inverter's *Max Charge Rate* setting.

Default setting: 100%

Range: 0-100%

Example: The max charge rate of the inverter/charger is 120 amps and you need to limit the charge rate to 72 amps. Choose a *Max Charge Rate* = 60% (i.e., 72 amps = 60% of 120 amps).



Info: If the *Maximum Charge Rate* setting is 0%, the topology of the Magnum inverter (when connected to an AC source) overrides the 0% setting and starts charging if the battery voltage is: <12 VDC (12-volt models), <22 VDC (24-volt models), or <44 VDC (48-volt models).

How do I determine where to set my Maximum Charge Rate? Generally, set to a C/5* rate (C = the total AH capacity of the battery bank – using the 20-hour AH rate). The C/5 rate is usually used when the objective is to quickly charge the batteries (i.e., 400 AH ÷ 5 = 80 amp max charge rate). A lower rate such as C/20* is used when the batteries need to be charged as slowly.

* C/5 or C/20 rate – charge rates are commonly expressed as a ratio of the total amp-hour (AH) capacity of the battery bank. For example, with a 400 AH battery bank (C = 400), the C/5 charge rate is 80 A (400/5 = 80 A).

Setup



CAUTION: The C/5 or C/20 charge rate settings are not requirements on how to set your battery charge rate. For specific charge rate requirements, refer to your battery manufacturer.



CAUTION: If multiple inverter/chargers are used on a single battery bank, ensure that the total charge rate from all inverter/chargers is limited to the maximum charge rate needed for your battery bank. The *Max Charge Rate* setting only limits the charging on each inverter/charger individually, not on all inverter/chargers.

- **03F Max Charge Time** – This setting is a safety feature that ensures abnormal conditions will not cause the charger to hold batteries at a high voltage for a prolonged period of time. This menu sets a maximum time the charger is allowed to operate in either the Bulk, Absorption, or Equalization charge modes. If the charger reaches the maximum charge time setting, it will transition to the final charge stage as set in the *SETUP: 03G Final Charge Stage* menu. The "OFF" selection can be used if there is an application where 25.5 hrs is not long enough.

Default setting: 12.0 Hrs

Range: OFF, 0.1-25.5 Hrs

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 03C Battery Type menu.



CAUTION: If using "OFF", the batteries can be held at a high voltage for an extended time. Monitor the batteries to ensure they are not overcharged.



Info: If the time the charger has been in Bulk, Absorption, or EQ charge modes exceeds the *Max Charge Time* setting, the ME-ARC's CHG LED blinks and "Max Charge Time" scrolls across the LCD display.



Info: The Max Charge Time safety feature uses the time accumulated under the *METER: 03A Charge Time* display to determine how long the charger has been in the Bulk, Absorption, or EQ charge modes.

Where should I set my Max Charge Time? To ensure a complete charge cycle is accomplished, adjust the *Max Charge Time* setting to a time period that will normally be longer than the settings in the following SETUP menu items: *03D Absorb Done Time/Amps/SOC*. The *Max Charge Time* setting has priority over these menus and will stop the charge cycle once that setting is satisfied.

Example: The *Max Charge Time* setting is 6 hours, but the *Absorb Done Time* setting is 8 hours. After six hours in the Absorption charge cycle, the charger transitions to the final charge stage.

- **03G Final Charge Stage** – This setting determines what charge stage(s) occurs after the Absorption Charge stage has finished.

Default setting: Multi

Range: Multi, Float, Silent

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 03C Battery Type menu.

◆ **Set Final Charge Stage = Multi** – The *Multi* setting (which is short for "Multi-Stage"), transitions from the Absorption charge stage to the Float charge stage. Once in the Float stage for four hours with no DC load on the batteries, the charger will enter the Full Charge stage (i.e., Battery Saver mode). In Full Charge mode, the charger automatically stops charging but is still on and actively monitoring the battery voltage. The charger will remain in the Full Charge stage until the battery voltage drops below 12.7 VDC for 12-volt batteries, 25.4 VDC for 24-volt batteries, and 50.8 VDC for 48-volt batteries—at which time it will return to the Float stage. The charger will continue to cycle between Float and Full Charge as long as incoming AC is available. See Figure 3-12.

Note: These battery voltages are the fully charged voltages of a battery at rest.

Final Charge Stage: Multi-Stage

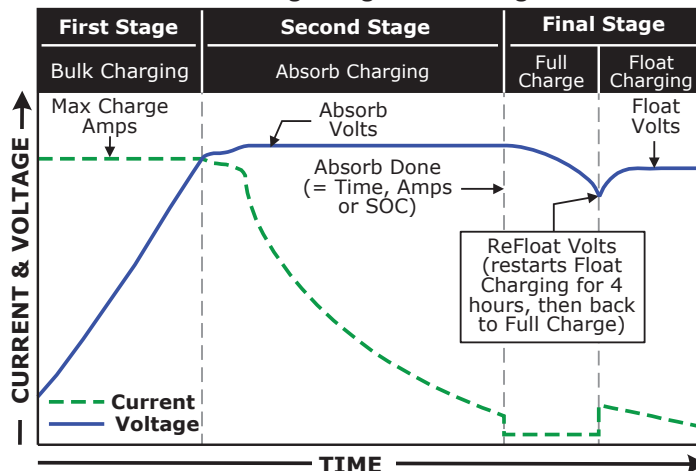


Figure 3-12, Final Charge Stage – Multi-Stage

Final Charge Stage: Float

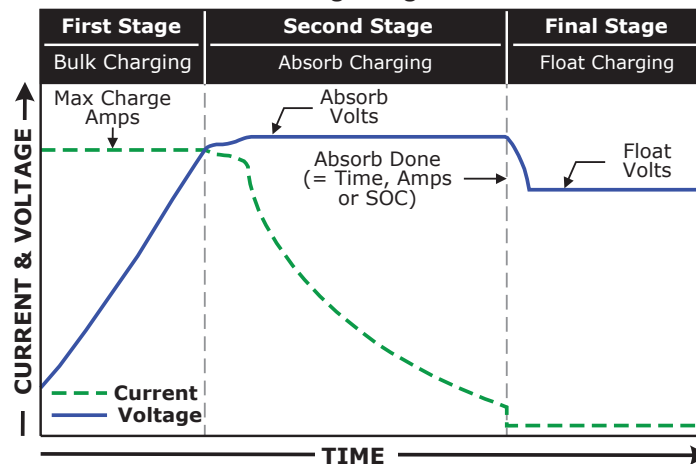


Figure 3-13, Final Charge Stage – Float

Final Charge Stage: Silent

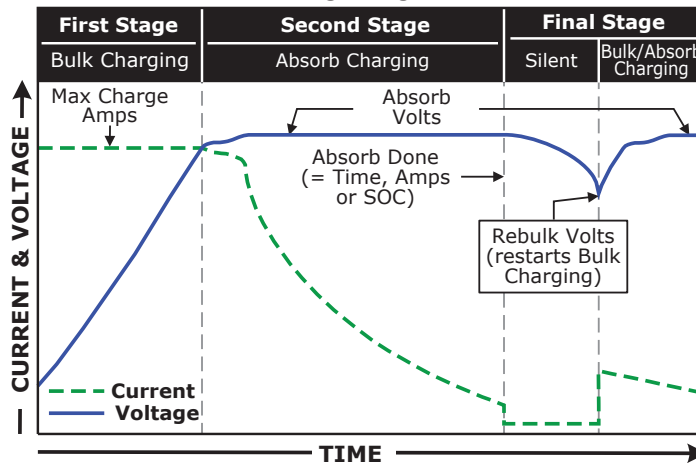


Figure 3-14, Final Charge Stage – Silent

Setup



Info: When *Multi* is selected and the charger goes to Full charge mode, if another charge source (such as PV or wind) is charging the batteries above the fully charged voltage, the charger will remain in the Full Charge stage.

Why should I use Multi? Multi is the most commonly used charge mode. It is suitable for most applications and assures a full charge to the batteries, without overcharging. If there is another alternate charge source charging the batteries (PV, wind or hydro), then Multi mode uses the inverter/charger to complete a full charge. The inverter/charger transitions to Full Charge mode and the alternate charge source then maintains the battery voltage. If the alternate source is unable to maintain the voltage, the charger enters Float mode for another 4-hour period. The Full Charge feature in the Multi mode also helps reduce water consumption in flooded batteries when they are left in charge mode for extended periods, such as in a backup power application.

◆ **Set Final Charge Stage = Float** – The Float stage is a maintenance charge mode that maintains a constant voltage—while delivering up to the maximum rated current of the charger in order to power any DC loads connected to the batteries. Most 3-stage chargers finish the charge mode in Float, and remain in Float as long as an AC source is available on the input of the charger. The float voltage is determined by the battery type selected in the *03C Battery Type* menu. Unlike Multi mode, in Float mode there is no Full Charge feature. See Figure 3-13.

Why should I use the Float Charge Stage? Float mode is typically used when the charger is the only charge source connected to the batteries. This mode will maintain the batteries at the float voltage. If using flooded batteries and the charger is in float for an extended period, the water level should be checked every two to three weeks for proper levels.

◆ **Set Final Charge Stage = Silent** – The charger stops charging once it transitions to 'Silent'. Normally, the charger enters Silent mode after the Absorption charge mode has finished. Once the charger enters the Silent mode, the battery voltage is continuously monitored. If the batteries fall to the *Set Rebulk Volts* value, the charger restarts the Bulk charge mode and then transitions to Absorb charge mode. After the Absorb charge mode, the charger again transitions to Silent mode. This Silent to Rebulk to Absorb and back to Silent cycle will continue as long as it is required. See Figure 3-14.

■ **Set ReBulk Volts** – When *Silent* mode is selected, you must also set the DC voltage set-point where the charger restarts the Bulk charge mode. This setting should be slightly above the lowest DC volts to which you want the batteries to fall. Typically, the lowest DC volts to which the batteries are allowed to fall is 12.0 to 12.2 VDC (12-volt systems), 24.0 to 24.4 VDC (24-volt systems), and 48.0 to 48.8 VDC (48-volt systems), respectively.

Default setting: 12.0 VDC (12V), 24.0 VDC (24v), 48.0 VDC (48v)

Ranges: 12.0-16.0 VDC (12v), 24.0-32.0 VDC (24v), 48.0-64.0 VDC (48v)

Why should I use the Silent Stage? Silent mode is typically used when an alternate charge source is available and able to fully charge or finish the charge cycle after the Absorb stage. A major difference between Multi mode and Silent mode is that the Silent mode returns to Bulk mode instead of Float mode. In Silent mode, you can also adjust the Rebulk set-point in order to allow the alternate charge source to provide more of the battery charging.

- **03H EQ Reminder Days:** This menu sets the number of days that must pass before the remote will remind you to equalize your batteries.

Default setting: OFF

Range: OFF, 1-255 Days

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 03C Battery Type menu.



Info: Once equalizing begins, the *METER: 03C Since EQ Start* timer resets to zero days.

SETUP: 04 AGS Setup/SETUP: 05 BMK Setup/SETUP: 06 PT Setup

Refer to Sections 7.0, 8.0, and 10.0 respectively for detailed information on the AGS/BMK/PT SETUP menus that are available from the ME-ARC remote's SETUP button.

3.2.5 TECH Button and Menu

The TECH menu button provides access to selections that are used to assist service technicians in troubleshooting. It also provides access to system information along with a selection that allows all system settings to be returned to their original factory default values. See Figure 3-15 below.

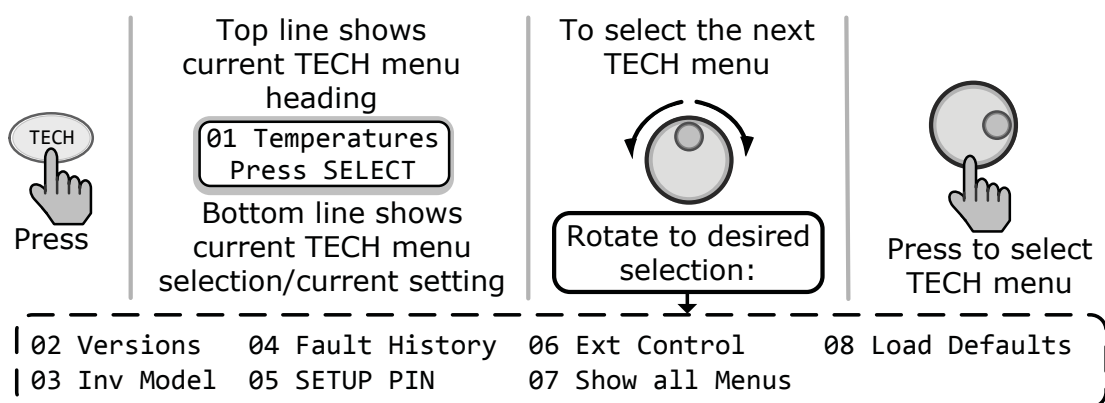


Figure 3-15, TECH Button and Menu

TECH: 01 Temperatures

Displays the various temperatures measured throughout the system. Rotate the SELECT knob to scroll through the various meters to view the following temperature displays:

- **Inv BTS** – Displays the temperature of the inverter’s Battery Temp Sensor (BTS) that is connected to the battery bank.
Note: If a BTS is open, shorted, or not installed, there is no temperature compensation applied to the battery charging voltage.
- **Inv Tfmer** – Displays the temperature of the main power transformer inside the inverter.
- **Inv FETs** – Displays the temperature of the inverter’s internal FETs (Field Effect Transistors).
- **AGS Sensor** – Displays the temperature of the AGS Temp Sensor plugged into the REMOTE port on the AGS controller (taken from *METER: 04D AGS Temp* display).
- **ACLD Temp** – Displays the temperature of the ACLD load diversion controller (taken from *METER: 06C ACLD Temp* display).
- **PT BTS** – Displays the temperature of the BTS that is connected to the PT controller.
Note: Shows 152°C (305°F) if no BTS is detected, and 151°C (304°F) if a shorted BTS is detected; in either situation (open or shorted BTS), there is no temperature compensation applied to the battery charging voltage.
- **PT FETs** – Displays the temperature of the PT controller’s FETs (Field Effect Transistors).
- **PT Inductor** – Displays the PT controller’s internal inductor temperature.



Info: The temperatures are displayed in Fahrenheit or Celsius, as selected in the *SETUP: 01C Temp Display* menu.

TECH: 02 Versions

Displays the versions of those devices that are connected to the Magnum network. Rotate the SELECT knob to scroll through the versions. The following devices display versions (if connected to the remote): inverter, remote, AGS, BMK, router, ACLD, and PT controller.



Info: The BMK, AGS, and any remote accessories may display a “0.0” version. Either the accessory is not installed, there is no communication because of a bad or miswired network cable, the device is not powered, or the device is bad.

If the ME-ARC is connected to a router (ME-RTR), the router version will be displayed, but not all functions of the ME-ARC will be available. The ME-ARC has limited functions as a second remote connected to a router. Refer to the ME-RTR Owner’s Manual (PN: 64-0020) for a complete list of active menus when the ME-ARC is connected to a router.

Setup

TECH: 03 Inv Model

Displays the model number of the connected Magnum inverter.



Info: When the *03 Inv Model* menu item displays “Unknown”, the remote is unable to determine the inverter model. This happens when the remote is connected to a later/newer inverter model not recognized by an older remote. All remote menu selections and features that are available in the inverter will function normally.



Info: When an inverter is stacked in parallel or series, a stacking indication follows the model number. The indication will identify the following stacking conditions: “PM” – Parallel Master; “PS” – Parallel Slave; “SM” – Series Master; “SS” – Series Slave.

TECH: 04 Fault History

These menus display a history of any inverter, AGS, and PT controller faults, and provide a way to clear all recorded fault history.



Info: All recorded fault history displays will be retained (except for the day the fault occurred), even if power is removed from the remote. If no fault history is recorded, the display shows “No Fault History”.

- **04A Inv Faults** – This menu displays a history of the last nine inverter/charger faults. Information for each fault displays from the most recent fault (H1) to the earliest/past recorded faults (H2 up to H9). Refer to Figure 3-16.

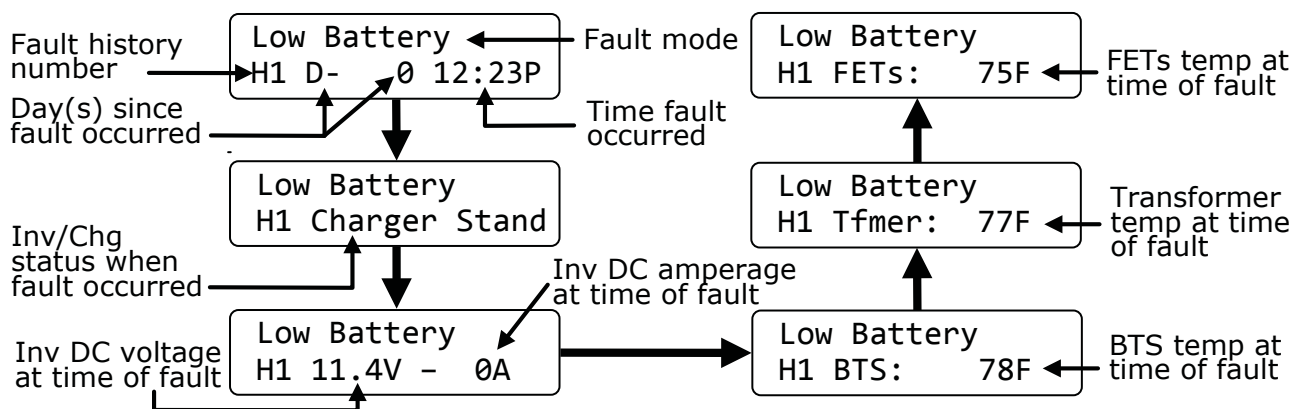


Figure 3-16, Inverter Fault History Screens

The top line of each inverter fault screen displays the inverter fault mode. The bottom line of the first inverter fault screen displays the fault history number, the number of days since this fault occurred, and the time this fault occurred. Rotate the SELECT knob to display additional readings for this particular fault history number (series of six screens for each fault). The following information displays (in order) on the subsequent inverter fault history screens: status of the inverter or charger as the fault occurred, DC voltage at the time of this fault, DC amperage at the time of this fault, and temperatures of the BTS, transformer, and FETs at the time of this fault.

Continue to rotate the SELECT knob to display earlier faults (as applicable).

- **04B AGS Faults** – Refer to Section 7.2.3.2 for detailed information on the AGS fault history displays that are available using the ME-ARC remote’s TECH button.
- **04C PT Faults** – Refer to Section 10.2.2.2 for detailed information on the PT fault history displays that are available using the ME-ARC remote’s TECH button.
- **04D Clear Faults** – This menu allows all recorded fault history information—includes fault history data for any device (inverter, AGS, or PT controller) that are network connected—to be cleared/erased. Press and hold the SELECT knob until “HISTORY CLEARED” displays.



CAUTION: Before using the Clear Faults feature, be sure you do not want the fault history data for any device (inverter, AGS, or PT controller). Once fault history data has been cleared, it cannot be retrieved.

TECH: 05 SETUP PIN

This menu sets the password (PIN – Personal Identification Number) and locks/unlocks the ARC's SETUP button menus.

Why should I use the PIN feature? Restricting access to the SETUP menus with a password can avoid unauthorized changes to your settings by inexperienced users.

Setting a PIN (unlocked SETUP button)

If a PIN has not been set, the SETUP menus are accessible to everyone (i.e., SETUP unlocked). When you first enter the *05 SETUP PIN* menu, "Set SETUP PIN = 0000" displays with the first "0" blinking. "0000" is the default setting when no PIN has been set.

To set a PIN (from the *Set SETUP PIN = 0000* menu):

1. Rotate the SELECT knob to the desired number (0-9), and then press SELECT.
Note: "0000" is not a valid PIN.
2. Repeat Step 1 to set the remaining three digits until the desired PIN number displays.
3. After pressing the SELECT knob for the last digit, the PIN is set. "Set SETUP" displays on top line and "Unlock SETUP" displays on bottom line (rotate knob to access other options).
 - **Unlock SETUP** – Press SELECT to allow all users to access the SETUP button menus. The PIN you established is still valid, but a user is not required to enter that PIN in order to access the SETUP menus.
 - **Lock SETUP** – Press SELECT to restrict access to the SETUP button menus to only those users that enter the valid PIN (which you just established).
 - **Change PIN** – Press SELECT to change the existing PIN.

Entering the SETUP Menu When the PIN is Set and Locked

When the SETUP button is pressed and the "Enter SETUP PIN = 0***" menu displays, a PIN has been set and the SETUP button menus are locked. The correct PIN must now be entered in order to access the menu. If the incorrect PIN number is entered, "Invalid PIN" displays. There is no limit on how many attempts can be made to enter the correct PIN number.

To enter an existing PIN (from the *Enter SETUP PIN = 0**** menu):

1. Rotate the SELECT knob to the correct digit, and then press SELECT.
2. Repeat Step 1 to enter the remaining three digits of the existing PIN.
3. After pressing the SELECT knob for the last digit, access to the SETUP menu is permitted.



Info: After the correct PIN has been entered you do not need to reenter it to access another protected menu—unless five minutes have passed without any button push.

Changing an Existing PIN

You can change your PIN at any time. However, you must first access the *TECH: 05 SETUP PIN* menu, and then enter the existing PIN in order to access the *Change PIN* menu item.

To change an existing PIN (from the *05 SETUP PIN* menu):

1. Use the SELECT knob to enter the existing PIN (see above procedure).
2. Once the existing PIN is entered and you press SELECT for the last digit, the *Set SETUP* options menu appears.
3. Rotate the SELECT knob to the *Change PIN* menu option, and then press the SELECT knob. The *Set SETUP PIN* menu appears with the current PIN displayed and the first PIN digit blinking.
4. Enter the new PIN (see the Setting a PIN procedure above). **Note:** "0000" is not a valid PIN.
5. After pressing the SELECT knob for the last digit, the new PIN is set. You are returned to the *Set SETUP PIN* menu where you can lock/unlock the SETUP button menus.



Info: There may be SETUP menus you want others to have access to without giving away the PIN number. To do so, enter the desired SETUP menus in the FAVS button menu before setting the PIN number. Once you enter the SETUP menus in FAVS, the PIN number can be entered and the SETUP button is locked. The SETUP menus in FAVS are now accessible without having to enter the PIN number. See FAVS button info.

Setup

Resetting/Clearing a PIN

You can override a previously entered PIN. When "PIN = 0***" displays, press and hold the SELECT knob until "PIN = 0000" displays (approximately 7 seconds). Enter a new PIN number.

TECH: 06 Ext Control

External Control is a read only menu. Magnum Energy has adopted an open protocol policy which allows certain functions of the inverter/charger to be controlled externally—such as with a third party communications device. "Yes" displays if any external device/software is controlling the remote. This menu is designed to help Magnum Energy technical support personnel determine if the inverter/charger is operating normally, or being controlled by a third party.

- **No Ext Control** – Indicates no third party network device is controlling any inverter/charger functions or the ME-ARC remote.
- **Yes** – When this display shows a number or a series of numbers (i.e., 04 05 10 20 ## ## ## ##), it indicates that one or more of the allowable functions of the inverter/charger is currently being controlled externally. The number(s) displayed can be used by Magnum technicians to determine what function(s) in the inverter/charger is being controlled.

TECH: 07 Show all Menus

This menu enables you to have the ME-ARC remote display all available screens (*YES*), or to just display those screens that pertain to the devices and accessories currently active (*NO*).

TECH: 08 Load Defaults

This menu restores factory defaults to all settings on the inverter/charger and to any defaults on any accessories that are networked. To restore all defaults, depress the SELECT knob for 5 seconds (once countdown is finished the screen displays "DEFAULTS LOADED"). Refer to Table 3-3 for the remote's inverter/charger default values (see also Table 7-6 and Table 10-1 for the remote's AGS and PT default values, respectively).



Info: For information on the factory default settings for any networked accessory, refer to the owner's manual for that accessory.



Info: If a PIN has been set and locked, it must be entered before the *Load Defaults* menu can be used.

Table 3-3, Inverter/Charger Default Settings on ME-ARC

Menu Items	Default Settings	Menu Items	Default Settings
Max Charge Amps	200 ADC	VAC Dropout	80 VAC (AC1), 70 VAC (AC2)* (Exports = 150 VAC)
Search Watts	5 Watts	Battery Type	Flooded
LBCO Setting	10 VDC (12v) 20 VDC (24v) 40 VDC (48v)	Absorb Done	Time = 2 Hrs Amps = 20 ADC SOC = 100%
AC In - Time	6:00A - 6:00P	Max Charge Rate	100%
AC In - VDC	11.0-14.1 VDC (12v) 22.0-28.2 VDC (24v) 44.0-56.4 VDC (48v)	Max Charge Time	12.0 Hrs
AC In - SOC	80%, 100% SOC	Final Charge Stage	Multi
Power Up Always	OFF	ReBulk Volts	12.0 VDC
AC Input Amps	30A (AC1), 20A (AC2)*	EQ Reminder Days	OFF

* AC2 settings available on MSH4024RE models only.

4.0 Menu Maps: ME-ARC Remote Control

Figures 4-1 through 4-5 are an overview of the settings and information displays available from the ME-ARC's menu buttons. **Note:** When applicable, battery voltage defaults and ranges are shown for a 12-volt battery (24-volt systems multiply by 2; 48-volt systems multiply by 4).

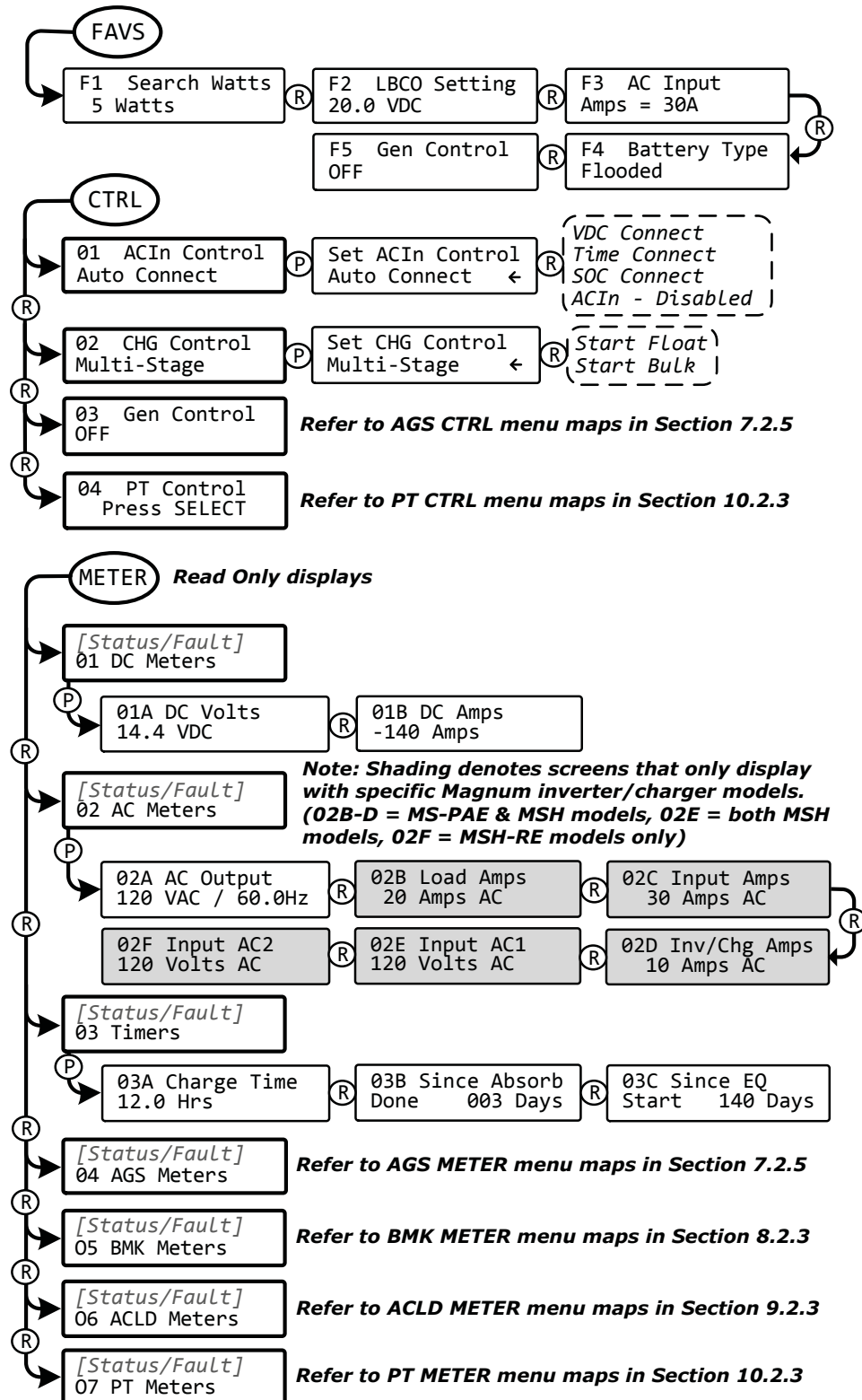


Figure 4-1, FAVS/CTRL/METER Button Menu Maps

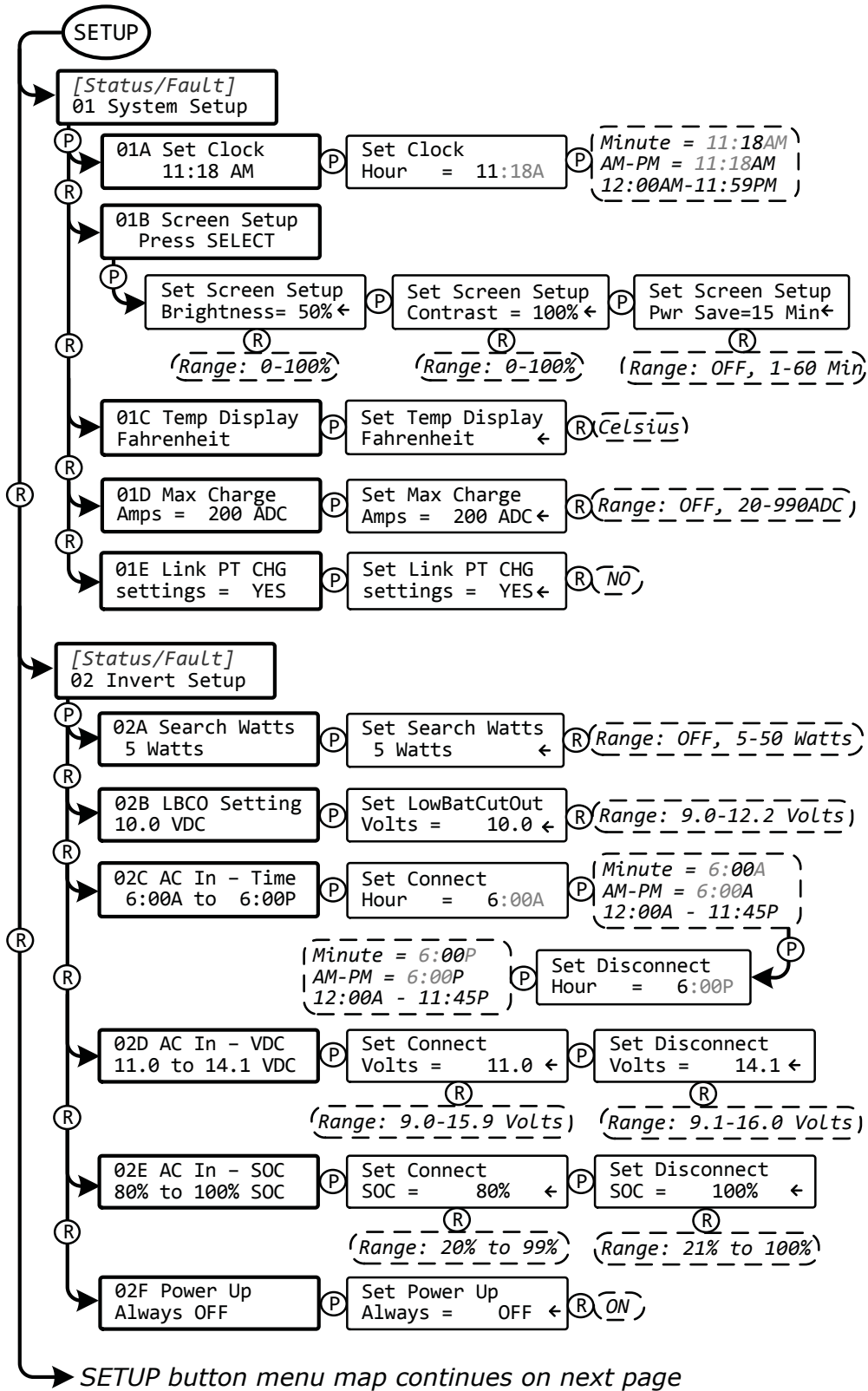


Figure 4-2, SETUP Button Menu Map

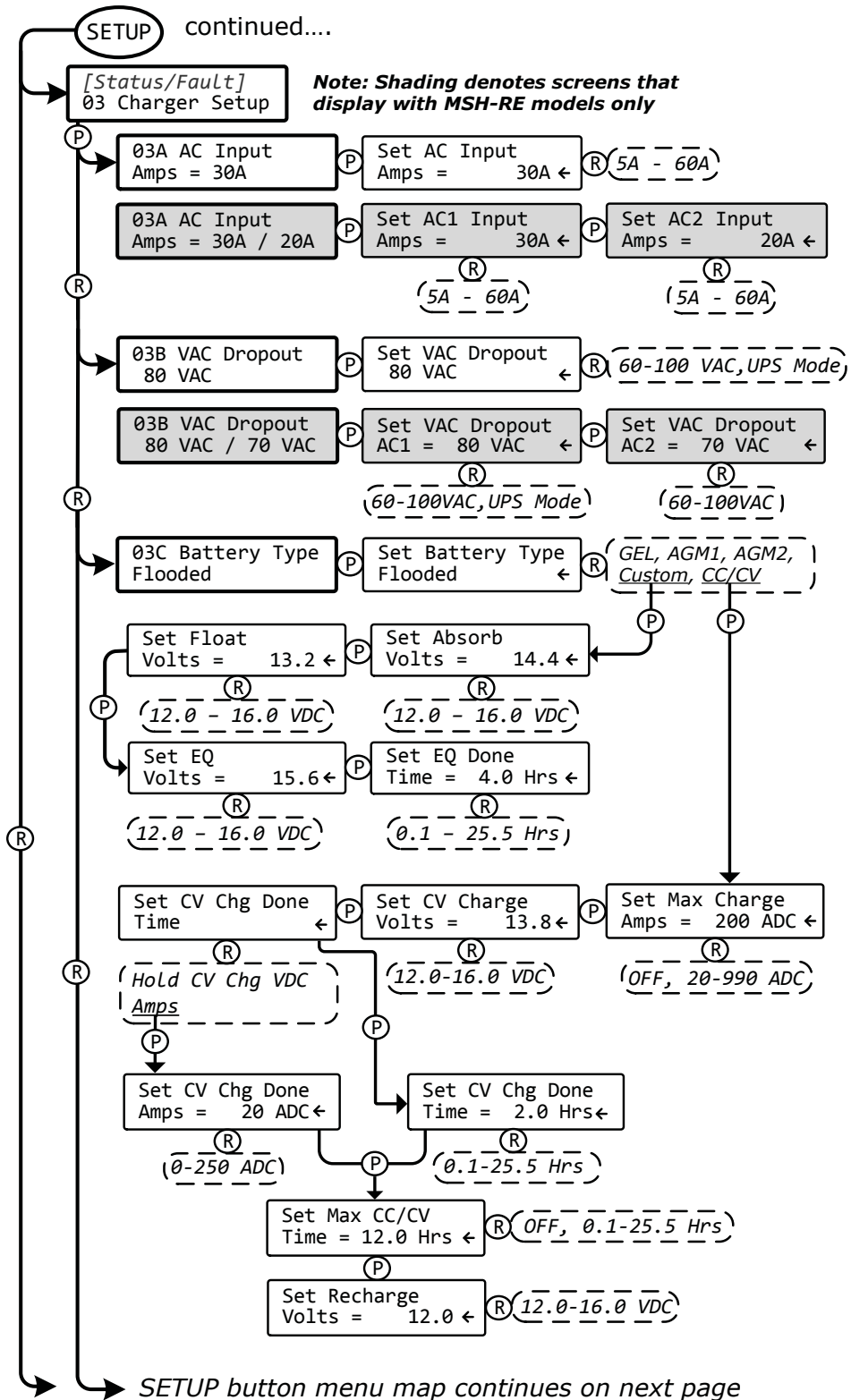


Figure 4-3, SETUP Button Menu Map

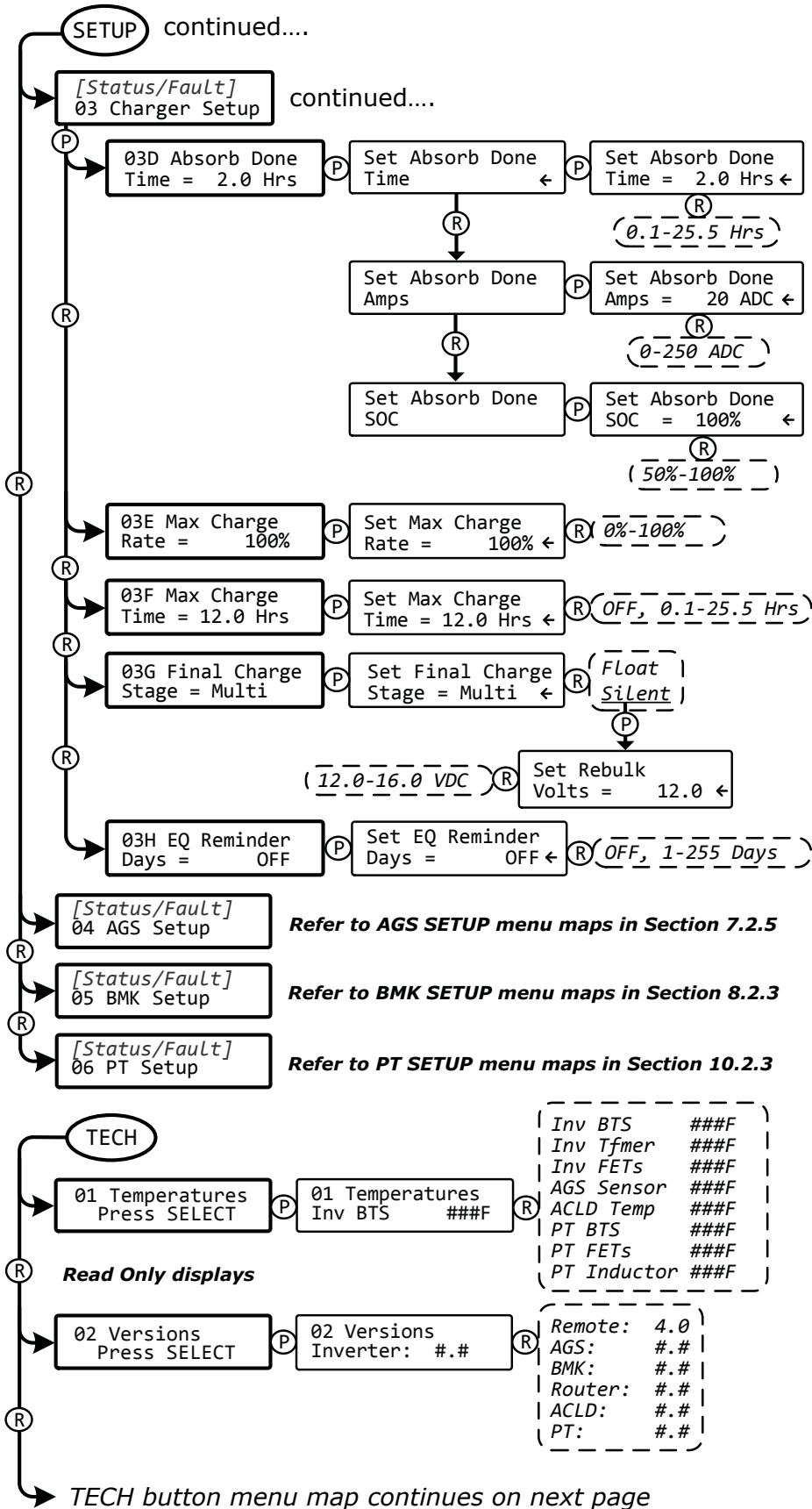
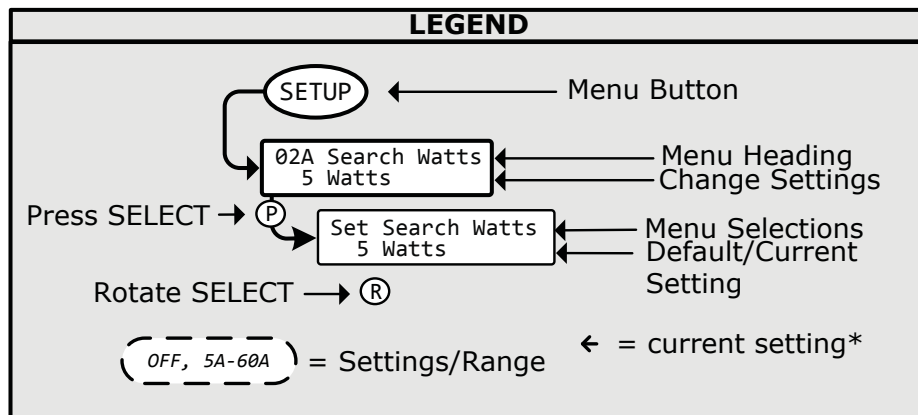
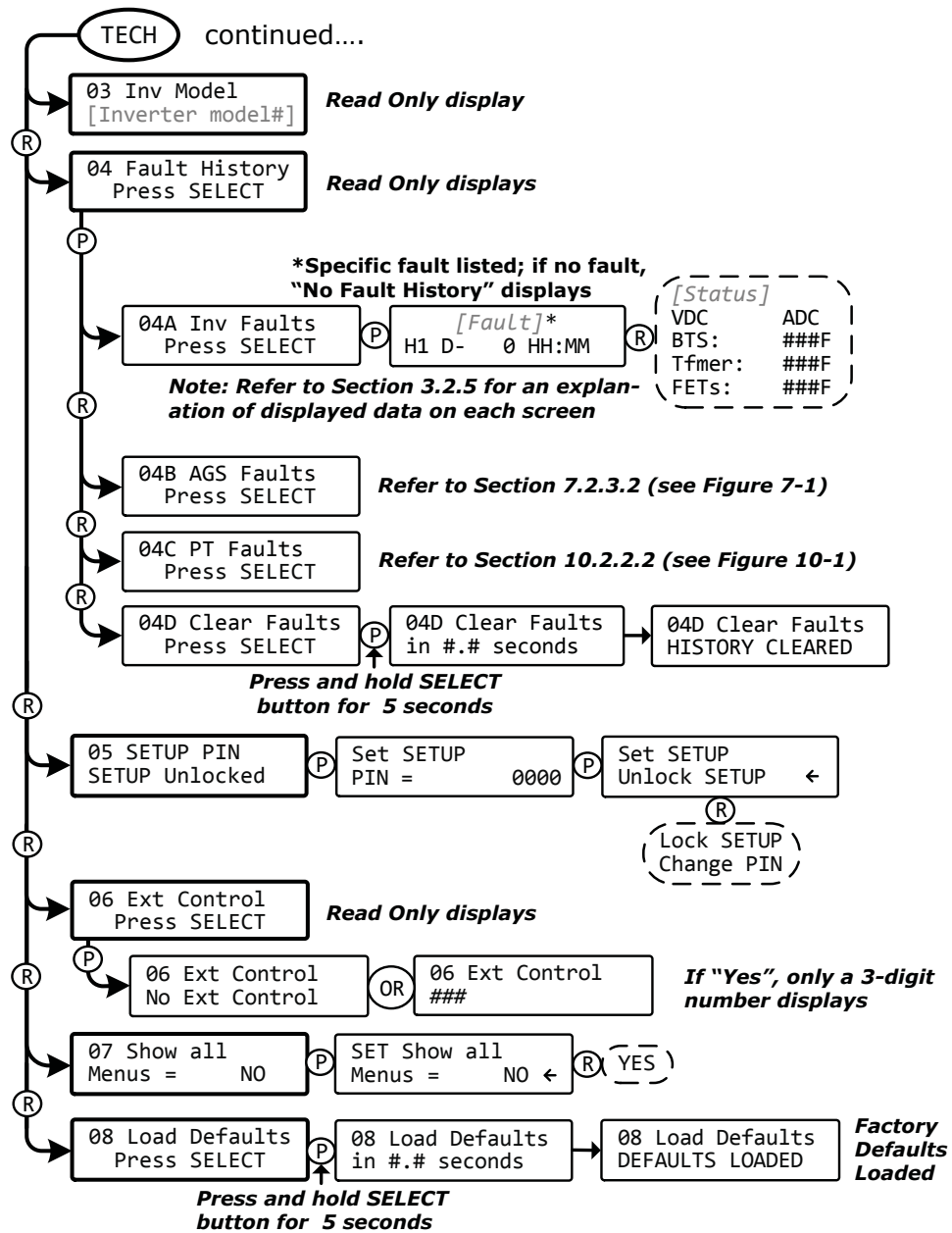


Figure 4-4, SETUP/TECH Button Menu Maps



* For this menu map, the arrow denotes the factory default setting

Figure 4-5, TECH Button Menu Map

5.0 Operation

This section explains how to operate the inverter/charger using the ME-ARC remote. It also provides information on the LED indicators and the LCD display that are used to show the operational status of the inverter/charger.

5.1 Front Panel

The ME-ARC's front panel contains LED indicators and a LCD display for viewing system status, buttons to control system operation, and a rotary knob that enables you to locate and select system information and settings.

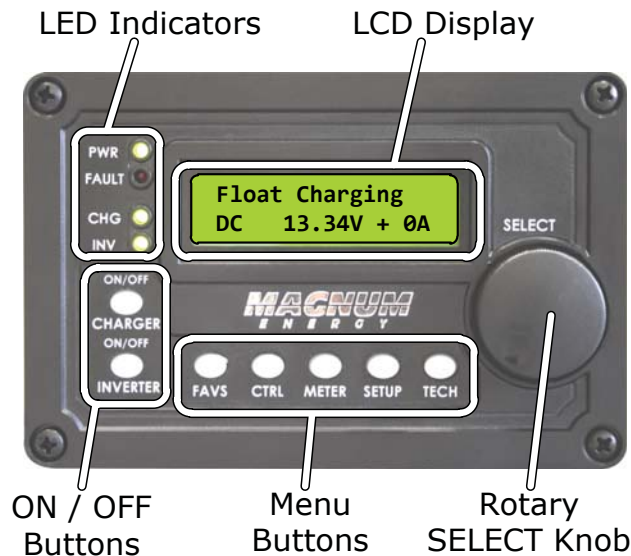


Figure 5-1, ME-ARC Front Panel Controls and Indicators

5.1.1 LED Indicators

There are four LED indicators on the front panel that light solid or blink to indicate the inverter/charger's status. When the remote is first powered-up, all the LED's come on as it goes through a self test (See Section 2.5 for information on the Self Test). Once the self test is complete and the clock is set, the LED's and the LCD provide the operating status of the inverter/charger. See Section 5.3.5 for more information on the LED indicators.

5.1.2 LCD Display

The LCD display is used for setting up the system operation, as well as viewing the current operating status and fault conditions. This display has two lines of alphanumeric characters and features a backlight that can be set to turn off to conserve power. The top line provides the inverter/charger status, which is detailed in this section. The bottom line displays battery information when using the METER menu, displays system troubleshooting information when using the TECH menu, and displays menu items that can be configured for your specific system operation when using the SETUP menu. This display automatically powers-up with the current system status on the top line and the home screen (detailing the inverter's DC voltage and current as shown in Figure 5-1) on the bottom line.

5.1.3 ON/OFF Pushbuttons

- **ON/OFF INVERTER** – This button toggles the inverter function on and off. The green INV LED turns on and off with the button.
- **ON/OFF CHARGER** – This button toggles the charger function on and off after it is actively charging. The green CHG LED turns on and off with the button. This button is also used to initiate an Equalize charge. For more information on using the Equalize Charging feature, see "Equalizing" under Section 5.3.2.

5.1.4 Menu Buttons

These five buttons provide quick access to menu items for configuring, monitoring, and troubleshooting your inverter/charger system.

- **FAVS** – This button allows five menu items to be stored for easy access without having to find them within the SETUP or other buttons. The five items stored under the FAVS button become the “favorite” menus that are most often used. For more information, see Section 3.2.1.
- **CTRL** – This button accesses the *AC In Control*, *CHG Control*, and *GEN Control* menu items. The CTRL button gives you quick control of the main functions of the inverter/charger. See Section 3.2.2 for more detailed information.
- **METER** – This button provides meter information on the inverter/charger, and the ME-AGS-N and ME-BMK/ME-BMK-NS (if connected). See Section 3.2.3 for more detailed information.
- **SETUP** – This button allows the remote, inverter/charger, and any connected accessory to be configured to specific system preferences. See Section 3.2.4 for more detailed information.
- **TECH** – This button allows you to access menu selections that can help service personnel with troubleshooting, and also allows the factory default settings for the inverter/charger and any connected accessory to be restored. See Section 3.2.5 for more detailed information.

5.1.5 Rotary SELECT Knob

The rotary SELECT knob is similar to a car dash radio knob, and is used to view and select various menu items and settings displayed on the LCD screen. Turn the rotary knob clockwise and counterclockwise to view the different menu items and available settings. Press the SELECT knob to select/enter a menu item or to save a setting once it is displayed on the LCD screen. Press and hold the SELECT knob for 10 seconds to refresh the LCD display.



Info: All adjustable inverter/charger settings in the ME-ARC are saved in non-volatile memory (except for the brightness and contrast settings under *SETUP: 01B Screen Setup*, the *CTRL: 03 GEN Control* setting, and the *TECH: 07 Show All Menus* setting—which revert back to default). The adjustable settings are preserved until changed, even if an inverter reset is performed or power to the remote or the inverter is removed.

Note: *If power to the ME-ARC is removed, the current time must be reset from the SETUP: 01 System Setup/01A Set Clock menu (as well as the above settings that reverted back to default).*



CAUTION: An accessory that is networked to the inverter may have adjustable settings that revert back to default if all power to the inverter is lost. Refer to the owner’s manual for the particular accessory to determine if any setting is affected.

5.2 Operating the Inverter/Charger

5.2.1 Inverter Mode

Turning the inverter on: Press the ON/OFF INVERTER button to activate the inverter function. The inverter will either be actively “inverting” by using power from the batteries to power the AC loads; or, the inverter will be “searching” for a load by using very little power from the batteries, if in Search mode. The green INV LED is on when the inverter is actively inverting, and the green INV LED flashes while searching.

Turning the inverter off: While the inverter is actively inverting or searching, press the ON/OFF INVERTER button to switch the inverter function off. This turns the green INV LED off.

Inverter Standby – The inverter is in Inverter Standby mode when it is enabled (green INV LED is on) but not actively providing power from the batteries to the inverter loads. During Inverter Standby mode, the loads connected to the inverter are powered by the external AC power; however, if a blackout or brownout condition occurs, the inverter senses these conditions and starts inverting to power the inverter’s AC loads.



CAUTION: If you have critical loads and are in Inverter Standby, do not press the ON/OFF INVERTER button to turn the inverter function off. If the green INV LED is off, inverter power will NOT be available to run your critical loads if the external AC power is interrupted.

Operation

5.2.2 Charger Mode

Turning the charger on: The charge mode is automatically activated and begins when acceptable AC power (utility/generator) is connected to the input of the inverter. When in charge mode, the display may show: *Charging, Bulk Charging, Absorb Charging, Float Charging, Full Charge, Silent, Charger Standby, Force Float, Equalizing, Load Support VDC, and Load Support AAC.*

Charger Standby – While the charger is actively charging, press the ON/OFF CHARGER button to switch the charger to Charger Standby. While in Charger Standby, the incoming AC is still available on the inverter's output, but the charger is not allowed to charge. The LCD displays "Charger Standby" and the CHG LED flashes.



Info: To resume charging, momentarily press the ON/OFF CHARGER button or disconnect/reconnect AC power to the inverter's input.

Equalizing – Equalizing is a "controlled overcharge" performed after the batteries have been fully charged. It helps to mix the battery electrolyte (to reverse the buildup of stratification) and to remove sulfates that may have built up on the plates. These conditions if left unchecked, reduce the overall capacity of the battery. To enable the Equalization charge, see page 49.



WARNING: Do not perform an Equalization charge without reading and following all safety precautions pertaining to charging/equalization as noted in this manual and provided by the battery manufacturer, and any equalization information in the inverter owner's manual.

5.3 System Status Messages

A status message may be an operational or fault message indicating the inverter/charger's current operating status. This section will cover the inverter/charger's operating and fault modes, and the available status messages under each mode.

Use the displayed status message and the status LEDs on your ME-ARC remote (Figure 5-2) to determine the inverter/charger's current operating status, and to help troubleshoot the system if a fault occurs.

There are three modes of operation for the inverter/charger:

- Inverter mode
- Charger mode
- Fault mode

Refer to the appropriate section to locate information on any particular status message.

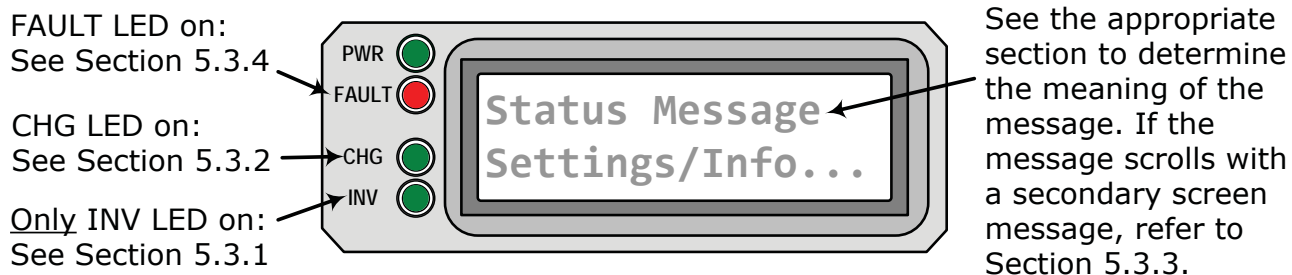


Figure 5-2, System Status Screen (Example)

5.3.1 Inverter Mode Status Messages

There are six Inverter mode messages. View the top line of the LCD display and the corresponding message in this section to identify and understand the particular Inverter mode.

- **Inverting** – The inverter is providing AC voltage on its output by inverting power from the batteries.
- **Inverter Standby** – The inverter is on but not actively providing power. However, the inverter remains active and an external AC power (utility or generator) is passing through the inverter to power the AC loads.
- **No Inverter Comm** – The remote is not receiving any communication data via the Magnum Network.



Remedy: Disconnect the remote communications cable from the inverter for five seconds, and then reconnect to reset the remote (see Figure 2-2). If the fault continues, examine the remote cable for damage, and replace if needed (4-wire telephone cable).

What if the cable is not the issue?

- Try another remote display
- Reconnect the remote from the Remote port to the Network port
- The inverter may need servicing
- **Off** – This message tells you that there is no AC available on the inverter’s AC output. The inverter function is OFF, and there is no utility or generator AC power sensed on its input.
- **Searching** – The inverter is in Search mode. This means the AC loads on the inverter output are less than the *SETUP: 02A Search Watts* setting. The Search mode function is used to reduce the inverter draw from the battery, and may be turned off at any time if you want full inverter output voltage available at all times (see *02 Invert Setup* on page 20).
- **Unknown Mode ##** – This status message displays when the inverter/charger has sent an operational status code that the ARC remote does not identify.



Remedy: Call Technical Support at Magnum Energy (425-353-8833) for assistance in identifying and understanding the actual fault status.

5.3.2 Charger Mode Status Messages

When AC power (utility or generator) is connected to the inverter/charger, it begins to monitor the AC input for acceptable voltage. Once the AC input is accepted, the AC transfer relay (inside the inverter) closes and charge mode begins. There are ten Charger mode status messages. View the top line of the LCD display and the corresponding message in this section to identify and understand the particular Charger mode.



Info: The AC input becomes acceptable once: a minimum 10-second delay passes and the voltage is greater than the *SETUP: 03B VAC Dropout* setting, or no *CTRL: 01 AC In Control* menu setting is enabled and actively preventing the AC from connecting.

- **Absorb Charging** – The Absorb charge state is the constant voltage stage and begins when the absorb voltage is reached (determined by the *SETUP: 03C Battery Type* setting) while Bulk charging. During this stage, the DC charging current decreases in order to maintain the absorb voltage setting. This charge stage continues until the *03D Absorb Done (Time, Amps, or SOC)* or the *03F Max Charge Time* setting is reached.
- **Bulk Charging** – The battery charger is delivering maximum current (determined by the *SETUP: 03E Max Charge Rate* setting) to the batteries. The charger remains in Bulk charge until the absorb voltage (determined by the *SETUP: 03C Battery Type* setting) or the *03F Max Charge Time* setting is reached.
- **Charger Standby** – This indicates the charger has been disabled to prevent further charging, but the AC power (from utility or generator) to the AC input is still available on the AC output. This display is shown when the ON/OFF CHARGER button is pressed while the AC power is passing through the inverter/charger.

Operation



Info: Press the ON/OFF CHARGER button to enable charging again. When enabled, the charger continues in the previous charge mode and the CHG (green) LED comes on.

- **Charging** – Once Charger mode has been enabled, the unit waits and displays “Charging” to determine the charge routine. If the DC voltage is low (≤ 12.8 VDC/12v models, ≤ 25.6 VDC/24v models, or ≤ 51.2 VDC/48v models), the charger initiates bulk charging. If the DC voltage is high (≥ 12.9 VDC/12v models, ≥ 25.7 /24v models, or ≥ 51.3 /48v models), the charger skips the Bulk and Absorb charging stages and go directly to the final charge stage (Float or Silent).

Note: If battery type is CC/CV, the charger enters the Constant Current mode after “charging”.

- **Equalizing** – This display indicates that the battery charger is delivering the equalize voltage to the batteries. See Table 3-1 to determine the equalize voltage for your battery type.

Equalize charging can be enabled by the ON/OFF CHARGER button if the *SETUP: 03C Battery Type* setting allows. Equalization charging can only be enabled while the charger is in Float Charge or Full Charge mode. To turn on Equalize charging, ensure the LCD display reads “Float Charging” or “Full Charge”, then press and hold down the ON/OFF CHARGER button (about five seconds) until the LCD screen displays “Equalizing”.

The Equalize charge will continue for four hours and then automatically stop and return to float charging. The Equalize charge can be manually stopped by pressing and holding down the ON/OFF CHARGER button (about five seconds) until the LCD screen displays “Float Charging”.

During Equalize mode the batteries will begin gassing and bubbling vigorously, which consumes water. Ensure each cell has adequate distilled water levels prior to equalizing, and then add water as needed after equalizing.



WARNING: Equalizing produces hydrogen and oxygen gas. To avoid explosions, ensure the battery compartment has adequate ventilation in order to dissipate this gas.



CAUTION: Ensure your batteries can be equalized. Only do so if permitted by your battery manufacturer or dealer. Performing an Equalization charge on batteries other than liquid lead acid or certain AGM types could permanently damage them. Contact your battery manufacturer for their recommendations.



CAUTION: Ensure the DC loads will not be damaged by the higher voltage applied to the batteries during the equalize charge. If in doubt, disconnect the loads to prevent damage.



Info: Equalization charging is not available if *GEL* or *AGM 2* is selected from the *SETUP: 03C Battery Type* menu.

Why would I equalize? Equalizing helps to mix the battery electrolyte and attempts to reverse the build-up of stratification by removing sulfates that may have built up on the plates. These conditions if left unchecked, reduce the overall capacity of the battery bank.

How often should I equalize? Some experts recommend that heavily used batteries should be equalized periodically—anywhere from once a month to once or twice per year. Other experts only recommend equalizing when the cells have a low specific gravity, or when the difference between any individual cell has a specific gravity reading greater than .015 after being fully charged. Contact your battery manufacturer for their recommendations.

How long should I equalize? While the batteries are gassing, monitor the specific gravity readings every hour. When the specific gravity readings no longer increase, the Equalization charge is complete and should be stopped.

- **Float Charging** – At the end of the absorb charge time, the charger reduces the charge voltage and tries to maintain the batteries at the float charge voltage setting. This is determined by the *SETUP: 03C Battery Type* setting as shown in Table 3-1.



Info: If the battery voltage falls ≤ 12.1 VDC (12-volt models), ≤ 24.2 VDC (24-volt models), or ≤ 48.4 VDC (48-volt models) the unit will initiate bulk charging.

- **Full Charge** – This status indicates that you have entered the Battery Saver™ mode. This mode maintains the batteries without overcharging, and prevents excessive loss of water in flooded batteries or drying out of GEL/AGM batteries. After four hours of float charging, the charger turns off and “Full Charge” displays (charger is now in Battery Saver™ mode). If the battery voltage drops to ≥ 12.6 (12-volt models), ≥ 25.2 (24-volt models) or ≥ 50.4 (48-volt models), the charger automatically initiates another four hours of float charging. This cycle helps to ensure the batteries are maintained and continues as long as AC power is continuously connected to the AC input. “Full Charge” only displays if *Multi-Stage* is selected from the *03G Final Charge Stage* menu.

- **Load Support AAC** – The inverter is in the Load Support (Amps AC) mode because the inverter load is requiring more power than the incoming AC source can provide on its own. The inverter pulls the additional current—that is needed for the loads—from the inverter batteries to keep the incoming AC current from exceeding the *SETUP: 03A AC Input Amps* setting.



Info: The Load Support AAC feature operates in parallel with the AC input to support the inverter loads and is only available on MSH Series inverter/chargers. It is only active when the inverter is enabled (INV LED is on).



Info: When in Inverter Standby mode (charging and pass-thru), the current is normally a positive value. However, in Load Support AAC mode, the inverter amps reading is a negative number to indicate how much current is being provided/removed from the inverter’s batteries. The inverter’s batteries continue to provide current to assist the AC input current until the batteries reach 0.5 volts (12V systems), 1.0 volts (24V systems), and 2.0 volts (48V systems) above the *SETUP: 02B LBCO Setting* menu’s value.

- **Load Support VDC** – The inverter/charger is in the Load Support (Volts DC) mode because an external DC source (solar, wind, etc.,) is providing more current than needed—which causes the battery voltage to rise. The inverter/charger reduces the incoming AC current in an effort to keep the battery voltage from rising above the temp-compensated *03C Battery Type* setting.



Info: The Load Support VDC feature operates in parallel with the AC input to support the inverter loads and is only available on MSH Series inverter/chargers. This feature is only active in Bulk, Absorb, Float or EQ charge modes and when the inverter is enabled (INV LED is on); it is deactivated if the charger is in Charger Standby.

- **Silent** – This displays at the end of the Absorption stage if *Silent* is selected from the *03G Final Charge Stage* menu. In Silent mode, the charger is not actively charging but does monitor the battery voltage. When the battery voltage reaches the *Set ReBulk Volts* setting (from *03G Final Charge Stage* menu) the charger will restart a Bulk and Absorb charge cycle, and then transition back into Silent mode at the end of the Absorb cycle.

5.3.3 Secondary Scrolling Status Messages

These displays alternate with the inverter/charger status to indicate other pertinent messages.

- **ACIn-Disabled** – AC power is present at the inverter’s AC input, but the inverter/charger is prevented from connecting to any incoming AC because the *AC In-Disabled* setting has been selected from the *CTRL: 01 ACIn Control* menu.

- **Gen Warm-up** – The ME-AGS-N has commanded a generator to run, but the inverter will not connect to the generator’s DC output until the generator warm-up time is complete. **Note:** Requires that the optional ME-AGS-N Auto Gen Start controller be installed.

- **Max Charge Time** – The charger has finished Absorption charge mode as the *03F Max Charge Time* setting has been exceeded.

- **Reminder to EQ** – The number of days that was set in the *03H EQ Reminder Days* menu has been exceeded and you need to equalize your batteries.

- **SOC Connect** – AC power is present at the inverter’s AC input, but the battery bank State of Charge needs to reach the *Connect SOC* setting from the *SETUP: 02E AC IN - SOC* menu in order for the inverter/charger to connect to the incoming AC.

Operation

- **Time Connect** – AC power is present at the inverter's AC input, but the time of day needs to fall within the *Connect* time and the *Disconnect* time settings per the *SETUP: 02C AC In - Time* menu in order for the inverter/charger to connect to the incoming AC.
- **VDC Connect** – AC power is present at the inverter's AC input, but the battery voltage needs to fall below the *Connect Volts* setting from the *SETUP: 02D AC In - VDC* menu in order for the inverter/charger to connect to the incoming AC.

Note: Most faults (inverter, AGS, BMK, and PT controller) also alternate with the inverter/charger status. See Sections 5.3.4, 7.3.3, 8.3.2, and 10.3.2 for more information on identifying and resolving these faults.

5.3.4 Fault Mode Messages

The FAULT LED comes on and a fault status is displayed when an abnormal condition is detected. Use the information in this section to identify and correct the issue.



Info: Many of the faults automatically clear once the fault is resolved. Some will require a manual restart. This requires the ON/OFF INVERTER button on the remote to be pressed and released. Finally, if the fault will not clear, an inverter reset (Section 6.2) or power reset (Section 6.3) may be required.

- **AC Backfeed** – This fault causes the inverter to shut down because AC voltage from an external AC source has been detected on the inverter's AC output. When the unit shuts down because of this fault condition, an inverter reset or power reset will be required to resume operation (see Sections 6.2 & 6.3 to reset the inverter).



Remedy: This fault usually occurs because the AC output wiring is connected to (or able to be connected to) the incoming AC source. When this fault happens, all system wiring should be re-checked to ensure the incoming hot and/or neutral wires are not able to be connected to the AC output.

- **AC Overload** – This fault message displays when the AC load on the inverter/charger's output has exceeded the inverter's AC current protection limits. If the overload condition lasts for <10 seconds, the fault automatically clears and the unit restarts and resumes operation. However, if the overload occurs for more than 10 seconds, the unit shuts down and the fault will require a manual restart.



Remedy: This fault may occur because the connected AC loads are larger than the inverter's output capacity, there is a wiring short on the output, or the output wires are incorrectly installed. Once the AC loads are reduced or the output wiring is corrected, the inverter can be restarted after a manual restart.

- **Breaker Tripped** – The AC input breaker on the inverter/charger has opened due to excess current flow through the inverter to the AC loads.



Remedy: After reducing the AC loads, push in the inverter's AC input circuit breaker to reset and resume operation.



Info: While in Charger mode, the inverter's AC input breaker could nuisance trip if the loads on the inverter's output exceeds the current rating of the inverter's input circuit breaker.

- **Dead Batt Charge** – This fault indicates that the inverter has been connected to an AC source (grid or generator), and has determined that the battery bank is either highly discharged or not connected. The inverter is attempting to close its internal relay and to begin charging, but has detected less than 9 volts (12-volt models), 18 volts (24-volt models), or 36 volts (48-volt models) on the battery bank.



Remedy: Check the DC voltage at the inverter's DC terminals and compare it with the DC voltage at the battery bank. These two voltages should be very close (<0.5 VDC difference). If not, check to ensure all connections are tight and the fuse/circuit breaker between the inverter and battery bank is good.

This fault automatically clears once current flows into the battery from the battery charger—this may take anywhere from a few minutes to a few hours depending on the condition of your batteries. This fault can also be cleared if the AC input is removed.

- **FET Overload** – This fault message indicates the inverter/charger was running normally, but the temperature of the FETs (Field Effect Transistors) started rising abnormally fast.



Remedy: Allow the inverter to cool down, then press the remote's INVERTER ON/OFF pushbutton (manual restart) to resume operation. If the fault returns, perform an inverter reset (see Section 6.2). If the fault continues, disconnect all the inverter's AC output wires and perform a power reset (Section 6.3). If this fault does not clear after doing the power reset, the inverter will require service.

- **High Battery** – The inverter has turned off because the battery voltage is at a very high level. This fault message displays and the FAULT (red) LED turns on when the battery voltage is above the High Battery Cut-Out (HBCO) value. This fault automatically clears and the inverter resumes operation when the battery voltage drops 0.3 VDC (12v models), 0.6 VDC (24v models), or 1.2 VDC (48v models) below the HBCO value.



Info: The HBCO value is dependent on the inverter version and model. Normally, the HBCO value for the ME/MM/RD Series' inverters is 16 VDC (12-volt models) or 32 VDC (24-volt models); and, the HBCO value for the MS/MMS Series' inverters is 17 VDC (12-volt models), 34 VDC (24-volt models), or 68 VDC (48-volt models).



Info: This fault can occur whether the inverter is "inverting", "searching" or "off".



Remedy: This fault usually occurs when an external DC charging source is charging the inverter's battery bank. Turn off any other additional charging source to allow the DC voltage level to drop.

- **High Batt Temp** – This fault message indicates the inverter/charger has shut down because the Battery Temperature Sensor (BTS) has reached a temperature greater than 54°C/129°F.



Remedy: Once the BTS has cooled down ($\leq 49^\circ\text{C}/120^\circ\text{F}$) it automatically restarts and continues operation. As a precaution, check the area where the BTS is located; if placed on a battery ensure they are not overheated, or that the BTS hasn't been placed in a hot area or near a hot device. If neither of these are the issue, then monitor the *Batt Sensor* display under the *TECH: 01 Temperatures* menu—this reading should be above 54°C/129°F. Now remove the BTS from the inverter BTS port. If the Batt Sensor reading goes to 25°C/77°F, replace the BTS. If the reading does not go to 25°C/77°F, then inspect the BTS port for cleanliness and/or have the inverter/charger serviced.

- **High Speed Bus** – This fault indicates a communication error has occurred between the inverter's internal onboard microprocessors. When the unit shuts down because of this fault condition, perform an inverter reset or power-down the inverter (see Sections 6.2 & 6.3).



Remedy: After performing the reset, turn the inverter on. If the fault does not clear after the reset, the inverter may require service.

- **High Volts AC** – This fault causes the AC input to be disabled because a very high AC voltage (>150 VAC or >300 volts for export inverters) has been detected on the AC input.



Remedy: Remove all AC power from the inverter's AC input for at least 15 minutes to clear this fault. Ensure only 120VAC power is connected to each of the inverter's AC inputs.

- **Low Battery** – The inverter has turned off to prevent the batteries from being over-discharged. The fault message displays and the FAULT (red) LED illuminates when the battery voltage drops below the *SETUP: 02B LBCO Setting* for more than one minute. The fault will clear and the inverter will automatically restart and resume operation when the battery voltage rises to ≥ 12.5 VDC (12-volt models), ≥ 25.0 VDC (24-volt models), or ≥ 50.0 VDC (48-volt models).



Info: This fault can only occur if the inverter status is "Inverting" or "Searching."



Remedy: This fault also automatically clears if AC power such as utility power or a generator is connected to the inverter/charger's input and battery charging begins.

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- **Overcurrent** – This fault may be the result of an excessive AC load and causes the inverter to shut down to protect internal power components. If the overload condition lasts for less than 10 seconds, the unit automatically restarts and resumes operation. However, if the overcurrent condition occurs for more than 10 seconds, the unit shuts down and requires a manual restart.



Remedy: This fault usually occurs because the connected AC loads are larger than the inverter's output capacity, there is a wiring short on the AC output, or the output wires are incorrectly wired. Once the AC loads are reduced or the output wiring is corrected, manually restart the inverter to resume operation. If this fault condition continues, perform an inverter reset.

- **Overtemp** – This fault message indicates the inverter/charger has shut down because the internal power components (FET's and/or transformer) have exceeded their safe temperature operating range. Once the unit cools down, the fault automatically clears and the unit restarts and continues operation.



Remedy: If the fault occurs while inverting, reduce the load on the inverter. If it occurs while charging, turn down the charge rate. If this fault happens often, ensure the inverter is not in a hot area, has proper ventilation, and the inverter's cooling fans are working.

- **Stuck Relay** – This fault message displays when the inverter is "inverting", but the internal AC pass-thru relay that should be open while inverting, is closed.



Remedy: The AC pass-thru relay is most likely stuck. A relay usually sticks because of damage to the contacts from trying to handle higher currents than that for which they are rated. This is usually caused by not protecting the relay from handling high continuous currents, or by switching high current inductive loads. The internal relay contacts are rated to handle 30 amps AC continuously and should be protected with a breaker sized no larger than 30 amps. If you are connected to an AC source (grid or generator) and running large inductive loads (i.e., pumps, motors, etc.,) on the inverter output, turn those particular loads off prior to removing the AC input source. This fault requires an inverter or power reset to clear.

- **Tfmr Overtemp** – This fault message displays when the transformer causes the inverter to shut down to protect the internal power transformer from damage. Once the transformer cools down, the inverter automatically restarts and resumes operation.



Remedy: Allow the inverter to cool down, then press the remote's INVERTER ON/OFF pushbutton (manual restart) to resume operation. If the fault returns, perform an inverter reset (see Section 6.2). If the fault continues, disconnect all the inverter's AC output wires and perform a power reset (Section 6.3). If this fault does not clear after doing the power reset, the inverter will require service.

- **Unknown Fault ##** – This fault message displays when the inverter/charger has sent a fault code that cannot be identified by the remote.



Remedy: Contact Technical Support at Magnum Energy for more information or assistance in identifying the actual fault status.

5.3.4.1 Stacking Fault Messages

A fault condition may occur when multiple inverters are connected or stacked together.

- **StackClock** – There is a stacker cable problem; or, one inverter is losing synchronization with the other inverter.



Remedy: Ensure you are using the correct stacking cable (the cable for stacking is not a telephone/data cable, it is a custom made cable). Unplug and inspect the stacking cable, and then reconnect both ends (listen and make sure you hear an audible “click” from the connectors at both inverters).



Info: This fault has been known to occur when a Magnum Energy accessory is plugged into the Stack Port, but the installation is not using multiple inverters in a stacked configuration. If this occurs, perform an inverter reset (see Section 6.2).

- **Stack Mode** – A problem with the “other” stacked inverter has been detected. Check that unit for a fault condition.



Remedy: This fault will automatically clear when the fault with the other inverter is corrected.

- **StackPhase** – Either: 1) The AC input wiring is incorrect; 2) One phase was lost from the AC input source; 3) One of the inverter’s internal transfer relays is bad; or, 4) The inverter’s AC input circuit breaker may be open.



Remedy: If this fault doesn’t clear after checking these four recommendations, perform an inverter reset (see Section 6.2).

5.3.4.2 Internal Fault Messages

The inverter continually monitors several internal components. If a condition inside the inverter occurs that does not allow proper operation, one of the following internal fault messages displays and the inverter shuts down to help protect itself.



Remedy: If one of the following internal faults occurs, the inverter will require an inverter or power reset to clear the fault. See Sections 6.2 & 6.3 to perform an inverter or power reset. After resetting the inverter, press the ON/OFF INVERTER pushbutton on the remote to turn the inverter on and then verify that the fault has cleared (i.e., manual restart). If the internal fault remains or returns, the inverter will require repair at an Magnum Energy Authorized Service Center. For service center locations see <http://magnumenergy.com/authorized-service-centers/>.

- **Internal Bridge** – This fault message displays when the FET bridge shuts down after the inverter has been inverting—the inverter output circuit can no longer detect any AC output voltage or current.
- **Internal Charger** – This fault message displays when the FET bridge shuts down because the charger circuit is trying to provide maximum current, but is not detecting a current or voltage rise to the battery bank.
- **Internal NTC** – This fault message displays when the internal NTC (Negative Temperature Coefficient) temperature sensor suddenly causes a very large but unexpected temperature change.
- **Internal Relay** – This fault message displays when the internal AC transfer relay is not closed while charging.

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5.3.5 LED Indicator Guide

Use the LEDs and the LCD display to determine the operating status.

Table 5-1, LED Indicator Guide

LED	Status	Meaning
PWR (green)	OFF	1) Inverter is disabled; 2) Remote's in Power Save mode – press any button to activate LEDs; 3) No power to remote (check remote cable or the power to the inverter); or, 4) No AC power at the inverter's AC output terminals.
	ON	AC power is available from the inverter, utility, or generator at the inverter's AC output terminals.
FAULT (red)	OFF	Normal operation.
	ON	A fault condition has been detected. Check the LCD display to find and correct the cause.
CHG (green)	OFF	1) Remote is in Power Save mode – press any button to activate LEDs; or, 2) Charger off – no utility or AC generator present.
	ON	Bulk, Absorb, Float, or Equalize charge mode (see the LCD display to determine charge status).
	BLINKING, display says "Charger Standby"	The charger is in Charger Standby mode. This occurs when the ON/OFF CHARGER button is pressed to disable the charger.
	BLINKING, display says "Full Charge" or "Silent"	The charger is in Battery Saver mode. This mode monitors the battery voltage level and only charges if the battery voltage decreases to a low level. Silent mode will automatically start charging when the <i>ReBulk Volts</i> setting is reached.
	BLINKING, display shows a charging status (i.e., Bulk, Absorb, Float)	The charger current is automatically decreased because: 1) Charger Back-off – the inverter's internal temperature is getting hot, the current is decreased to reduce/maintain temperature; or, 2) Low AC Input Voltage – the input AC voltage is low, the charger is disabled to help stabilize incoming AC voltage to prevent AC disconnect.
	BLINKING, display <u>does not</u> show any charge status	The inverter is detecting AC voltage (from utility or an AC generator) on the inverter's AC input terminals.
INV (green)	OFF	1) Inverter is disabled; or, 2) Remote is in Power Save mode – press any button to activate the LEDs.
	ON	Inverter is enabled – 1) Supplying AC power on the output; or, 2) In Inverter Standby (if both INV and CHG LEDs are on); the inverter will automatically supply AC power to the loads if utility or generator power is lost.
	BLINKING	Inverter is in Search mode (the AC load is below the <i>SETUP: 02A Search Watts</i> setting).

6.0 Troubleshooting

The remote may not be functioning correctly, use the following table to help find a solutions.

Table 6-1, Remote Control Troubleshooting Guide

Symptom	Possible Cause	Solution
Display shows unrecognizable letters or symbols	Static electricity may have been discharged into the LCD display.	Refresh Display: Press and hold the SELECT knob for 10 seconds.
LCD text display is locked-up, pushing any button has no response	RJ11 connections on communication cable are not making a good connection.	Reset remote: 1) Disconnect remote cable from inverter for 5 seconds and reconnect; 2) Check RJ11 cable connection on back of remote (Figure 2-2). Important: Ensure the RJ11 connector is pushed into the correct port. You should feel/hear a "click" when the connection is made.
	Remote not getting sufficient power from inverter.	Ensure inverter batteries are connected and the inverter is operating correctly; the inverter should be able to invert and power AC loads from the batteries (ensure no AC power is connected to the inverter AC inputs).
LEDs and backlight are off	Remote may be in Power Save mode.	Press any button to reactivate the remote (or turn Power Save mode Off).
Remote is non-functional (no lights, no text on LCD display, and no response when pressing any button)	Communication cable is bad or not correctly connected to the Remote port on the inverter.	Check communications cable from inverter to remote; ensure: 1) it is connected to the Remote port, 2) the correct communications cable is used (a 4-conductor telephone cable may be substituted to determine if the cable is good).
	Inverter is not connected to the batteries.	Ensure the inverter batteries are connected and the inverter is operating correctly without any AC power connected (can invert and power AC loads from batteries).

Troubleshooting

6.1 Troubleshooting Tips

6.1.1 Inverter Problems

- **Inverter turned on, green LED on inverter blinking, no output:** Inverter is in Search mode. Either defeat Search mode, if not needed, or turn on loads greater than the *Search Watts* setting.

6.1.2 Charger Problems

- **Unit won't transfer to Charge mode with AC applied:** Is the charge (CHG) LED on the remote blinking? If not, the charger does not recognize the incoming AC as being within acceptable limits. Measure the input AC voltage at the inverter input terminals – should be 120 VAC +/- 20 VAC (230 VAC +/- 40 VAC for export models). Also, check that the *03B VAC Dropout* setting on the remote is 80 VAC or less (160 VAC or less for export models). If the CHG LED is blinking, the transfer relay should close within 20 seconds and begin charging. If the LED is on solid, the relay should be closed and the charger should begin charging.

- **Transfer relay closes, then opens and continues to cycle:** AC voltage is too low or has transients that drop the AC voltage momentarily. Change the *03B VAC Dropout* setting to 60 VAC (110 VAC for export models) and check for improvements. If the cycling continues, back off the charge rate from 100% to 10% (or "OFF", if available).

This cycling may also be caused if the AC output of the inverter is connected to the inverter's AC input. Check for proper input and output AC wiring.

- **Charger not charging even though Charge LED is on steady and the unit says "Charging":** Full charge rates are not obtained in Charging mode. Full charge rates will occur only after this mode changes to Bulk charging, Absorb charging, or Float charging modes.

- **Charger not charging even though Charge LED is on steady and the unit says "Bulk Charging" (or "Absorb Charging"):** Check the *01A DC Volts* and *01B DC Amps* meter values on the ME-ARC display. It should be 80% or more of rated charge current if the battery voltage is under 14.0 VDC (28.0 VDC on 24-volt models or 48.0 VDC for 48-volt models). If not, check the *03E Max Charge Rate* setting and verify the setting is 80% or greater. Still low charge rate? Check the *03A AC Input Amps* setting. If no AC loads are being passed through the inverter, the *03A Input Amps* setting must be 15 amps (25 amps for 3kW unit) or greater to receive a full charge rate.

- **Charger says "Float Charging" not "Bulk Charging" when the AC is first plugged in:** Check the *01A DC Volts* meter on the ME-ARC display. If the battery is >13.0 VDC (>26.0 VDC for 24-volt models or >52.0 VDC for 48-volt models) then the battery was already charged and the charger automatically goes to Float charging to keep from overcharging the batteries. Try the *Start Bulk* setting from the *02 CHG Control* menu.

- **Charge amps are lower than expected, or is 0 amps DC:** Measure input AC voltage and increase if the input voltage is under 90 VAC. The charge rate is reduced to keep the input voltage above 90 VAC. Also, check the *03A AC Input Amps* and *03E Max Charge Rate* settings to determine if the current is being limited.

- **Charger output voltage is different than expected:** Check the Battery Temperature Sensor (BTS) temperature. If the BTS is installed, the charge voltage settings will increase if the temperature around the BTS is below 77°F (25°C), and decrease if the temperature around the BTS is higher than 77°F (25°C).

7.0 Using a ME-AGS-N Controller

The AGS menus on the ME-ARC remote allow you to customize and monitor operating parameters, and to help troubleshoot your autostart/autostop generator system.

IMPORTANT: The AGS must be a connected network version (ME-AGS-N) and communicating with the ME-ARC in order to set up and/or control its operation. If the AGS is not communicating or there is no AGS connected, "No AGS Present" appears when accessing the *METER: 04 AGS Meters*, *SETUP: 04 AGS Setup* or the *CTRL: 03 Gen Control* menus (unless the *TECH: 07 Show all Menus* menu is set to "Yes"). Refer to Section 3.2.5 for more information on the *TECH: 07* menu.

7.0.1 Software Differences Between AGS Versions

Even though the ARC remote provides a selection/feature or shows a setting, based on the version of your ME-AGS-N, this selection or setting may not be available. Use Table 7-1 to determine if your ME-AGS-N is compatible with the selection or setting you want to use. Refer to *TECH: 02 Versions* to determine the software version of your AGS.

Table 7-1, Software Differences Between AGS Versions

AGS Menu (Button: Menu)	ME-AGS-N Required
<i>CTRL: 03 Gen Control</i>	≥ Ver 5.0
<i>METER: 04 AGS Meters</i>	
04A AGS Status	≥ Ver 5.0
04B DC Volts-AGS	≥ Ver 5.0
04C Gen Run Time	≥ Ver 5.1
04D AGS Temp	≥ Ver 5.0
04E Since GenRun	≥ Ver 5.0
04F Since 100%**	≥ Ver 5.3
04G Hour Meter	≥ Ver 5.3
<i>SETUP: 04 AGS Setup</i>	
04A Gen Run VDC	≥ Ver 5.0
04B Gen Run Time	≥ Ver 5.0
04C Gen Run Amps*	≥ Ver 5.0
04D Gen Run SOC**	≥ Ver 5.0
04E Gen Run Temp	≥ Ver 5.0
04F Max Gen Run Time	≥ Ver 5.2
04G Quiet Time	≥ Ver 5.0
04H Gen Exercise	≥ Ver 5.0
04I Gen Warm-up Time	≥ Ver 5.0
04J Gen Cooldown Time	≥ Ver 5.0
04K Gen 100% SOC Start Days**	≥ Ver 5.3
<i>TECH: 04 Fault History</i>	
04B AGS Faults	≥ Ver 5.0
* Only MS-PAE, MS-PE, or MSH Series inverters	
** Requires the ME-BMK (Battery Monitor)	

Using an AGS Module: Setup

7.1 Setting Up the AGS using the ME-ARC

Press the SETUP button on the ME-ARC remote, and then rotate the SELECT knob to the *04 AGS Setup* display. The menus available from this screen allow the generator to be automatically started and stopped based on many different conditions. From Table 7-2, determine the specific autostart and autostop conditions with which you want the generator to be automatically controlled, and then use that specific menu setting to configure the AGS.



Info: For information on using the CTRL, METER, and TECH button menus, refer to Section 7.2 “Operating/Monitoring the AGS using the ME-ARC”.



Info: The *Auto Connect* setting must be selected from the *CTRL: 01 ACIn Control* menu if a ME-AGS-N is installed and enabled in the system. Otherwise, when the generator is autostarted it may be prevented from connecting because the criteria to allow the AC input to connect (*02C AC In - Time*, *02D AC In - VDC*, or *02E AC In - SOC*) may not have been met.

Note: This is true unless you are using an inverter that has two independent AC inputs—one for grid and the other for generator (i.e., MSH4024RE). On the MSH4024RE inverter, the AC In control features only work with the GRID IN (AC1) input.

Table 7-2, ME-ARC Autostart/Autostop Matrix

Autostart Condition	Autostop Condition	SETUP Menu	Page
Starts on low battery voltage (DC voltage connected to Terminals #3 and #4)	Stops on higher battery voltage	<i>04A Gen Run VDC</i>	60
	Stops at Float charge after a set time period (using <i>Absorb Done Time</i> setting)	<i>04A Gen Run VDC (Set to Float)</i>	60
	Stops at Float charge after battery current requirement is low (using <i>Absorb Done Amps</i>)	<i>04A Gen Run VDC (Set to Float)</i>	60
	Stops at Float charge using a battery SOC setting (using <i>Absorb Done SOC</i> setting) ²	<i>04A Gen Run VDC (Set to Float)</i>	60
Starts daily at a set time	Stops daily at a different set time	<i>04B Gen Run Time</i>	62
Starts on high AC amps to an inverter load ¹	Stops on lower AC amps to an inverter load ¹	<i>04C Gen Run Amps</i>	62
Starts when the battery SOC ² is low	Stops when the battery SOC ² is higher	<i>04D Gen Run SOC</i>	63
Starts when temperature increases	Stops after a set time period	<i>04E Gen Run Temp</i>	64
Starts when battery SOC ² has been <100% for a set # of days	Stops when battery SOC ² is 100%	<i>04K Gen 100% SOC Start Days</i>	70

Note¹: Only applicable to MS-PAE, MS-PE and MSH inverters.

Note²: Autostart/stop conditions using SOC require a ME-BMK to be installed.

SETUP: 04A Gen Run VDC Menu

This menu provides the option to start the generator when the battery voltage gets low, and to stop the generator either when the battery reaches a higher voltage level or when the battery has been fully charged and goes into the Float charge stage. Using voltage to automatically start and stop the generator is considered the simplest and easiest method to understand. The *04A Gen Run VDC* menu also has start and stop delay settings that minimize nuisance starts/stops to prevent short cycle generator run times.

- **Set Start Gen Volts** – This setting will start the generator when the battery voltage (on Terminals #3 & #4) decreases to or below this setting continuously for the duration of the *Start Volts Delay* setting.

Default setting: 11.5 VDC (12v), 23.0 VDC (24v), 46.0 VDC (48v)

Range: OFF, 9.0-15.9 VDC (12v), 18.0-31.8 VDC (24v), 36.0-63.6 VDC (48v)

Where should I set Start Gen Volts? The VDC start voltage must be high enough to not over-discharge the battery, but low enough to keep from nuisance starting the generator. Typically, the start volts is set at approximately 50% of the battery capacity. Since this is an inverter/battery system, and the battery is normally loaded, the VDC used to determine 50% battery capacity should be set lower than what is shown on typical battery voltage SOC charts (approximately 11.0-11.5 in a 12-volt system), which show the battery at rest (unloaded). A typical start voltage setting would be between 11.0 VDC - 11.5 VDC for a 12-volt system.



Info: The DC voltage the AGS uses to determine when to autostart is displayed in the *METER: 04B DC Volts-AGS* menu.



Info: Using a 12-volt battery, a typical SOC (State of Charge) battery chart will show that 12.2 VDC is considered 50% SOC. This voltage is a battery “at rest,” meaning it has no load connected and has been at rest for a minimum of 30 min. While this voltage is accurate under these at rest conditions, this same voltage with a load applied means the battery is well above 50% SOC, and should be set much lower. The larger the battery bank the less the voltage will be affected by a load applied to the battery bank.



Info: When using the *04A Gen Run VDC* settings, ensure the *Start Gen Volts* setting is higher than the *02B LBCO* setting (under *SETUP: 02 Invert Setup*). This prevents the inverter from shutting down before the generator comes on. The *04A Gen Run VDC* setting should be high enough to allow sufficient time until the generator is allowed to start (i.e., start delay time) and the inverter is allowed to connect (i.e., warm-up time and AC input delay time). Set the *Start Gen Volts* setting at least 1 volt higher than the inverter’s *02B LBCO* setting, and then adjust depending on how long it takes the battery voltage to fall under normal usage conditions.

- **Set Start Volts Delay** – This setting determines how long the *Start Gen Volts* parameter must be continuously maintained before the generator autostarts. This ensures the generator does not nuisance start. By setting a delay, momentary surges from heavy loads—that can cause the battery voltage to dip—will not start the generator unnecessarily.

Default setting: 120 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

Where should I set Start Volts Delay? First, determine what loads will be running when the generator needs to start. The larger the load the shorter the delay time setting. When a large load is applied to the battery bank the battery voltage drops quickly, so the delay time should be short to ensure the batteries are not over-discharged. If you are unsure what loads might be running or where to set the start delay, error on setting a shorter time such as a default of two minutes (to protect batteries from over-discharge).

Using an AGS Module: Setup

- **Set Stop Gen Volts** – This setting will stop the generator when the battery voltage (on Terminals #3 & #4) increases to or above this setting continuously for the duration of the *Stop Volts Delay* setting. To allow the battery bank to go through a full Bulk and Absorption charge, this setting should be set to *Float*.

Default setting: 14.4 VDC (12v), 28.8 VDC (24v), 57.6 VDC (48v)

Range: OFF, 9.1-16.0 VDC (12v), 18.2-32.0 VDC (24v), 36.4-64.0 VDC (48v), *Float*

Where should I set Stop Gen Volts? Typically, when using a generator to charge batteries, most individuals only charge the batteries to 80-85% to compromise between minimizing fuel usage and maximizing battery life. This is done by having the generator start on low battery voltage, and then stop at a higher voltage (i.e., the *Stop Gen Volts* setting). When deciding where to set the *Stop Gen Volts* setting, it must be lower than the inverter's *Absorb Volts* setting (determined by the *SETUP: 03C Battery Type/Custom* setting menu). Otherwise, the charger will enter Absorption charge mode—which is required to maintain the batteries at a constant voltage level—and the battery voltage will not reach the *Stop Gen Volts* setting, which will cause the generator to run until it is out of fuel or until it reaches the *SETUP: 04F Max Gen Run Time* setting.

Therefore, after reading this some will think that they should just set the *Stop Gen Volts* setting slightly lower than the absorption level to ensure the charger always reaches the *Stop Gen Volts* setting before it goes into the Absorption charge mode. However, temperature changes can affect the *Absorb Volts* setting¹ and may require you to readjust the *Stop Gen Volts* setting seasonally. If you are in a normally cold climate (<32°F), the actual absorb charge voltage will increase. So, the *Stop Gen Volts* setting should be set well above the *Absorb Volts* setting (~.5V above for 12-volt systems). If you are normally in a hot climate (>95°F), the actual absorb charge voltage will decrease. In that case, the *Stop Gen Volts* setting should be set well below the *Absorb Volts* setting (~.5V below for 12-volt systems).

A simpler way to charge the batteries to 80-85% and to automatically allow a temperature-compensated charge to the batteries (no seasonal adjustment required) is accomplished using the settings below:

- Set the *Stop Gen Volts* setting to *Float*
- Set the *Absorb Volts* setting (*SETUP: 03C Battery Type/Custom* setting) to the voltage level at which you want the generator to turn off (normally ~ 14.5 volts for flooded batteries in a 12-volt system)
- Set the *Absorb Done Time* setting (*SETUP: 03D Absorb Done Time*) to 0.1 hours

Using these settings, when the batteries reach a low voltage level the generator turns on (per the *Start Gen Volts* setting) and charges the battery to the temperature-compensated *Absorb Volts* setting. After reaching the absorption voltage level, the inverter/charger goes into Absorption charge mode and is there for only six minutes (0.1 hours) before it goes to Float charge mode. Once the inverter/charger enters Float charge mode, the AGS autostops the generator.



Info: Battery life will be reduced if the batteries are regularly charged to only 80-85%. It is highly recommended to charge the batteries to 100% as often as possible (~ once a week, or every other discharge cycle) in order to avoid sulfation of the battery plates. Using the *SETUP: 03D Absorb Done Time* menu, the absorption charge time can easily be changed to a longer duration to increase the batteries' state of charge.

Note: If a ME-BMK (battery monitor) is installed in the system, refer to the *SETUP: 04K Gen 100% SOC Start Days* menu, which can be used to autostart the generator and to periodically charge the battery to 100%.

- **Set Stop Volts Delay** – This setting determines the amount of time the battery voltage must be above the *Stop Gen Volts* setting before the AGS autostops the generator.

Default setting: 120 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

Note¹: When the inverter's BTS is connected, the actual absorb charge voltage will increase or decrease to ensure correct charging as the battery temperature changes.

SETUP: 04B Gen Run Time Menu

This menu autostarts and autostops the generator based on a specific time of day. This feature uses the ME-ARC's internal clock to start and stop the generator at the selected times.



Info: Ensure the remote's clock is correct. If needed, refer to the Section 3.2.4 for guidance on setting the time on the remote's clock.



Info: The ME-ARC clock is powered from the inverter through the remote cable. If the ME-ARC or inverter loses power, the clock will lose the correct time and must be reset.

- **Set Gen Run Time** – This menu allows set times to be established to turn the gen on and off each day. Select *ON* to set specific times of day to autostart and autostop the generator.

Default setting: *OFF*

Range: *OFF, ON (12:00 AM - 11:45PM, 15 minute intervals)*

- ◆ **Set Start Gen Hour** – Set the hour the generator will autostart each day.
- ◆ **Set Start Gen Minute** – Set the minute the generator will autostart each day.
- ◆ **Set Start Gen AM-PM** – Set the time period the generator will autostart.
- ◆ **Set Stop Gen Hour** – Set the hour the generator will autostop each day.
- ◆ **Set Stop Gen Minute** – Set the minute the generator will autostop each day.
- ◆ **Set Stop Gen AM-PM** – Set the time period the generator will autostop.

Why would I set a specific time of day to start/stop the generator? Starting/stopping at a particular time of day is useful if you want to run the generator for other uses while charging the batteries. You may require the generator to run a heavy load (e.g., pump or machinery) every day at the same time. You may also want the generator to run while you are at work each day to have charged batteries when you get home, and to avoid having to hear it running.

SETUP: 04C Gen Run Amps Menu

This menu autostarts the generator based on the amount of AC amps needed to handle the load the inverter is running.

Note: *This feature is only applicable to Magnum's MS-PAE, MS-PE and MSH Series inverters.*



Info: The *METER: 02B Load Amps* menu is used to determine how much load the inverter is currently running when in Inverter mode.

- **Set Start Gen AC Amps** – This setting determines when the generator would start depending on the AC amps level of the load the inverter is running. The load's amps level must be continuously maintained above the *Start Gen AC Amps* setting for the duration of the *Start Amps Delay* setting in order for the generator to autostart.

Default setting: *OFF*

Range: *OFF, 5-60 Amps*

- **Set Start Amps Delay** – This setting determines the amount of time that the inverter load's current must continuously remain above the *Start Gen AC Amps* setting for the AGS to initiate an autostart.

Default setting: *120 Sec*

Range: *0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)*

- **Set Stop Gen AC Amps** – This setting determines when the generator would stop depending on the drop in the AC amps level of the load the inverter is running. The load's AC amps level must be continuously maintained below the *Stop Gen AC Amps* setting for the duration of the *Stop Amps Delay* time setting in order for the generator to autostop.

Default setting: *4 Amps*

Range: *4-59 Amps*

- **Set Stop Amps Delay** – This setting determines the amount of time that the AC load must continuously remain below the *Stop Gen AC Amps* setting before the generator autostops.

Default setting: *120 Sec*

Range: *0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)*

Using an AGS Module: Setup

Why would I use Gen Run Amps? This feature is designed to prevent the battery from being heavily discharged by monitoring the battery current used to power the inverter loads (shown in AC amps). When the AC current exceeds the *Start Gen AC Amps* setting, a generator autostart is initiated. After the generator connects to the inverter, the current from the generator is now used to run the loads instead of the battery current. This feature is useful when there is occasionally a large load or combinations of loads that the inverter is able to run, but by doing so would quickly deplete the battery bank (large loads might be motors, well pumps, A/C units, or freezers).



Info: The Gen Run Amps feature is not designed to turn on the generator to power loads above the capacity of the inverter. If attempting to run loads above the inverter capacity, the inverter may overload and shut down before the generator can autostart and power the heavy load through the inverter.

Where should I set Gen Run Amps? Typically, the generator autostarts when the AC load amps is >70-75% of the inverter's AC current output rating¹. This keeps the inverter from running too large a load and the batteries from cycling unnecessarily. Set *Stop Gen AC Amps* just below the start amps to ensure the large load has turned off. Set the *Start Amps Delay* time so surge loads don't trigger a false start, and set a long enough *Stop Amps Delay* time setting to ensure the load has turned off.

Example: In this scenario, most AC loads typically do not exceed 20A when in Inverter mode. When a freezer or well pump starts, the load exceeds 30A so the battery voltage starts to quickly drop. Instead of cycling the batteries to a low voltage, set *Start Gen AC Amps* to 25A with a 60-second delay (using the *Start Amps Delay* menu). Set the *Stop Gen AC Amps* menu to 20A with a 60-second delay (using the *Stop Amps Delay* menu). After 60 seconds of detecting a larger than 25A load on the inverter, the generator autostarts and powers the loads and recharges the batteries. Once the AC amps load drops below 20A for 60 seconds, the generator will turn off.

SETUP: 04D Gen Run SOC Menu

This menu autostarts/stops the generator based on the SOC (State of Charge) reading from the attached battery monitor (BMK required), as shown on the *METER: 05B Battery SOC* display. This is considered the best overall method for using AGS settings to autostart/stop your generator. Since the ME-BMK already uses voltage, time, and current to determine the true SOC of the batteries, there is little guesswork or calculating needed to determine what settings to use.

- **Set Start Gen SOC** – This menu sets the SOC level for autostarting the generator.
Default setting: OFF
Range: OFF, 20-99%
- **Set Stop Gen SOC** – This menu sets the SOC level for autostopping the generator.
Default setting: 90%
Range: 21-100%



Info: There is no start or stop delay time needed since the ME-BMK already displays an accurate state of charge of the batteries.



Info: The optional Battery Monitor Kit (ME-BMK or ME-BMK-NS) must be installed and enabled to use the Gen Run SOC autostart/autostop feature.



Info: When using this feature, the gen autostarts and runs until the battery bank has reached the *Stop Gen SOC* setting or the AGS's *SETUP: 04F Max Gen Run Time* setting is met, whichever occurs first. Ensure the charger never leaves the Bulk/Absorption charge mode. This is done by ensuring the *SETUP: 03D Absorb Done* selection is "SOC" and the setting is \geq the *Stop Gen SOC* setting; and, either set the *04F Max Gen Run Time* setting to OFF, or set it long enough to ensure the generator is able to run until the battery is fully charged. If the charger is allowed to exit the Bulk/Absorption charge mode (i.e., go to Float/Silent), the battery SOC may never reach 100%.

Note¹ – For a 4000 watt inverter, set *Start Gen AC Amps* at 25A.



Info: The *METER: 05B Battery SOC* meter must have a valid SOC number for the Gen Run SOC feature to determine when to start and stop based on the battery SOC. Under the *METER: 05B Battery SOC* menu, *Think'n*, *No Comm*, or any BMK fault (i.e., *Factory Fault*, *Power-up Fault*, or *Unknown Fault ##*) are not valid SOC numbers.



Info: When the Gen Run SOC feature is enabled and a generator SOC start is triggered, the remote issues a one-time "Start Bulk" command to the inverter/charger. This ensures—after the generator connects—that regardless of battery voltage, a Bulk/Absorb charge cycle is started.

Where should I set Gen Run SOC? Most battery manufacturers recommend that for optimum battery life, deep-cycle batteries should not be discharged below 50% SOC. The ME-BMK determines the battery's SOC by using a DC shunt to measure the flow of current in and out of the battery. Many refer to a SOC meter as a "fuel gauge" for your batteries, since this meter gives you an accurate reading of how much capacity is remaining in the battery bank.

Set the *Start Gen SOC* level to 50%, or to 60% if you do not want to discharge the batteries quite as much. When considering the *Stop Gen SOC* setting, keep in mind that running the generator past 90% SOC delivers very little current to get that last 10% into the batteries. Thus, it is common to stop the generator at 90% to save fuel and run time on the generator. However, if the *Stop Gen SOC* setting is less than 100%, the batteries should be charged to 100% as often as possible (~ once per week, or every other discharge cycle) in order to avoid sulfation of the battery plates (see the *SETUP: 04K Gen 100% SOC Start Days* menu).

SETUP: 04E Gen Run Temp Menu

This menu allows you to automatically start the generator, either from an external temperature sensor, or by receiving an external input command from an A/C thermostat—typically, to power an A/C unit for cooling—based on an increase in temperature.

Note: This temperature autostart feature requires that the AGS's remote temp sensor cable or an optional ME-PT1 or ME-PT2 pigtail adapter be connected to the AGS's REMOTE (purple) port.



Info: The optional ME-PT1 or ME-PT2 pigtail adapters can be used to connect an A/C or relay control circuit. For more information, refer to the instruction sheet for each pigtail adapter (PN: 64-0025 for ME-PT1 instructions, or PN: 64-0026 for ME-PT2 instructions).

- **Set Gen Run Temp Start** – This menu is used to enable and set the temperature that triggers a generator autostart. If the temperature start feature is not needed, set to the *OFF* position.

Default setting: *OFF*

Range: *OFF, Ext Input, 65F - 95F (or 18C - 35C)*

- ◇ **Ext Input** – This setting is used when an optional pigtail adapter (ME-PT1, or ME-PT2) is used. When an AGS pigtail adapter is connected to the AGS's REMOTE port, an external command—either from a thermostat connection on an air conditioner control circuit or an external relay control circuit—is recognized and causes the AGS to begin a generator autostart sequence. Once the external command is no longer recognized, an autostop sequence is given and the generator stops after a minimum two-minute delay.

- ◇ **65F - 95F (18C - 35C)** – These settings determine the rising temperature value that triggers a generator temperature autostart.

- **Set Gen Run Temp Time** – This menu sets the amount of time the generator runs after a temperature autostart (when using the remote temp sensor).

Default setting: *2.0 Hrs*

Range: *0.5-25.5 Hrs (0.5 hour increments)*



Info: The *Run Time* in this menu uses the *METER: 04C Gen Run Time* menu's displayed value to determine the generator's run time.

Using an AGS Module: Setup

How does the Gen Run Temp feature work? When the temperature around the remote temperature sensor (based on the *METER: 04D AGS Temp* display) increases to the *Gen Run Temp Start* setting, the generator immediately starts and runs based on the *Gen Run Temp Time* setting. When this run time period is finished, the temperature sensor reading is checked. If the temperature sensor (or thermostat control if using the optional pigtail adapter) reading is below the *Gen Run Temp Start* setting, the generator will autostop. If the temperature sensor (or thermostat control) reading is above the *Gen Run Temp Start* setting, the generator will continue to run for a second run time period. At the end of this second run time period, the temperature sensor reading (or thermostat control) is checked again. This cycle continues as long as the *CTRL: 03 Gen Control* menu is set to *AUTO* or the *SETUP: 04F Max Gen Run Time* setting is reached, whichever occurs first.

Why would I use Gen Run Temp? Typically, in a mobile application such as in an RV or on a boat where the air conditioning (A/C) unit is too much power for the inverter to run from the batteries, this feature is used to start a generator to run the A/C unit. Many RV and marine customers travel with pets and they do not want to leave the pets inside on a hot day. With this feature, you could set the A/C unit to turn on and leave. Whenever the inside temperature rises to the start setting, the AGS commands the generator to autostart; which provides power to the A/C unit so that it can now run and cool the pet area. This would keep the area cool and comfortable—plus, while the generator is on, the inverter batteries are being charged.

Should I use the Remote Temperature Sensor or the External Input? If your A/C unit provides a thermostat connection or you want to set up an external relay control circuit, then use the external input (*Ext Input*) selection. When using the external input setting, you must connect an optional AGS pigtail adapter (ME-PT1 or ME-PT2) to the AGS's REMOTE port. When the pigtail adapter recognizes an external command, the AGS will begin a generator autostart sequence.



Info: The ME-PT1 requires a +12-volt to common ground input, and the ME-PT2 requires a two-terminal dry contact input.

Without any connection to an external control circuit, the remote temperature sensor cable must be used. This cable is provided with the AGS and is 60' in length with the sensor wired to the end and covered with heat shrink. The sensor must be placed in the location that is required to be monitored for temperature, and the *Gen Run Temp Start* setting must be set.

Where should I set Gen Run Temp Start? If using this feature to power an A/C unit, the *Gen Run Temp Start* setting should be slightly above the temperature setting of the thermostat controlling the air conditioner unit—to ensure the A/C unit runs once the generator starts. Once the *Gen Run Temp Start* setting is reached, the generator starts providing power to the A/C unit. If the *Gen Run Temp Start* setting is below the A/C unit's thermostat setting, the generator could be commanded to autostart; but because the thermostat has not reached its start temperature, the A/C unit wouldn't have turned on yet. In other words, your generator would be running, but the A/C unit would not be running—resulting in wasted fuel and the area not being cooled down.



Info: If using the temperature autostart feature to start a generator that is powering two air conditioners, it is suggested that the second air conditioner's thermostat be set 2° to 5° higher than the first air conditioner. This staggered setting allows the first air conditioner to start and run in an effort to keep the coach cool. If the temperature continues to rise inside the coach, the second air conditioner would then turn on.

How long should I set the Gen Run Temp Time? If you use the remote temp sensor cable and set a *Gen Run Temp Start* temperature, the *Gen Run Temp Time* setting must be set. When the temperature rises to the *Gen Run Temp Start* setting, the gen autostarts and runs until either the *Gen Run Temp Time* setting or the *04F Max Gen Run Time* setting is reached—whichever occurs first. At the end of the *Gen Run Temp Time* setting, the temperature around the sensor is checked. If the temperature is still above the *Gen Run Temp Start* setting, the generator continues to run for another *Gen Run Temp Time* setting. This means you could set the time to the lowest time setting (*0.5 Hrs*), knowing the generator will attempt to run until the temperature setting is met.

SETUP: 04F Max Gen Run Time Menu

This menu is used to set the maximum time the generator will run if autostarted.

- **Set Max Gen Run Time** – Set this to the maximum amount of time you want the generator to run once it has been autostarted.

Default setting: 12.0 Hrs

Range: OFF*, 0.1-25.5 Hrs

* The Max Gen Run Time setting can only be turned off using a ME-AGS-N with Ver \geq 5.2.

Why should I use Max Gen Run Time? This setting ensures the generator does not run longer than desired once autostarted. Designating a maximum run time ensures the generator stops if the autostop setting cannot be satisfied. For example, if the fuel capacity of a generator is five hours, set the *Max Gen Run Time* setting to 4.5 hours to ensure it does not run out of fuel.



Info: When the generator autostarts, it autostops when the autostop parameter for that particular setting has been satisfied. For example, if the generator starts due to the *04A Gen Run VDC* menu's *Start Gen Volts* autostart setting, it then stops once it satisfies the *Stop Gen Volts* autostop setting. However, the *Max Gen Run Time* setting overrides any autostop setting. If the generator stops because the *Max Gen Run Time* setting has been reached, the *Fault MaxRn* status occurs. If this happens, you may have to increase the *Max Gen Run Time* setting or adjust the autostop setting to finish sooner. If multiple autostart settings are set in the *04 AGS Setup* menus and a *Fault MaxRn* status occurs, refer to the *METER: 04A AGS Status* menu to identify which condition autostarted the generator. This way you will know which auto condition is running longer than the *Max Gen Run Time* setting.



Info: The *Max Gen Run Time* menu uses the *METER: 04C Gen Run Time* value to determine the generator's run time.



Info: If the generator is stopped due to the *Max Gen Run Time* parameter being met, the status becomes *Fault MaxRn* and the generator will not autostart again until you clear the fault by selecting *OFF* from the *CTRL: 03 Gen Control* menu.

SETUP: 04G Quiet Time Menu

This menu is used to enable the Quiet Time feature and to set the period of time each day in which the generator is not allowed to automatically run. The generator is prevented from autostarting during the Quiet Time period. Also, if any autostart parameter in the *04 AGS Setup* menus has been met and the generator is running when the Quiet Time start setting is reached, the generator will turn off. The generator will not try to autostart until the Quiet Time stop setting has been reached and an autostart condition is once again satisfied.



The ME-ARC time clock must be set for proper operation of the Quiet Time feature (see *SETUP: 01 System Setup/01A Set Clock* menu).

- **Set Quiet Time** – Set to *ON* (allows you to set the start and stop times).

Default setting: OFF

Range: OFF, ON (12:00AM-11:45PM in 15 min intervals)

- ◇ **Set Start Quiet Hour** – Set the hour for Quiet Time to start.
- ◇ **Set Start Quiet Minute** – Set the minute for Quiet Time to start.
- ◇ **Set Start Quiet AM-PM** – Set AM or PM for the start of Quiet Time.
- ◇ **Set Stop Quiet Hour** – Set the hour for Quiet Time to stop.
- ◇ **Set Stop Quiet Minute** – Set the minute for Quiet Time to stop.
- ◇ **Set Stop Quiet AM-PM** – Set AM or PM for the stop of Quiet Time.

Using an AGS Module: Setup

- **Set Quiet Time Topoff** – Sets the time period the generator will autostart and run before Quiet Time starts. The generator will only start on *Quiet Time Topoff* if the battery voltage is within 0.3 volts¹ or less of reaching the *04A Gen Run VDC* start parameter, or the battery's SOC is within 4% or less of reaching the *04D Gen Run SOC* start parameter².

Default setting: OFF

Range: OFF, 30-120 Minutes (30 min intervals)

Why should I use Quiet Time? Quiet Time is used when there are park rules or local regulations that prohibit generators from running (i.e., noise requirements during sleep hours). If there are no local rules or regulations, you may not want to use Quiet Time—which would allow the generator to run at any time in a 24-hour period.

Where should I set Quiet Time? Set the Quiet Time start and stop settings to coincide with local noise requirements, or for a specific time period that you do not want the generator to automatically run each day.

What is Quiet Time Topoff? The Quiet Time Topoff feature charges the battery prior to the start of Quiet Time in an attempt to prevent the inverter from shutting down from a low battery condition during the entire Quiet Time period. The Quiet Time Topoff feature is enabled whenever you select a time from the *Set Quiet Time Topoff* menu.

The *Set Quiet Time Topoff* setting determines how long the battery voltage is monitored before the start of Quiet Time. During the toff time period, if the battery voltage is 0.3 volts¹ or less of reaching the *04A Gen Run VDC* start parameter, the generator will automatically start and charge the batteries before Quiet Time turns the generator off.

If an optional Battery Monitor Kit (ME-BMK or ME-BMK-NS) is installed and enabled, the Quiet Time Topoff feature will also autostart the generator if the battery's SOC is within 4% or less of reaching the *04D Gen Run SOC* start parameter during the toff time period.

Where should I set Quiet Time Topoff? Normally, setting *Quiet Time Topoff* to 30 or 60 minutes is a good idea. In cases where the DC or inverter loads are unusually high or the SOC autostart setting is low—which may cause the batteries to be heavily discharged during the Quiet Time period—increase *Quiet Time Topoff* to 90 or 120 minutes; this ensures the batteries receive the maximum charge time before Quiet Time shuts the generator off.



Info: When the generator starts on *Quiet Time Topoff*, it continues running until it reaches the Quiet Time start parameter—even if the VDC or SOC autostop parameter is reached.

Scenario example (Topoff based on battery voltage): The *04A Gen Run VDC* menu is set to start at 11.5 VDC, *Quiet Time* is set to start at 10PM, and the *Quiet Time Topoff* setting is 60 min. At 9PM, the battery voltage reaches 11.8 VDC; because the Quiet Time Topoff feature is enabled (60 min.) and the battery voltage is within 0.3 volts of the *04A Gen Run VDC* setting, the generator autostarts to allow the batteries to charge for 60 minutes before *Quiet Time* turns the generator off.

Scenario example (Topoff based on battery SOC²): The *04D Gen Run SOC* menu is set to start at 60%, *Quiet Time* is set to start at 10PM, and the *Quiet Time Topoff* setting is 120 min. At 8PM, the battery SOC reaches 64%; because the Quiet Time Topoff feature is enabled (120 min.) and the battery's SOC is within 4% of reaching the *04D Gen Run SOC* start setting, the generator autostarts to allow the batteries to charge for 120 minutes before *Quiet Time* turns the generator off.

Note¹: This voltage is scaled depending on your battery system; ≤ 0.3 for 12-volt systems, ≤ 0.6 for 24-volt systems, and ≤ 1.2 for 48-volt systems.

Note²: Requires the optional Battery Monitor Kit (ME-BMK or ME-BMK-NS) to be installed and enabled.

SETUP: 04H Gen Exercise Menu

This menu allows the generator to run (or “exercise”) after it has not been operated for a period of time. The generator is automatically started at a pre-selected time whenever it exceeds a set number of days without running.

Once the start command is initiated, the generator starts and runs to help it remain operational and to allow the generator’s starting battery to be charged.



The ME-ARC time clock must be set for proper operation of the Gen Exercise feature (see *SETUP: 01 System Setup/01A Set Clock* menu).

- **Set Gen Exercise Days** – This menu sets the maximum number of days the generator is allowed to sit without running. If the generator has not run in this number of days, the exercise parameters will start the generator. The *Gen Exercise Days* setting must be between 1-255 days in order to enable the Gen Exercise feature.

Default setting: OFF

Range: OFF, 1-255 Days

- ◆ **Set Exercise Run Hour** – Set the hour the generator will autostart.
- ◆ **Set Exercise Run Minute** – Set the minute the generator will autostart.
- ◆ **Set Exercise Run AM-PM** – Set AM-PM when the generator starts.
- ◆ **Set Exercise Run Time** – Set how long the generator will run for the exercise period.

Default setting: 1.0 Hrs

Range: OFF, 0.1-25.5 Hrs (12:00 AM - 11:45 PM @ 15 min. increments)

Why should I use Gen Exercise? Exercising your generator is one of the most overlooked aspects of routine maintenance, yet its the simplest to perform. Regularly exercising your generator keeps engine seals and components lubricated, prevents oxidation of electrical contacts, uses up fuel before it deteriorates, heats up the generator windings to eliminate moisture buildup, helps ensure the generator’s starting battery is maintained at an optimal state of charge, and in general, helps provide reliable engine starting. If long periods of time elapse without using your generator (remains connected to external AC power), or if you only use your generator a few days out of the year, enabling the Gen Exercise feature is recommended.

How often and how long should I exercise my generator? To maximize reliability and minimize repairs, exercise your generator at least once a month. This applies to both gas and diesel generators. When generators sit unused for as little as 30 days moisture can build up, and may damage your generator. Also, the fuel in gasoline-powered generators can begin to break down into gums and varnishes that clog the fuel system. Fuel varnishing results in hard starting and surging—a surging generator may not settle at a stable operating speed. Always check with your generator’s manufacturer to determine how to properly exercise your generator. Generally, it is recommended that you run the generator every month for two hours under at least half the rated load. For example, with a 5,000 watt generator, turn on a load(s) that is about 2,500 watts, and let it run continuously for two hours. It is always best to run the generator for longer periods of time rather than for multiple short periods.

How does this Gen Exercise feature work? The Gen Exercise feature allows the generator to autostart at a pre-selected time whenever it has not run for a set number of days. Once the Gen Exercise feature is enabled (by setting how many days to wait before exercising the generator under *Set Gen Exercise Days*), the generator will start and begin exercising only after two conditions are met. First, the generator must not have run for a set number of days (i.e., the *Since Gen Run Days* timer value must be equal to or greater than the *Gen Exercise Days* setting). Second, the generator’s exercise time of day (i.e., *Exercise Run Hour/Minute/AM-PM* settings) must occur.



Info: The Gen Exercise feature identifies the number of days since the generator has last run by using the *Since Gen Run Days* timer which is shown under the *METER: 04E Since GenRun* display.

Using an AGS Module: Setup



Info: When the generator starts and runs based on the gen exercise criteria, the generator power passes through the inverter to the inverter loads—if the inverter is enabled to accept AC power on its input—and also charges the inverter batteries (if the charger is enabled).

Example of a Gen Exercise Scenario:

Under the *SETUP: 04H Gen Exercise* menu: set *Gen Exercise Days = 3*, set *Exercise Run Hour, Minute and AM-PM = 8:30A*, and then set *Exercise Run Time = 1.0 Hrs*.

Under *CTRL: 03 Gen Control*, set to *AUTO*.

First required condition: The Since Gen Run Days timer must have accumulated to at least three days (*Set Gen Exercise Days = 3*). On Day 1, the generator was manually started and stopped at 2:00 PM. The stop time (2:00 PM) is the starting point for the Since Gen Run Days timer to begin counting days—the Since Gen Run Days timer displays “0 Days”. On Day 2 at 2:00 PM, 24 hours have accumulated since the generator has last run—the Since Gen Run Days timer displays “1 Day”. On Day 3 at 2:00 PM, 48 hours have accumulated since the generator last ran—the Since Gen Run Days timer displays “2 Days”. On Day 4 (third day since the generator was manually started) at 2:00 PM, 72 hours (or three days) have now accumulated since the generator has last run—the Since Gen Run Days timer now displays “3 Days”. The first required condition—which is how many days must pass before the generator hasn’t run—has been met.

Second required condition: The remote clock must now go to 8:30 AM (*Set Exercise Run Hour, Minute, and AM-PM = 8:30A*) before the generator can autostart. On Day 5 at 8:30 AM (Since Gen Run Days timer displays “3 Days”), the second required condition is met and the generator automatically starts and runs for one hour (*Set Exercise Run Time = 1.0 Hrs*).

SETUP: 04I Gen Warm-up Time Menu

This menu allows the generator to run (i.e., warm-up) before it connects to the inverter/charger, or powers the battery charger and any pass-thru loads. Most generators need to warm up before a load is supplied—similar to warming up your car before driving it.

- **Set Gen Warm-up Time** – This setting is the amount of time the generator is allowed to warm up before connecting to the inverter/charger.

Default setting: 60 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

Where should I set Gen Warm-up Time? Check with your generator manufacturer. Typically, smaller generators (~2-3 KW) need at least 60 seconds to warm up before applying a load; larger generators require a longer warm-up time.

SETUP: 04J Gen Cooldown Time

This menu allows the generator to continue to run unloaded after it disconnects from the inverter and prior to autostopping (i.e., cooldown). Allowing the generator to cool down after the load is disconnected helps to prolong generator engine life (especially diesel engines with turbos).

- **Set Gen Cooldown Time** – This setting is the amount of time the generator is allowed to cool down after it disconnects from the inverter/charger.

Default setting: 60 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

Where should I set Gen Cooldown Time? Check with your generator manufacturer. Most generators need at least 60 seconds to cool down after being disconnected from a load.



Info: The Gen Warm-up and Gen Cooldown features prevent the generator from connecting to the inverter’s AC input. Since the inverter has only a single-source input, it cannot distinguish between grid or generator input. So, during warm-up or cooldown time, the inverter will prevent any AC input from connecting. Also, when either warm-up or cooldown is activated, any AC source (i.e., grid or generator) connected to the inverter’s AC input will disconnect until the time period (warm-up or cooldown) is over.

SETUP: 04K Gen 100% SOC Start Days

This menu allows the AGS to autostart the generator at a pre-selected time of day and to charge the battery bank to 100% SOC—whenever a set number of days have passed since the battery bank has been charged to 100% SOC.



Info: The optional Battery Monitor Kit (ME-BMK or ME-BMK-NS) must be installed and enabled to use the Gen 100% SOC Start Days feature.

- **Set Gen 100% SOC Start Days** – This menu sets the maximum number of days the generator waits before autostarting and fully charging the battery bank to 100% SOC. If the battery bank has not been fully charged to 100% SOC in this number of days, the AGS starts the generator at a pre-set time of day.

Default setting: OFF

Range: OFF, 1-255



Info: The *Set Gen Exercise Days* setting must be between 1-255 days in order to enable the Gen 100% SOC Start Days feature.

- ◇ **Set 100% SOC Run Hour** – Set the hour the generator will autostart (once the *Gen 100% SOC Start Days* setting has been satisfied).
- ◇ **Set 100% SOC Run Minute** – Set the minute the generator will autostart.
- ◇ **Set 100% SOC Run AM-PM** – Set the time period (AM or PM) when the generator autostarts.

Range: 12:00AM-11:45PM (15 min intervals)

Why should I use the Gen 100% SOC Start Days feature? In installations that primarily use a generator to charge the battery bank, the generator run time is usually limited in order to save on fuel costs, which does allow the battery bank to be fully charged. If this situation persists (where the batteries never reach full charge), some reduction in the battery life will occur. This feature helps to maximize the life of the batteries.

How many days should I wait to fully charge my battery bank? Most battery manufacturers recommend that the batteries be fully charged each time to ensure maximize battery life. With this in mind, select the amount of days that provides a good balance between reducing fuel consumption and maximizing battery life. If the batteries are discharged heavily each day, then a full charge would need to occur more often—maybe every 3-4 days. If the batteries are discharged lightly each day, then a full charge may only be needed once every week or two. Monitor your battery system to adjust the days to find the best compromise.

How does the Gen 100% SOC Start Days feature work? This feature allows the generator to autostart at a pre-selected time of day if the battery hasn't been charged to 100% SOC (per the ME-BMK battery monitor) for a set number of days. Once this feature is enabled (by setting the *Gen 100% SOC Start Days* value to ON), the generator will start only after two conditions are met. First, the battery hasn't been charged to 100% SOC for a set number of days. This is determined by monitoring the BMK's *METER: 05J Days Since 100% SOC* value, which must be equal to or greater than the *Gen 100% SOC Start Days* setting. Second, the *Set 100% SOC Run* start time parameters (i.e., *Hour, Minute, AM/PM* settings) must have been satisfied.



Info: When using the Gen 100% SOC Start Days autostart feature, the generator autostarts and runs until the battery bank has reached 100% SOC or the AGS's *SETUP: 04F Max Gen Run Time* setting is reached, whichever occurs first. Ensure the charger never leaves the Bulk/Absorption charge mode. This is done by ensuring the *SETUP: 03D Absorb Done* selection is "SOC" and the setting is 100% (*Set Absorb Done SOC = 100%*), and either setting the *04F Max Gen Run Time* setting to OFF or setting it long enough to ensure the generator is able to run until the battery is fully charged. If the charger is allowed to exit the Bulk/Absorption charge mode (i.e., go to Float/Silent), the battery SOC may never reach 100%.

Using an AGS Module: Setup



Info: The *Gen 100% SOC Start Days* setting uses information from the BMK's *METER: 05J Days Since 100% SOC* display to determine how many days have passed since the battery bank has not been charged to 100% SOC. A valid SOC number must display under the *METER: 05B Battery SOC* menu for the BMK's *METER: 05J Days Since 100% SOC* menu to accumulate and display days. *Think'n, No Comm, or any BMK fault (i.e., Internal Fault, Power-up Fault, or Unknown Fault ##)* are not valid SOC numbers.



Info: When the *Gen 100% SOC Start Days* feature is enabled and a generator SOC start is triggered, the remote issues a one-time "Start Bulk" command to the inverter/charger. This ensures—after the generator connects—that regardless of battery voltage, a Bulk/Absorb charge cycle is started.



Info: When using the *Gen 100% SOC Start Days* feature, set the *CTRL: 01 ACIn Control* menu to *Auto Connect*. This ensures the generator—once autostarted—connects and charges the battery.



Info: The ME-ARC time clock must be set for proper operation of the *Gen 100% SOC Start Days* feature (see *SETUP: 01 System Setup/01A Set Clock* menu).



Info: Once the BMK's *METER: 05B Battery SOC* menu displays *100%*, the AGS stops the generator and the BMK's *METER: 05J Days Since 100% SOC* display resets to *0* days.



Info: If the generator does not start (i.e., AGS fault, generator runs out of fuel, etc.,) despite the gen SOC start criteria being met, an additional day must increment before another attempt is made.

7.1.1 AGS Functional Tests

Once you have used the ME-ARC to establish all the autostart/autostop settings you need, perform the following tests to verify that the AGS system is functioning correctly and there is communication between the remote/inverter and the ME-AGS-N.

7.1.1.1 Remote to Generator Communication Test

This section describes using the ME-ARC remote to start the generator and to determine the current AGS status.

Determining AGS Status

Use your remote control to determine the AGS's status:

1. Press the *METER* button until the bottom line displays "*01 DC Meters*".
2. Rotate the *SELECT* knob to the *04 AGS Meters* menu, and then press the *SELECT* knob. The top line shows *04A AGS Status* and the bottom line displays the current status of the AGS.

An AGS status of *Off* or *Ready* indicates the remote/inverter is communicating with the AGS. If the AGS status is not *Off* or *Ready*, then refer to Section 7.3.2 or Section 7.3.3 for assistance before continuing.

Starting the Generator from the Remote

To confirm that the generator will turn on and run from the remote, first ensure the AGS status is *Off* or *Ready* (see Section 7.1.2.1 above). Then:

1. Press the *CTRL* button, and then rotate the *SELECT* knob to the *03 Gen Control* menu.
2. Press the *SELECT* knob, and then rotate it to the *ON* setting.
3. Press the *SELECT* knob to activate the generator test.



Info: Once the generator starts, it should run until you change the *03 Gen Control* menu to *OFF* (before turning off).

If your AGS/generator system started, and the *STATUS LED* on the AGS turns solid green (after two minutes), then the wiring from the AGS to the generator is correct. You are now ready to enable the AGS by setting the remote's *03 Gen Control* setting to "*AUTO*" (see Section 7.2.1).

If the ME-ARC displays a generator fault, or the AGS's *STATUS LED* continues to blink or shows a fault condition (solid red LED indication), refer to your AGS owner's manual for assistance.



Info: A solid green STATUS LED means the generator has successfully started and is providing the generator run sense signal to the AGS controller.



Info: If the generator attempted to start but did not run, continue to wait—the AGS will attempt to start the generator three more times. If the generator fails to start after four attempts, the STATUS LED will turn red—indicating a fault.

If a generator fault displays or the AGS's STATUS LED shows a fault condition (solid red LED indication), refer to Section 7.3.3 for assistance.

7.2 Operating/Monitoring the AGS using the ME-ARC

This section covers the AGS menus under the ME-ARC's CTRL and METER buttons that determine the control and operation of the generator. The section also includes menus that are used to help monitor the AGS and the generator's starting/running conditions.

7.2.1 Operating the AGS

The AGS uses the *CTRL: 01 ACIn Control* menu to ensure the incoming AC from the generator is connected, and the *CTRL: 03 Gen Control* menu is used to activate the generator either manually or automatically. Press the CTRL button on the ME-ARC remote to access both menus.

CTRL: 01 ACIn Control

The *01 ACIn Control* menu determines the condition in which the inverter/charger connects to an incoming AC power source. When using a ME-AGS-N, the *Auto Connect* setting must be selected. If another *ACIn Control* setting is enabled, the inverter/charger may be prevented from connecting—when the generator is autostarted—because the criteria to allow the AC input to connect (AC In based on time, VDC, or SOC) may not have been met.

Note: *This is true unless the inverter has two independent AC source inputs—one for grid and the other for generator—as provided in the MSH4024RE. If you are using a MSH4024RE, then you can select any AC In selection that is appropriate for your application, because the AC In Control features only work with the GRID IN (AC1) input.*

CTRL: 03 Gen Control

The *03 Gen Control* menu is used to control a standby generator that is connected to the system and using the optional ME-AGS-N controller. Once the AGS-N is installed in the system, the generator can be manually started and stopped, or set to start and stop automatically from this menu.

Note: *Options include: OFF (default setting), ON, and AUTO.*



Info: A ME-AGS-N must be installed in order for the *03 Gen Control* menu to control a standby generator. See the ME-AGS-N owner's manual (PN: 64-0039) for more info.



Info: If a ME-ARC is directly connected to one of a router's communication ports (P1-P6), it can be used in a remote location as a remote on/off switch—as well as to assist in monitoring the system and to control a generator that is connected to an AGS-N.



Info: If a ME-ARC is directly connected to a router, the ARC's CTRL button function is defeated. However, the *03 Gen Control* selection is in the ARC's FAVS so the generator can be controlled via the ARC through the FAVS menu, but not through the CTRL menu.

- **OFF** – This selection stops the generator by sending a 'stop' command from the ME-AGS-N controller (can be running from either a manual start or an autostart command from the AGS). When the *OFF* setting is selected, the generator will not automatically start.



Info: If DC power is lost to the remote or to the inverter system, this menu resets to the default *OFF* selection for safety.



Info: When *OFF* is selected, the generator turns off immediately—regardless of any delay settings (i.e., *Cooldown*).



Info: If the generator is manually started from the generator control panel or a generator remote panel, selecting *OFF* on the ME-ARC remote may not shut down the generator.

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- **ON** – The *ON* selection manually starts the generator by sending a 'start' command from the AGS controller. Once started (by selecting "ON"), the generator must be manually stopped—either from an external stop switch or by selecting *OFF* from the *03 Gen Control* menu (sends "stop" command from AGS).



Info: When "ON" is selected, the Magnum inverter will not attempt to accept the generator AC voltage until the warm-up period is satisfied. The *ON* selection uses warm-up time. The *OFF* selection stops immediately and does not use the cooldown time.



Info: You can manually start the generator and have it automatically stop by selecting *ON* from the *03 Gen Control* menu, and then changing the selection to *AUTO* to automatically stop the generator. When *AUTO* is selected after the generator has been manually started, it displays the AGS status as "Start VDC" and uses the stop setting from the *SETUP: 04A Gen Run VDC* menu (even if not active) or the *04F Max Gen Run Time* menu, whichever occurs first. This is useful if you want to make sure the generator starts before you leave; the *Max Gen Run Time* setting ensures the generator does not run longer than required.

- **AUTO** – This selection uses the settings from the *SETUP: 04 AGS Setup* menus to automatically start and stop the generator based on battery voltage, time of day, AC load on the inverter, high temperature, or battery state of charge (requires a ME-BMK/ME-BMK-NS accessory). Refer to the Section 7.1 "Setting Up the AGS using the ME-ARC" to set the start and stop parameters for the generator.

7.2.2 Enabling the AGS

Before the AGS can begin operating/monitoring for an autostart condition (using active AGS autostart/autostop settings in your ME-ARC), it must be enabled. To enable the AGS:

1. Press the remote's CTRL button, and then rotate the SELECT knob to the *03 Gen Control* menu.
2. Press the SELECT knob. The *Set Gen Control* screen displays with the current generator control setting and an arrow to the right.
3. Turn the SELECT knob to the *AUTO* setting, and then press the SELECT knob again to select this setting. The selection arrow appears to the right of the screen.

After enabling the AGS, go to the *METER: 04A AGS Status* menu. If the AGS's status is *Ready*, then the AGS is ready to automatically start/stop the generator once an autostart condition is satisfied. If the AGS's status is not *Ready*, then refer to Section 7.3.3 "Resolving AGS Faults using the ME-ARC" before continuing.

Note: If power is lost to your remote, the AGS control setting will return to the default *OFF* setting. Once power is restored, you must enable the AGS again.



Info: Several autostart/autostop settings can be active at once. However, once an autostart condition becomes active all other autostart conditions are ignored until the specific condition that caused the generator to start (e.g., *Start Gen Volts*) is satisfied by its autostop condition (e.g., *Stop Gen Volts*). Once the generator has completed this autostart/autostop cycle, the AGS immediately begins to monitor for any active autostart/autostop settings again.

7.2.3 Monitoring the AGS

The ME-ARC remote's METER and TECH buttons have additional menus that are helpful for the proper operation and monitoring of your AGS system.

7.2.3.1 ME-ARC Remote's AGS METER Menus

Press the ME-ARC remote's METER button, rotate the SELECT knob to the *04 AGS Meter* menu, and then press the SELECT knob to access the AGS meter's read-only menus. Rotate the SELECT knob to view the various AGS meters.

METER: 04A AGS Status Menu

This read-only menu displays the AGS's current status. There are 28 different status messages that can display to identify what state the AGS is currently in—only one displays at any one time (refer also to Figure 7-2).



Info: This menu is important when determining if the AGS is working correctly or for troubleshooting an AGS installation. For any fault mode displayed in the status menu, refer to Section 7.3.3.

Available statuses are (see Tables 7-3 through 7-5 for information on each):

Operational/Start Status:

- AC In
- Gen Cooldown
- Gen Warmup
- Manual Run
- No Comm (AGS not present)
- Off
- Quiet Time
- Ready
- Start Amp
- Start Exercise
- Start SOC
- Start Temp
- Start Test
- Start Time
- Start Topoff
- Start VDC
- Start 100% SOC

Fault Status:

- Fault Amp
- Fault Exercise
- Fault Gen Run
- Fault MaxRn
- Fault SOC
- Fault Temp
- Fault Test
- Fault Time
- Fault Topoff
- Fault VDC
- Fault 100% SOC

METER: 04B DC Volts-AGS Menu

This read-only menu displays the DC voltage measured at Terminals #3 and #4 of the AGS controller. This menu is useful in setting up the voltage start for the AGS, and for troubleshooting its operation.



Info: This DC voltage reading may vary from the DC voltage readings in the *METER: 01A DC Volts* and *METER: 05C DC Volts-BMK* menu items. When troubleshooting, read the appropriate related meter for each device. Use this menu for AGS verification and testing.

METER: 04C Gen Run Time Menu

This read-only menu displays the length of time the generator has been running since it was autostarted. This helps determine how long the generator has been running since it was autostarted—in case you were not present when it started. This menu is enabled when *CTRL: 03 Gen Control* is set to *AUTO*, but does not display run time when the generator has been manually started. This meter is not designed to replace an hour meter that shows the total hours the generator has run—refer to the *METER: 04G Hour Meter* menu.



Info: The *Gen Run Time* menu's timer is started when the gen run sense voltage/signal is correct and qualified at the AGS controller. It is not considered qualified until after a full start attempt and the *04I Gen Warm-up Time* setting is satisfied. Cooldown and warm-up times are not included in the gen run time display. Total generator run time = *Gen Run Time* + *Gen Warm-up Time* + *Gen Cooldown*.



Info: The times in this display are shown in tenths of an hour (0.0 hrs., 0.1 hrs., etc.,)—thus, 0.1 hrs. = 6 minutes.



Info: Depending on the AGS's version, the *Gen Run Time* display resets to 0.0 differently. The ME-AGS-N (Ver 5.2): resets to 0.0 when the generator autostart has finished. The ME-AGS-N (≥Ver 5.3): resets to 0.0 when another generator autostart is triggered.



Info: This display is used by the *SETUP: 04F Max Gen Run Time* menu to determine the generator's maximum run time when started automatically.

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METER: 04D AGS Temp Menu

When the AGS remote temp sensor (included, but use optional) is connected to the AGS's REMOTE (purple) port, this read-only menu displays the temperature of the temp sensor. If the temperature around the sensor is very high ($>104^{\circ}\text{F}/>40^{\circ}\text{C}$) or the temp sensor is closed/shorted, the display will show "TS Hot"; and, if the temperature around the sensor is very cold ($<33^{\circ}\text{F}/<1^{\circ}\text{C}$), the display will show "TS Cold". If the temperature sensor is not installed or the temp sensor is open, the display will show "TS Open".

Note: If a BTS is open, shorted, or not installed, the charge voltages will not be compensated and the batteries will charge at a temperature of 77°F (25°C).



Info: The temperature in the *METER: 04D AGS Temp* menu can be displayed in either Fahrenheit (default) or Celsius depending on the *SETUP: 01C Temp Display* setting.

If an optional ME-PT1 (or ME-PT2) pigtail adapter is connected to the AGS's REMOTE (purple) port, and the *04E Gen Run Temp Start* setting is set to *Ext Input*, this display will show "Ext ON" when the ME-PT1 has +12 present on its input (or the ME-PT2 is closed); and, will show "Ext OFF" when the ME-PT1 does not have +12 on its input (or the ME-PT2 is open).

METER: 04E Since GenRun (Days) Menu

This read-only menu displays the number of days since the generator has last run. The Since Gen Run Days timer begins once the *CTRL: 03 Gen Control* menu is set to *AUTO*, and then counts by one day for every 24-hour period that the generator does not start. The Since Gen Run Days timer resets any time the gen run sense signal is present on Terminal 2 of the AGS, which could be either by autostarting the generator (including from a previous exercise run), or manually starting the generator (using the ME-ARC).



Info: When the DIP switch inside the AGS is set to "2-Wire Standby Mode"—which does not require the gen run sense signal to be present on Terminal 2 of the AGS—the Since Gen Run Days timer will not be reset to zero.



Info: If a MSH4024RE (dual AC input inverter) is used, the Since Gen Run Days timer also resets any time voltage is present on the AC2 (Gen) input.

METER: 04F Since 100% (Days) Menu

This read-only menu displays the number of days since the battery was at 100% SOC, and is calculated in the ME-AGS-N. It is used by the *SETUP: 04K Gen 100% SOC Start Days* menu to determine when to command the ME-AGS-N to autostart the generator.



Info: This display requires a ME-BMK to be installed and resets once the battery SOC reaches 100%, power to AGS is lost, or data communications from the BMK is lost.



Info: The *METER: 04F Since 100% (Days)* menu uses information from the *METER: 05B Battery SOC* menu to determine the last time the battery SOC was 100%.



Info: For the *METER: 04F Since 100% (Days)* meter to increment, the *METER: 05B Battery SOC* display must not display 100% (or *No Comm*), the optional ME-AGS-N must be connected and enabled (*CTRL: 03 Gen Control = AUTO*) and the *SETUP: 04K Gen 100% SOC Start Days* menu must also be enabled (not set to *OFF*).



Info: The *METER: 04F Since 100% (Days)* menu, which is calculated in the ME-AGS-N, is similar to the *METER: 05J Days Since 100% SOC* menu (calculated in the remote). If an AGS is installed at a later date (or the remote is reconnected), the two menus will not be coordinated with each other. However, they will automatically synchronize once the BMK's *METER: 05B Battery SOC* menu reaches 100% SOC, or they can be manually synchronized by momentarily removing the network cable from the BMK.

METER: 04G Hour Meter Menu

This menu displays how many hours the generator has run since this "hour meter" was last reset. This menu is helpful if you would like to keep track of how long the generator has run from a specific point; for example, after the generator has been serviced.

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Note: The Hour Meter menu's timer starts when the gen run sense voltage (10-40 volts DC) from the generator to Pin 2 (+) and Pin 4 (-) is present on the AGS controller.



Info: The 04G Hour Meter menu's timer can register elapsed time up to 65,000 hours, and can be reset to "0 Hours" by pressing and holding the SELECT knob for approximately 3 seconds.



Info: The hour meter will not count if the Gen Type DIP switch inside the AGS controller is set to "2-Wire-Standby" because this setting does not require the gen run sense voltage from the generator to the AGS.



Info: The CTRL: 03 Gen Control setting has no effect on the whether the hour meter is active or not.



Info: The gen hours shown in this menu are calculated in the AGS. They do not reset if the inverter or remote loses power, but they do reset if the AGS controller loses power.

7.2.3.2 ME-ARC Remote's AGS-specific TECH Menus

Press the ME-ARC's TECH button, and rotate the SELECT knob to access:

TECH: 01 Temperature (rotate SELECT knob until AGS Sensor displays)

- **AGS Sensor** – Displays the temperature of the AGS temp sensor plugged into the REMOTE port on the AGS controller (taken from the *METER: 04D AGS Temp* display).

TECH: 02 Versions (rotate SELECT knob until AGS displays)

- **AGS: #.#** – Displays the software version of the AGS connected to the Magnum network (displays "0.0" if the remote does not sense an AGS).

TECH: 04 Fault History

Press the SELECT knob, rotate the knob until the 04B AGS Faults menu displays, and then press the SELECT knob.

- **04B AGS Faults** – This menu displays a history of the last nine AGS faults. Information for each fault displays from the most recent fault (H1) to the earliest/past recorded faults (H2 up to H9).

Note: The 04D Clear Faults menu allows all recorded fault history information—for any inverter and/or AGS, ACLD, or PT controller that is network connected—to be cleared/erased. Refer also to the TECH: 04 Fault History/04D Clear Faults menu in Section 3.2.5.

First screen – The top line displays the AGS fault mode. The bottom line displays the fault history number, day(s) since this fault occurred, and the time this fault occurred.

Rotate the SELECT knob to display the second and third screens for this particular fault.

Second screen – The DC voltage on the AGS at the time of this fault.

Third screen – The temperature of the AGS temp sensor at the time of this fault.

Continue to rotate the SELECT knob to display earlier faults (as applicable).

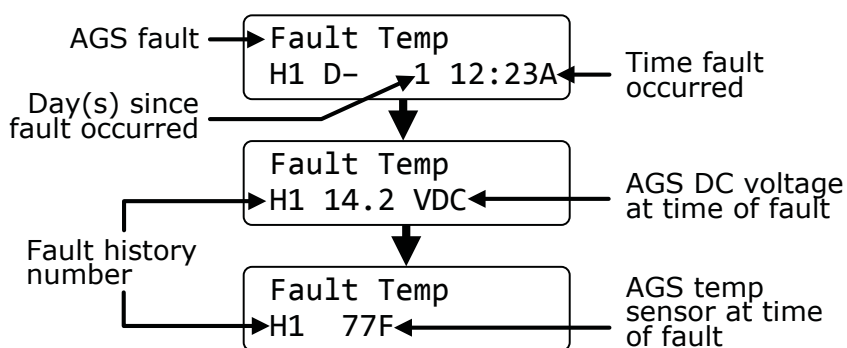


Figure 7-1, AGS Fault History Screens

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7.2.4 Starting and Stopping the Generator

The generator can be manually started/stopped, as well as autostarted/autostopped using the available settings from your ME-ARC.

To autostart/autostop the generator:

In order for the generator to autostart/autostop, one or more of the following autostart/autostop conditions must be pre-set (see Section 7.1):

Autostart Conditions

- 04A Gen Run VDC (pp. 60-61)
- 04B Gen Run Time (p. 62)
- 04C Gen Run Amps (pp. 62-63)
- 04D Gen Run SOC (pp. 63-64)
- 04E Gen Run Temp (pp. 64-65)
- 04G Quiet Time (pp. 66-67)
- 04H Gen Exercise (pp. 68-69)
- 04K Gen 100% SOC (pp. 70-71)

Autostop Conditions

- 04A Gen Run VDC (pp. 60-61)
- 04B Gen Run Time (p. 62)
- 04C Gen Run Amps (pp. 62-63)
- 04D Gen Run SOC (pp. 63-64)
- 04E Gen Run Temp (pp. 64-65)
- 04F Max Gen Run Time (p. 66)
- 04G Quiet Time (pp. 66-67)
- 04H Gen Exercise (pp. 68-69)
- 04K Gen 100% SOC (pp. 70-71)

To manually start the generator:

1. Press the CTRL button.
2. Turn the SELECT knob to the *03 Gen Control* menu.
3. Press the SELECT knob. The *Set Gen Control* menu displays with an arrow to the right of the current setting.
4. Turn the SELECT knob to the *ON* setting.
5. Press the SELECT knob again to select this setting. The selection arrow appears to the right of the screen. The generator should start.

If the generator does not start as expected, refer to Section 7.3.

To manually stop the generator:

1. Press the CTRL button.
2. Turn the SELECT knob to the *03 Gen Control* menu.
3. Press the SELECT knob. The *Set Gen Control* menu displays with an arrow to the right of the current setting.
4. Turn the SELECT knob to the *OFF* setting.
5. Press the SELECT knob again to select this setting. The selection arrow appears to the right of the screen. The generator should stop.

If the generator does not stop as expected, refer to Section 7.3.

To manually start the generator and have it automatically stop:

1. Press the CTRL button.
2. Turn the SELECT knob to the *03 Gen Control* menu.
3. Press the SELECT knob. The *Set Gen Control* menu displays with an arrow to the right of the current setting.
4. Turn the SELECT knob to the *ON* setting.
5. Press the SELECT knob again to select this setting. The selection arrow appears to the right of the screen. The generator should start.

Once the generator is running, rotate the SELECT knob to *AUTO* (under the *03 Gen Control* menu), and then press the SELECT knob to select this setting.

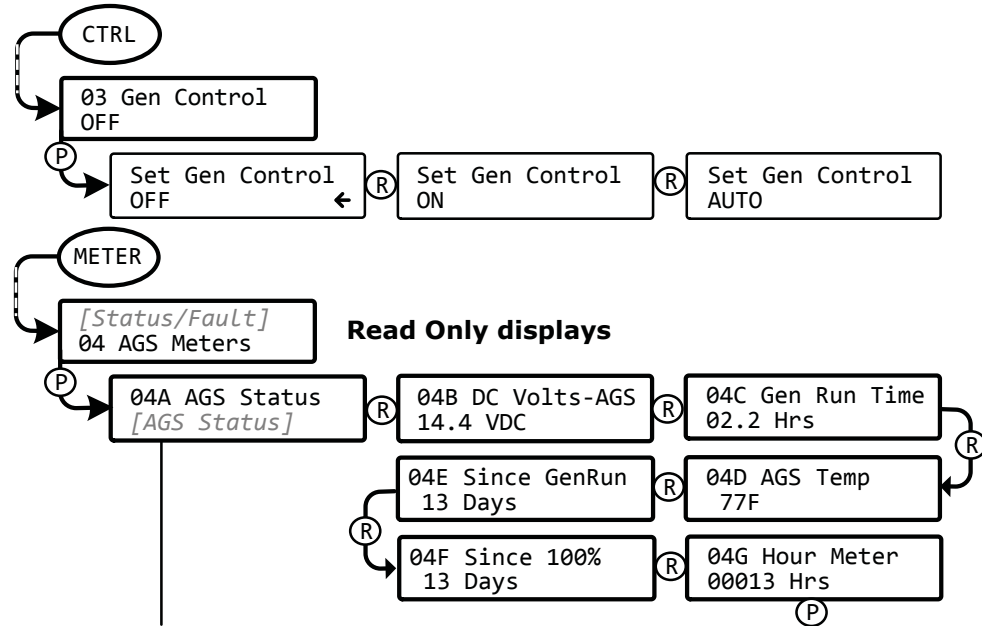
If the generator does not start or stop as expected, refer to Section 7.3.

Note: When the generator is manually started, but then changed to autostop, the SETUP: 04A Gen Run VDC settings are used to determine when the generator will autostop. If 04A Gen Run VDC is set to OFF, the Start/Stop Volts Delay and Stop Gen Volts values that were entered prior to selecting OFF will still be used to autostop the generator.

7.2.5 AGS Menu Maps

This section provides the AGS menu maps available from the CTRL, METER, SETUP and TECH buttons on your ME-ARC remote.

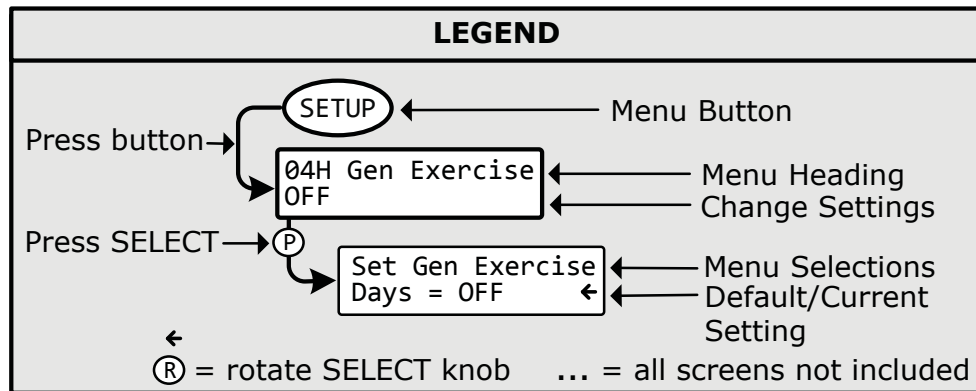
Note: When applicable, battery voltage defaults and ranges are shown for a 12-volt battery (24-volt systems multiply by 2; 48-volt systems multiply by 4).



Available Statuses:

Press and hold the SELECT button for 3 secs to reset

AC In	Start Amp	Fault Amp	Fault Test
Gen Cooldown	Start Exercise	Fault Exercise	Fault Time
Gen Warm-up	Start SOC	Fault Gen Run	Fault Topoff
Manual Run	Start Temp	Fault MaxRn	Fault VDC
No Comm	Start Test	Fault SOC	Fault 100% SOC
(No AGS present)	Start Time	Fault Temp	
Off	Start Topoff		
Quiet Time	Start VDC		
Ready	Start 100% SOC		



** For this menu map, the arrow denotes the factory default settings

Figure 7-2, AGS CTRL/METER Menu Map (Section 1)

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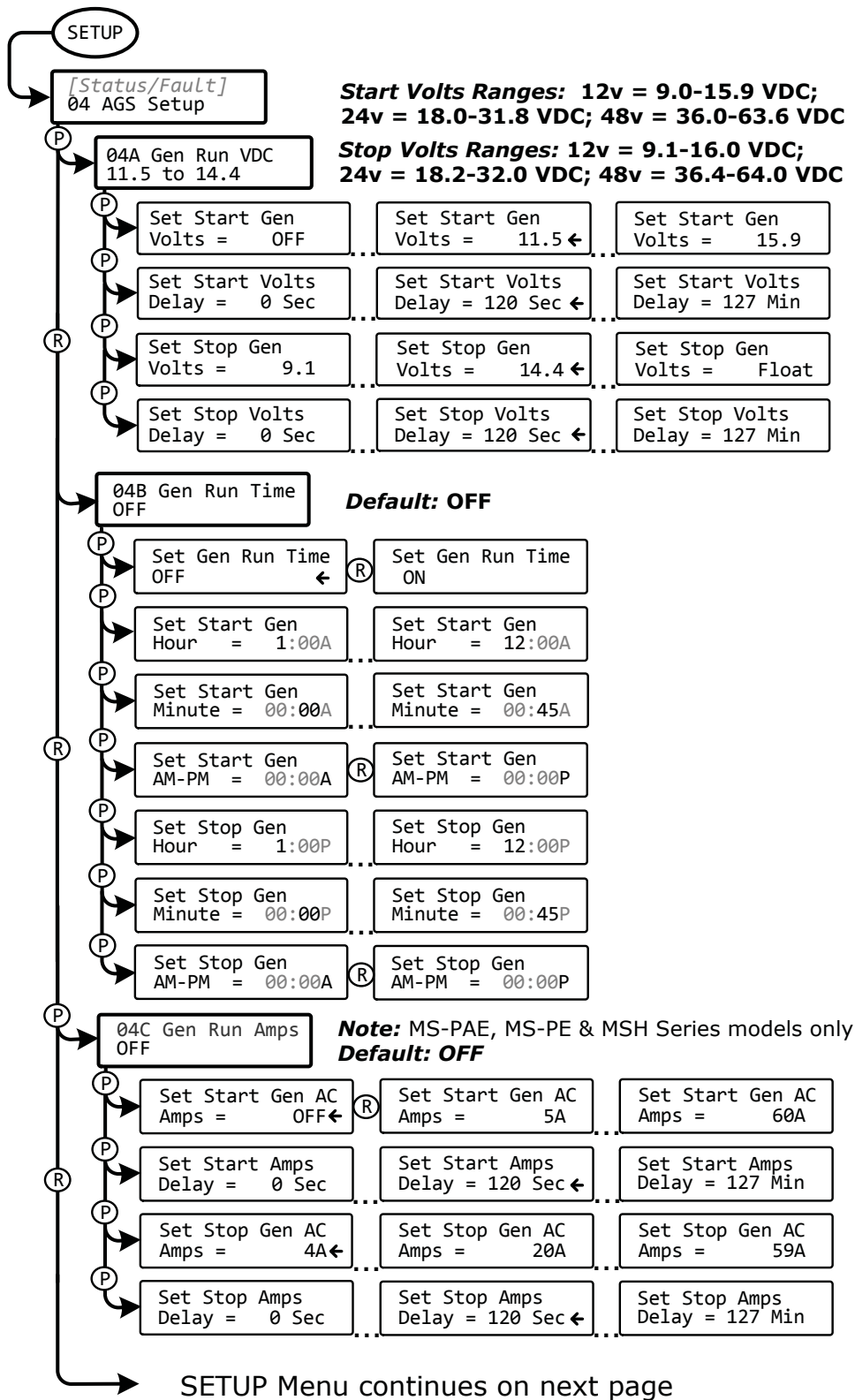


Figure 7-3, AGS SETUP Menu Map (Section 2)

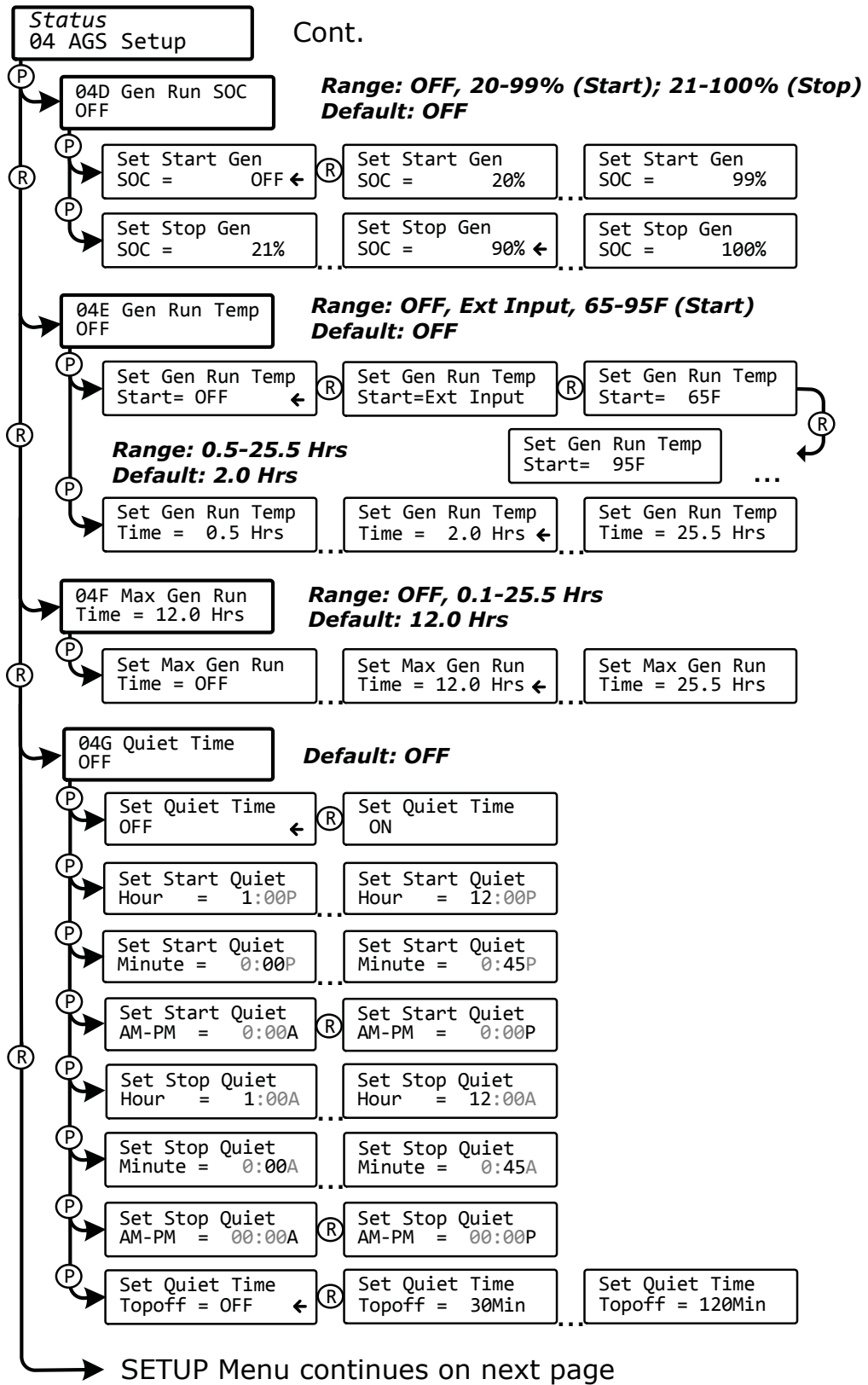
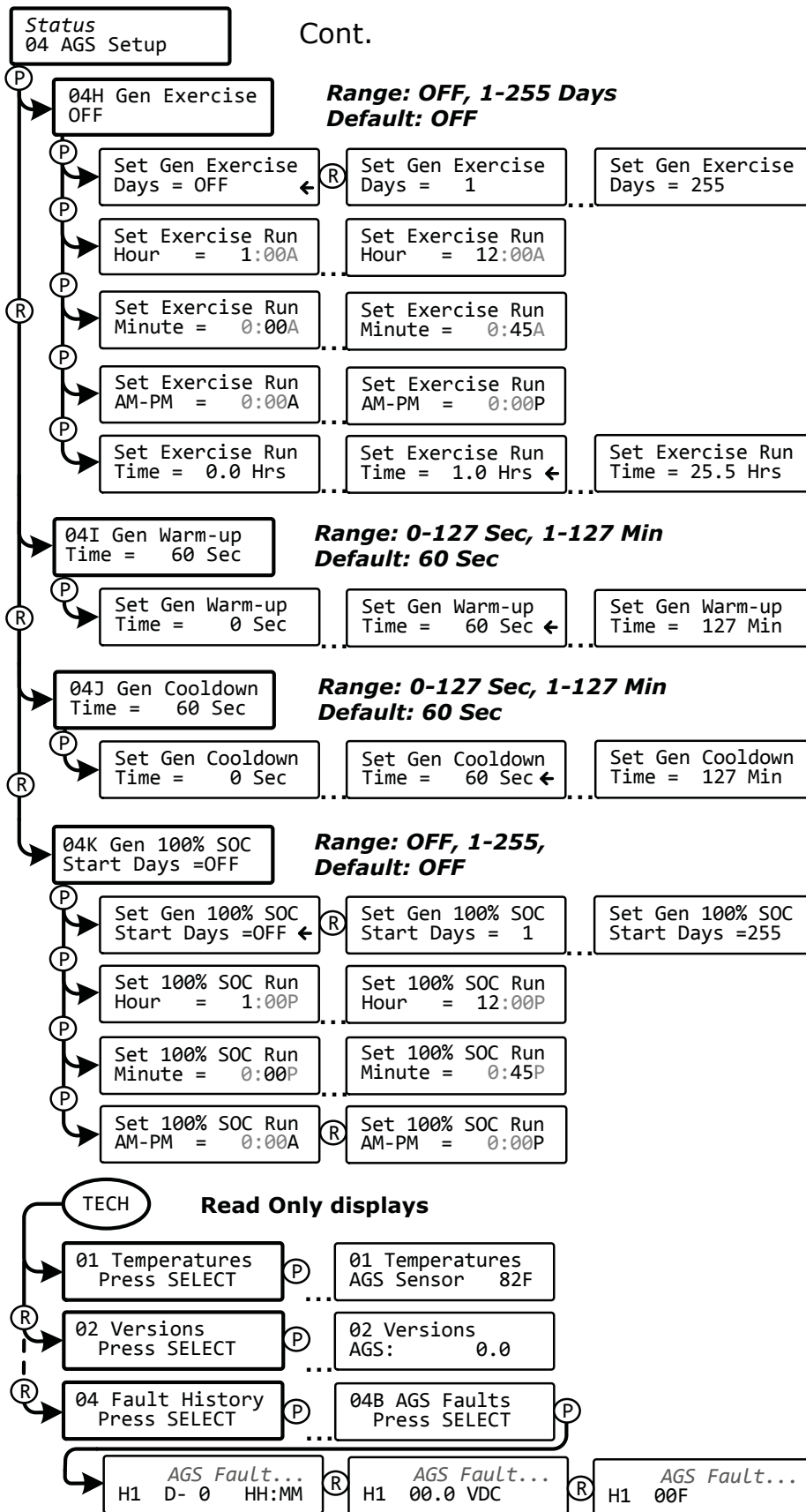


Figure 7-4, AGS SETUP Menu Map (Section 3)

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Each AGS fault has 3 screens. See Figure 7-1 for more info.
Figure 7-5, AGS SETUP/TECH Menu Map (Section 4)

7.2.6 AGS Remote Status Messages

A status message may be an operational or fault message. Access the AGS status menu (*METER: 04A AGS Status* menu) to view the AGS's current operating status. This menu is important when determining if the AGS is working correctly, or for troubleshooting an AGS installation.

7.2.6.1 AGS Remote Operational Statuses

Table 7-3 below has a brief description of possible AGS operational statuses.

Table 7-3, AGS Remote Operational Statuses

Status	Description
AC In	The inverter/charger is connected to another source such as a grid or an alternate generator, and is not controlled by the AGS. When <i>AC In</i> displays, the AGS is prevented or locked out from all autostarting conditions, except for when the generator needs to exercise—if enabled.
Gen Cooldown	The autostop setting has been met in one of the generator autostart/autostop menus and the generator has been disconnected from the inverter/charger. However, the generator still runs until the cooldown time is met (as per the <i>SETUP: 04J Gen Cooldown Time</i> setting).
Gen Warmup	The AGS is attempting to start the generator and a time period has been set from the <i>SETUP: 04I Gen Warm-up Time</i> menu. Once the AGS status indicates "Warm-up", the inverter/charger's AC input ignores any incoming AC power. This prevents the inverter/charger from loading the generator during warm-up. Once the AGS has determined that the generator is running, the warm-up time setting must be met before the generator can connect to the inverter/charger.
Manual Run	Generator started manually from a start/stop switch directly connected to the generator, or from the <i>CTRL: 03 Gen Control</i> menu.
Note: <i>The AGS determines that the generator has been manually turned on by sensing a gen run sense voltage to Terminal #2 on the AGS's 8-port terminal block. However, if the Gen Type DIP switch is set to "2-Wire Standby" (which doesn't require a gen run sense voltage), manually turning the generator on displays a status of "AC In" rather than "Manual Run".</i>	
No Comm	The AGS is not communicating with the inverter/remote.
AGS not present	If an AGS is installed, then refer to Section 7.3.2 "Resolving AGS Operational Statuses" for assistance.
Off	The <i>CTRL: 03 Gen Control</i> menu is set to <i>OFF</i> . This setting will not allow the AGS to autostart the generator.
Quiet Time	The AGS has entered Quiet Time per the <i>SETUP: 04G Quiet Time</i> setting.
Note: <i>The generator will not autostart during Quiet Time.</i>	
Ready	The <i>CTRL: 03 Gen Control</i> menu is set to <i>AUTO</i> , and the AGS is ready to autostart the generator based on the active autostart settings under the <i>SETUP: 04 AGS Setup</i> menus.

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7.2.6.2 AGS Remote Start Statuses

The following "Start" statuses identify the condition that autostarted the generator. If you determine that the autostart condition occurred sooner than expected (or didn't want this autostart condition), refer to the Section 7.1 "Setting Up the AGS using the ME-ARC" to change (or defeat) the autostart setting.

Table 7-4, AGS Remote Start Statuses

Status	Description
Start Amp	Generator has autostarted based on the <i>SETUP: 04C Gen Run Amps</i> setting.
Start Exercise	Generator has autostarted based on the <i>SETUP: 04H Gen Exercise</i> setting.
Start SOC	Generator has autostarted based on the <i>SETUP: 04D Gen Run SOC</i> setting.
Start Temp	Generator has autostarted based on the <i>SETUP: 04E Gen Run Temp</i> setting.
Start Test	The AGS is in Test mode. Test mode may be started from the TEST button located on the AGS.
Start Time	Generator has autostarted based on the <i>SETUP: 04B Gen Run Time</i> setting.
Start Topoff	Generator has autostarted based on the <i>SETUP: 04G Quiet Time Topoff</i> setting.
Start VDC	Generator has autostarted based on the <i>SETUP: 04A Gen Run VDC</i> setting.
Start 100% SOC	Generator has autostarted based on the <i>SETUP: 04K Gen 100% SOC Start Days</i> setting.

7.2.6.3 AGS Remote Fault Statuses

The following "Fault" statuses indicate that the generator wasn't able to start based on an expected autostart condition. Refer to Section 7.3.3 "Resolving AGS Faults using the ME-ARC" for help in diagnosing the problem.

Table 7-5, AGS Remote Fault Statuses

Status	Description
Fault Amp	Generator failed to autostart in Start Amps mode.
Fault Exercise	Generator failed to autostart in Start Exercise mode.
Fault Gen Run	Generator successfully started and ran for more than two minutes, but unexpectedly stopped before the AGS could automatically stop the generator.
Fault MaxRn	Generator turned off because the <i>SETUP: 04F Max Gen Run Time</i> setting had been met. This fault can occur when: 1) an autostop parameter has been met, but it did not stop the generator, or, 2) the autostop condition exceeded the <i>Max Gen Run Time</i> setting.
Fault SOC	Generator failed to autostart in Start SOC mode.
Fault Temp	Generator failed to autostart in Start Temp mode.
Fault Test	Generator failed to start in Test mode.
Fault Time	Generator failed to autostart in Start Time mode.
Fault Topoff	Generator failed to autostart in Start Topoff mode.
Fault VDC	Generator failed to autostart in Start VDC mode.
Fault 100% SOC	Generator failed to autostart in 100% SOC Start Days mode.

Table 7-6, AGS Default Settings on ME-ARC

Menu Items	Default Settings
Gen Run VDC	Start Volts: 11.5 VDC (12v) Start Volts Delay: 120 Sec Stop Volts: 14.4 VDC (12v) Stop Volts Delay: 120 Sec
Gen Run Time	OFF
Gen Run Amps*	OFF
Gen Run SOC	OFF
Gen Run Temp	OFF
Max Gen Run Time	12.0 Hrs
Quiet Time	OFF
Gen Exercise	OFF
Gen Warm-up Time	60 Sec
Gen Cooldown Time	60 Sec
Gen 100% SOC Start Days	OFF

**MS-PAE, MS-PE and MSH Series models only*

7.2.6.4 AGS General Notes

- If a fault condition occurs, select the *OFF* setting from the *03 Gen Control* menu. If the problem persists, refer to Section 7.3 “AGS Troubleshooting using the ME-ARC” in this manual.
- When the *03 Gen Control* setting in the ME-ARC is in the *OFF* position, all generator autostart functions are disabled and the AGS’s STATUS indicator will also be off.
- When AGS control is set to *AUTO*, and an autostart condition occurs, it attempts an automatic generator start. This is done by closing its internal relays (based on the Gen Type selection) to control the starter—much like a person does when manually starting the generator. The starter is turned on for short periods of time and then turned off. If the AGS determines that the engine has started while cranking (STATUS indicator lights solid green), the starter is turned off after a short delay. If the engine does not start, another attempt is made to turn on the starter after a long delay period. This is repeated until the generator starts or until all its start attempts are reached, which causes the AGS to go into a fault condition (indicated by a blinking FAULT indication on the remote and a solid red STATUS indicator on the AGS controller).
- If using the temperature autostart feature in an RV coach, set the air conditioner thermostat slightly less than the setting (*04E Gen Run Temp* menu). If using two A/C’s, it is suggested that the second air conditioner thermostat be set 2° to 5° higher than the first air conditioner.
- When the generator starts successfully, the STATUS indicator on the AGS controller will turn solid green. The generator will run until an autostop condition is reached or until it is manually turned off; at which time a stop signal will be sent to the generator.
- If the gen is running when the AGS’s TEST button is pressed, the gen will stop and then start again. The generator will then run for approximately 30-60 seconds before shutting off.
- There is a delay before the AGS attempts to start the generator. The delay is adjustable on volts and amps (*04A Gen Run VDC* and *04C Gen Run Amps* settings). There is no delay if the AGS attempts to start the generator when the temperature around the remote temp sensor rises to the *04E Gen Run Temp* setting.
- Several autostart/autostop settings can be active at once. However, once an autostart condition becomes active, all other autostart conditions are ignored until the specific condition that caused the generator to start (e.g., *Start Gen AC Amps*) is satisfied by its autostop condition (e.g., *Stop Gen AC Amps*). Once the generator has completed this autostart/autostop cycle, the AGS immediately begins to monitor for any active autostart/autostop settings again.

Using an AGS Module: Troubleshooting

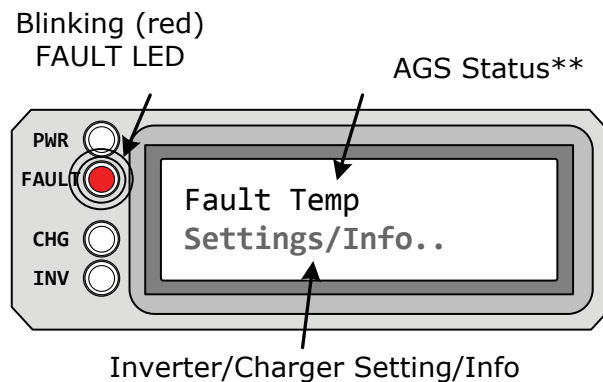
7.3 AGS Troubleshooting using the ME-ARC

This section assists you in using your ME-ARC remote to identify a fault and to resolve an abnormal operational condition detected within your AGS system.

7.3.1 AGS Fault Message Screen

When an AGS fault is detected, the ME-ARC's red FAULT LED comes on and the fault status is displayed on the LCD screen. Figure 7-6 is an example of how AGS fault messages appear on the ME-ARC remote. Use the remote's LCD screen and the information in this section to identify and correct the issue.

Note: The FAULT LED blinks and the fault alternates with the inverter/charger status.



**** AGS status alternates with inverter/charger status (scrolling).**

Figure 7-6, AGS Fault Message (Example)

7.3.2 Resolving AGS Operational Statuses

The following operational statuses can display on your ME-ARC, and some may indicate an abnormal condition. This section provides additional information and assistance to resolve these statuses (if needed).

- **AC In** – This is a normal status when the input to the inverter/charger is connected to an AC source such as utility/grid power, or to an alternate generator that may not be controlled by the AGS.



Remedy: The AC In status prevents the AGS from autostarting. To enable the AGS to autostart the generator, remove any AC power connected to the input of the inverter/charger.

- **No Comm** – If an AGS is installed, use the information below to determine the remedy.



Remedy: If an AGS is installed, then follow these steps:

1. Ensure the green READY indicator on the AGS controller is on (blinking or solid) to indicate that the AGS controller is getting power.
2. Ensure the communications cable is connected from the Network port on the Magnum inverter to the NETWORK port on the ME-AGS-N.
3. Ensure you have the correct communications cable.

7.3.3 Resolving AGS Faults using the ME-ARC

Should an AGS fault occur, use your ME-ARC remote and the information in this section to resolve the issue.

- **Fault Gen Run** – The generator successfully started and ran for more than two minutes, but the generator unexpectedly stopped before the active AGS autostop condition was finished.



Info: The AGS controller determines the generator is running by monitoring the gen run sense voltage/signal. When this gen run sense voltage/signal is no longer available, the AGS thinks the generator is off or has stopped.



Info: Fault Gen Run detection is not active if the generator is manually started.



Remedy: A) If the generator is still running: Confirm you are getting the correct gen run sense signal to the AGS controller. Refer to your ME-AGS-N owner's manual.

B) If the generator is not running: Check the generator for fault codes and adequate fuel. If neither is an issue, check the generator's owner's manual for troubleshooting tips to determine why it may have shut down on its own.

For the faults listed below, refer to the Remedy immediately following.

- **Fault Amp** – The generator failed to autostart and run per the *SETUP: 04C Gen Run Amps* menu's start parameters.
- **Fault Exercise** – The generator failed to autostart and run per the *SETUP: 04H Gen Exercise* menu's start parameters.
- **Fault SOC** – The generator failed to autostart and run per the *SETUP: 04D Gen Run SOC* menu's start parameters.
- **Fault Temp** – The generator failed to autostart and run per the *SETUP: 04E Gen Run Temp* menu's start parameters.
- **Fault Test** – The generator failed to autostart and run after the red TEST button is pressed on the AGS controller.
Note: *The ME-ARC can be set to manually turn the generator on and off, which can be used to test the generator wiring to the AGS.*
- **Fault Time** – The generator failed to autostart and run per the *SETUP: 04B Gen Run Time* menu's start parameters.
- **Fault Topoff** – The generator failed to autostart and run per the *SETUP: 04G Quiet Time Topoff* start parameters.
- **Fault VDC** – The generator failed to autostart and run per the *SETUP: 04A Gen Run VDC* menu's start parameters.
- **Fault 100% SOC** – The generator failed to autostart and run per the *SETUP: 04K Gen 100% SOC Start Days* menu's start parameters.



Remedy: One of the above fault messages may display on the ARC remote when:

A) The AGS attempts to start the generator four times, but the generator failed to start and run per the specific autostart parameters; or,

B) The generator started, but did not provide the correct gen run sense signal to the AGS controller. For any scenario above, refer to the Troubleshooting section in your ME-AGS-N owner's manual.

- **Fault MaxRn** – The generator has turned off because the gen run time—after autostarting—has exceeded the *SETUP: 04F Max Gen Run Time* setting.



Info: The *Max Gen Run Time* menu uses the *SETUP: 04B Gen Run Time* display to determine the generator's run time. Cooldown and warm-up times are not included in the *Gen Run Time* display.

Using an AGS Module: Troubleshooting



Remedy: Confirm that all the autostop parameters that are active or enabled can be satisfied before the *SETUP: 04F Max Gen Run Time* setting is reached.

- If using the *SETUP: 04A Gen Run VDC* menu's parameters with:
 - a battery voltage setting to autostop – ensure the autostop voltage is less than the temperature-compensated absorb charge voltage.
 - the *Float* setting to autostop – ensure the time that the charger is in the Bulk Charge and Absorb Charge¹ stages is shorter than the *04F Max Gen Run Time* setting.

Refer to the *SETUP: 04A Gen Run VDC* section for additional information on this setting.

- If using *SETUP: 04B Gen Run Time*, confirm you have not set the total run time (start time to the stop time) longer than the *SETUP: 04F Max Gen Run Time* setting.
- If using *SETUP: 04C Gen Run Amps*, confirm the inverter load(s) that is used to determine the *Stop Gen AC Amps* setting is not required to run longer than the *SETUP: 04F Max Gen Run Time* setting.
- If using *SETUP: 04D Gen Run SOC*, confirm that the *METER: 05B Battery SOC* reading is not "Think'n", but shows an actual percentage reading on the display (i.e., 85%), and the *Stop Gen SOC* setting can be satisfied before the *SETUP: 04F Max Gen Run Time* setting is reached.
- If using *SETUP: 04E Gen Run Temp*, the temperature around the remote temperature sensor has not reached the *Gen Run Temp* setting. You need to either lower the *Gen Run Temp Start* setting, determine how to cool the area (remote temp sensor location) to below the *Gen Run Temp Start* setting before the *04F Max Gen Run Time* setting is reached, or increase the *Max Gen Run Time* setting.

Lastly, confirm that your warm-up and/or cooldown time when added to your autostop condition does not exceed the *SETUP: 04F Max Gen Run Time* setting.



Info: Beginning with Version 5.2 of the ME-AGS-N, the *Max Gen Run Time* setting can be defeated. In some cases, it may be appropriate to set the *Max Gen Run Time* setting to *OFF*. However, this feature is mainly provided as a safety feature to ensure the generator doesn't run longer than the time it takes to reach the autostop conditions or to expend the generator's fuel capacity, whichever occurs first – take this into consideration if this setting is defeated.

Note¹: Several conditions determine the length of time that the charger is in the Absorb Charge stage. Ensure the *SETUP: 03D Absorb Done (Time, Amps, or SOC) setting—determines when the Absorb Charge stage is complete and enters the Float stage—is taken into account when setting the 04F Max Gen Run Time setting.*

7.3.4 How to Clear AGS Faults

Go to the *CTRL: 03 Gen Control* menu, and then select *OFF*.

Note: After the fault clears and the reason for the fault is determined, be sure to re-enable the AGS to autostart. Go to the *CTRL: 03 Gen Control* menu and select *AUTO*. Refer to Figure 7-2.

Once the fault is cleared and the reason for the fault is determined, you should re-enable the AGS to see if the fault returns, or test the AGS/generator system by performing the AGS functional test for your remote (see Section 7.1.2).

7.3.5 How to Clear AGS Fault History

Go to the *TECH: 04 Fault History* menu, press the *SELECT* knob, and then turn the knob until the *04D Clear Faults* screen appears.

At the *04D Clear Faults* screen, press and hold the *SELECT* knob until the "5.0 to 0.0 second" screen countdown is finished and the screen displays "HISTORY CLEARED".



CAUTION: Before using the Clear Faults feature, be sure you do not want the fault history for any device (inverter, AGS, or PT controller). Once fault history data has been cleared, it cannot be retrieved.

8.0 Using a BMK

This section discusses how to set up and monitor Magnum's BMK (battery monitor kit) using the menu options in the ME-ARC remote.

IMPORTANT: A BMK must be connected and communicating with the ME-ARC in order to set up and/or monitor its operation. If the BMK is not communicating or no BMK is connected, "No BMK Present" appears when accessing the *METER: 05 BMK Meters* and *SETUP: 05 BMK Setup* menus (unless the *TECH: 07 Show all Menus* menu is set to "Yes"). Refer to Section 3.2.5 for more information on the *TECH: 07* menu.

8.1 Setting Up the BMK using the ME-ARC

Use the BMK SETUP menus to establish your battery's charge efficiency and to set the capacity of the battery bank (AH size).

SETUP: 05 BMK Setup

This section provides information about charge efficiency and how to manually access/adjust this setting and the amp-hour setting.

- **05A Charge Efficiency** – This setting allows the battery monitor to calculate the battery's charge efficiency. The charge efficiency can be calculated automatically using the *Auto* setting, or can be calculated based on a fixed efficiency value determined by the user.

Default setting: *Auto*

Range: *Auto, 50%-99%*

What is charge efficiency? When a certain amount of energy is removed or discharged from the battery, this removed energy will need to be returned to keep the batteries at a 100% state of charge. As batteries are being charged, they lose energy; either in the form of heat, or while gassing. This loss of energy while charging means the battery will not be fully charged if you only return the current that was removed. To compensate for the battery's inefficiencies while charging, a charge efficiency setting is provided. The charge efficiency setting compensates the *METER: 05E AH In/Out* reading by ensuring the AH returned to the battery are greater than the AH removed.

Example: The *05E AH In/Out* display reads *000* and you begin powering a 25-amp load for two hours—the display will show *-050*. This indicates that you have discharged 50 AH (2 x 25) from the battery. If the charge efficiency setting is set to *95%*, then as you begin charging and return 50 AH, the AH I/O reading will be less than zero, indicating that the AH removed have not been fully returned. The 95% charge efficiency setting requires 52.5 AH (50/95) to be returned before the AH I/O returns to 0.



CAUTION: The factory default charge efficiency setting is *Auto*, which allows charging efficiency to be automatically calculated. In most circumstances, this setting determines the best charge efficiency. If you do not know your battery's charging efficiency, leave it at the factory default setting. If the setting is manually set but incorrect, the state-of-charge information will become more inaccurate with every charge.

Adjusting the Charge Efficiency Setting: The battery monitor is shipped with the charge efficiency set to *Auto*. This allows the battery monitor to automatically calculate variables that affect the charging efficiency, such as battery type, battery age, and how the batteries are maintained—which is not always constant. With the *Auto* setting, the efficiency is recalculated each time the batteries reach a 100% state of charge (SOC).

This setting can also be manually adjusted from 50% to 99% if the battery's charge efficiency is known. With a setting other than *Auto*, the battery monitor uses the manual setting to calculate the *METER: 05E AH In/Out* display. For example, if you set the charge efficiency to 90% and 100 AH are removed from the battery, the *AH In/Out* display would read *000* only after 111 AH have been returned to the battery. However, if the charge efficiency is manually set and inaccurate, the SOC information will be more inaccurate with every charge. Thus, continually monitor the AH I/O reading (along with the SOC display) under the remote's *METER* button.

After several charge and discharge cycles (below 80% SOC), the *AH I/O* reading should be slightly positive when the *SOC* display reads 99%.

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To view the SOC display: Access the *METER: 05B Battery SOC* display. If the *AH I/O* reading is below 000 (negative number) when the *SOC* display reads 99%, then increase the charge efficiency setting. If you find that the *AH I/O* reading is substantially above zero when the *SOC* display reads 99%, then decrease the charge efficiency setting.

- **05B AmpHour Size** – This setting is used by the battery monitor to calculate the battery's SOC. The AH size represents the amount of energy the battery can deliver.

Default setting: 400 AH

Range: 200-2500 AH

Note: It is important that the AmpHour Size setting is correct or else the calculations used to determine the battery's SOC display will be inaccurate.

Where do I set the AmpHour Size setting? Select the setting based on the 20-hr AH capacity of your battery bank. Refer to the battery manufacturer for the 20-hr AH capacity of your particular batteries.

How do I determine my Battery Amp-Hour capacity? The batteries should be a deep-cycle type and rated either by AH or reserve capacity in minutes.

- Amp-hour (AH) capacity is a measurement of how many amps a battery can deliver for a specified length of time (usually 20 hours) until the voltage achieves 1.75 VDC/cell at 80°F.
- Reserve Capacity (RC) is a measure of how many minutes a battery can deliver a certain amount of current (usually 25A) and maintain a voltage above 1.75 VDC/cell at 80°F. If using the Reserve Capacity (25A), the 20-hour AH capacity can be estimated by multiplying 'minutes reserve capacity' by 50%.

Note: For batteries in parallel strings – add the AH capacity of each string (Ex.: three 250AH batteries in parallel = 750 AH); for batteries in series – use the amp-hour capacity of one battery (Ex.: three 250 AH batteries in series = 250 AH).

8.2 BMK Operation/Monitoring with the ME-ARC

This section explains how the ME-BMK (Battery Monitor kit) battery monitor works, and how to use the ME-ARC to obtain battery bank information. It also covers the various LCD displays that are related to the battery monitor and the status of the sense module's LED indicator.

8.2.1 How does the BMK Battery Monitor Operate?

The ME-BMK uses a precision resistor—known as a shunt—to measure current flow into and out of the battery. The shunt provides a small voltage to the BMK sense module that is proportional to the current flow. When the battery current starts flowing, the sense module measures the amount of current removed from and returned to the battery. The amount of current (or AH) removed or returned is displayed as the *METER: 05E AH In/Out* value. This *AH In/Out* value is compensated by the *SETUP: 05A Charging Efficiency* value that accounts for energy losses while charging, and is one of the factors used to determine the battery's State Of Charge (SOC).

The battery's state of charge—which is the best indicator of the condition of the batteries—is indicated on the *METER: 05B Battery SOC* display. This display shows that the batteries are fully charged (i.e., SOC = 100%) once the following three conditions have been met:

1. The charging voltage has stabilized over a period of time (see Figure 8-1).
2. The charging current has decreased to a low % of the AHr capacity—normally less than 2%.
3. The AH that were removed from the battery are within 1% of fully being returned.

When the BMK sense module is first connected, the batteries will need to be fully charged (i.e., SOC = 100%) at least once to establish a SOC reference point. While this reference point is being calculated, the *METER: 05B Battery SOC* display shows "Think'n" to indicate that the SOC reference point is calculated. After the batteries are fully charged, the display changes from "Think'n" to "100%" and begins to provide accurate SOC percentage values. After the batteries have reached 100% SOC and have discharged $\geq 0.5\%$ of the battery capacity setting, the charge efficiency value is recalculated and the *Amp Hours In/Out* read-out resets to the recalculated value.



Info: To maintain the accuracy of the *METER: 05B Battery SOC* display and to keep the batteries in good condition, charge the batteries to 100% occasionally (~ x1/week).

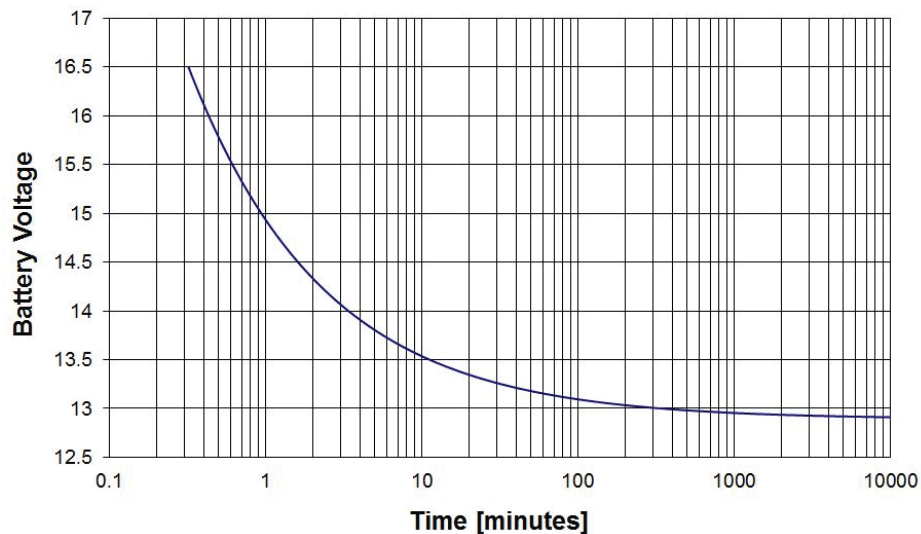


Figure 8-1, Ending Battery Voltage Verses Time

8.2.2 Monitoring the BMK using the ME-ARC

Use the ARC remote's METER button to monitor battery bank information and to determine the status of your battery system.

METER: 05 BMK Meters

This section describes what battery bank information is available from the battery monitor when using the ARC remote.

- **05A BMK Status** – This menu selection offers read only displays that give the current operating status of the battery monitor. This selection also provides information to determine if there is a power-up fault condition (see Table 8-1).
- **05B Battery SOC** – This read only menu either displays the calculated battery SOC (State of Charge) for the connected battery bank—"Think'n" (to indicate the SOC is being calculated), or identifies a fault condition. **Note:** Refer to Section 8.2.4 for information on BMK statuses/faults. The range is 0%-100%, where 100% is a fully charged battery and 0% is completely discharged. When the BMK sense module is first connected, the display will show "Think'n", to indicate that the SOC reference point is being calculated. After the batteries are fully charged, the display changes from "Think'n" to "100%" and begins to provide accurate SOC% values. **Note:** If the sense module is disconnected from power, this display resets to "Think'n" and the batteries require another full charge before SOC percentage information is displayed.
- **05C DC Volts-BMK** – This meter displays the DC volts at the BMK input. The range is from 07.00 to 70.00 volts (± 0.02)
- **05D DC Amps-BMK** – This meter displays the real-time charge current (amps into battery) or discharge current (amps out of the battery) as measured through the BMK shunt. Charging is shown as a positive (+) number and discharging is shown as a negative (-) number. The range is from ± 0.1 to 999 amps ($\pm 1.0\%$).
- **05E AH In/Out** – This meter displays the AH returned to or removed from the battery. When this value is positive, it represents AH returned to the battery during any subsequent charging. A negative value represents AH removed from a full battery. The range is $\pm 32,768$ AH. When using the charge efficiency's Auto setting, the AH I/O value is recalculated after the battery has been fully charged (100% SOC) and $\geq 0.5\%$ of the battery capacity has been discharged. If the sense module is disconnected from power, the AH I/O value resets to zero.

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Info: The *AH I/O* display correlates with the *SETUP: 05B AmpHour Size* setting to help determine the *05B Battery SOC* display.

Example: if you run a 10-amp load for three hours, the display will show -30 AH. When you begin charging, the display will count from -30 AH back toward 0 AH.

- **05F Reset AH Out** – This meter displays the total amp-hours removed from the battery since it was last reset. This display can be used as a battery load indicator to help identify and monitor the battery load consumption. The range is 0 to 65,535.0 amp-hours (0.1 amp-hour resolution). To reset the AH value to zero, press and hold the rotary SELECT knob for three seconds when the *Reset AH Out* display is shown. After this display has been reset, it will begin calculating and displaying new rAH out values. This display automatically resets to zero if the sense module is disconnected from power.
- **05G Total AH Out** – This meter displays the total amp-hours removed from the battery since the sense module was first connected. This display can be used as a battery service life indicator. The value is displayed in 0.1k [or 100 AH ("k" equals 1000)] resolution up to a maximum of 6,553.5k AH (6,553,500 amp-hours). To reset this display, press and hold the rotary SELECT knob for three seconds while the *Total AH Out* display is shown. After this value has been reset, the display will begin monitoring and showing new total AHr out values. Also, the displayed number resets to 0.0k when the sense module is disconnected from power.
- **05H Minimum VDC** – This menu displays the lowest battery voltage since the last reset. The voltage shown on the display is averaged each second, and is helpful when troubleshooting or detecting an over-discharge condition. To reset this display, press and hold the rotary SELECT knob for three seconds while the *Minimum VDC* display is shown. After this value has been reset, the display will begin monitoring and showing new minimum DC input values. If the battery monitor is not connected or not communicating, the display will show "0.0".
- **05I Maximum VDC** – This menu displays the highest battery voltage since the last reset. The voltage shown on the display is averaged each second, and this allows you to check your charging system (battery charger, charge controller, etc.,) to ensure the charging voltage has been attained. This display is also helpful when troubleshooting or detecting if an over-charge condition has occurred. To reset this display, press and hold the rotary SELECT knob for three seconds while the *Maximum VDC* display is shown. After this value has been reset, the display begins monitoring and showing new maximum DC input values. If the battery monitor is not connected or not communicating, the display shows "0.0".
- **05J Days Since 100% SOC** – This read-only menu displays the number of days since the battery was at 100% SOC, and is calculated in the remote.



Info: This display resets: once the battery SOC reaches 100%, power to the remote is lost, or communication from the BMK is lost.



Info: This display uses information from the *METER: 05B Battery SOC* menu to determine the last time the battery SOC was at 100%.



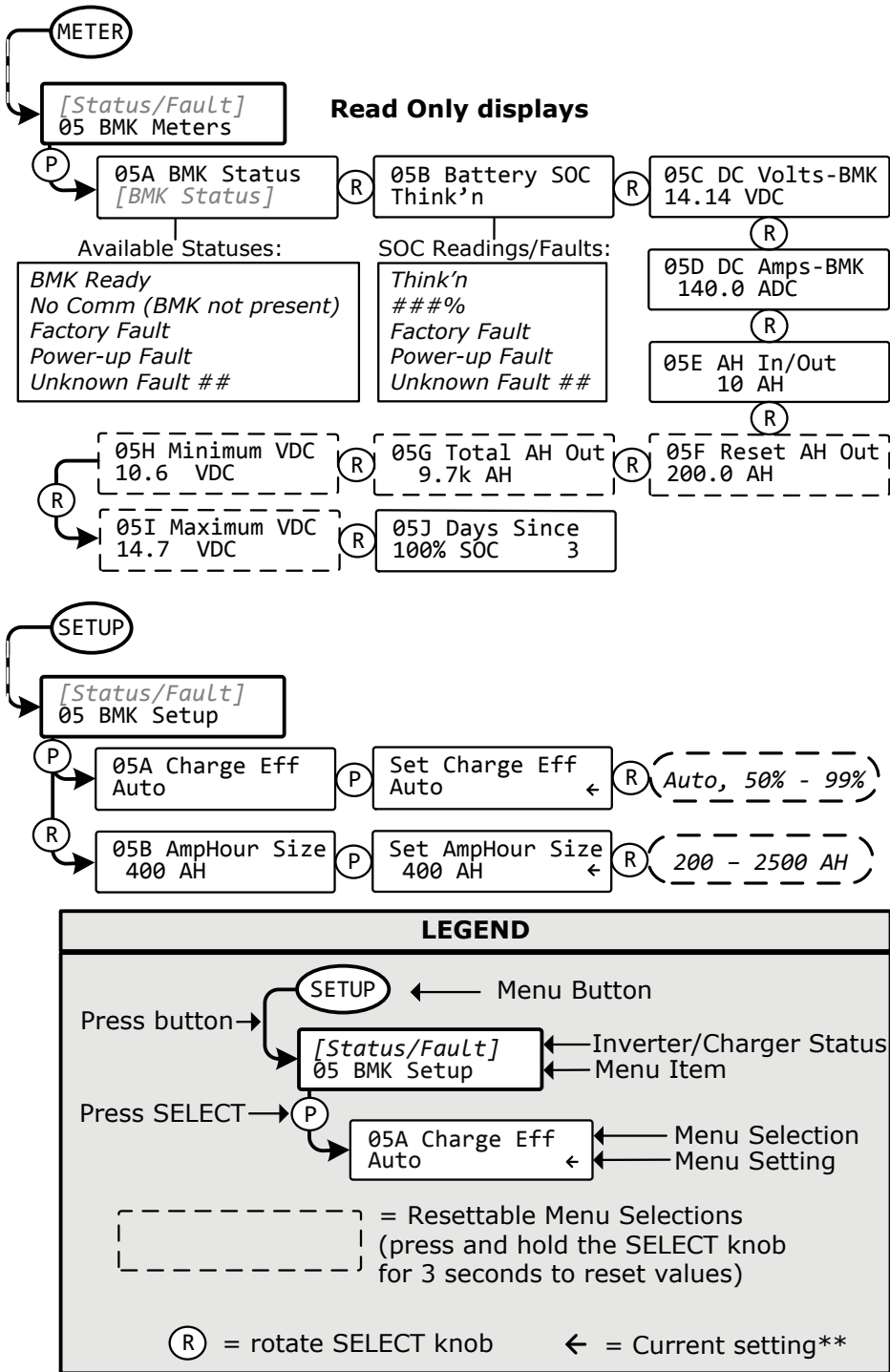
Info: For the 'days since value' to increment, the *METER: 05B Battery SOC* display must have a valid SOC number (*Think'n*, *No Comm* or any BMK fault is not valid), and the *SETUP: 04K Gen 100% SOC Start Days* must be enabled (not set to *OFF*).



Info: This display is similar to the *METER: 04F Since 100%* menu (calculated in AGS). If an AGS is installed at a later date (or the remote is reconnected), the two menus are not coordinated with each other. However, they automatically synchronize once the BMK's *METER: 05B Battery SOC* menu reaches 100% SOC (or you can manually synchronize by momentarily removing the network cable from the BMK).

8.2.3 BMK Menu Maps

The diagrams in this section are a complete overview of the settings and information displays available from the ME-ARC remote's BMK METER and SETUP menus.



** - For this menu map, the arrow denotes the factory default settings

Figure 8-2, BMK METER/SETUP Menu Map

Using a BMK: Monitoring

8.2.4 BMK Remote Status Messages

A BMK status message may be an operational or fault message. Access the *METER: 05A BMK Status* menu to view the BMK's current operating status. The status is important when determining if the BMK is working correctly, or for troubleshooting a BMK installation.

8.2.4.1 BMK Remote Operational and Fault Statuses

Refer to Table 8-1 for a brief description of the BMK operational and fault statuses that may display on your remote. Refer to Section 8.3.2 "Resolving BMK Faults using the ME-ARC" for help in diagnosing and resolving BMK fault conditions.

Table 8-1, BMK Remote Operational and Fault Statuses

Status	Description
BMK Ready	Indicates the BMK is correctly communicating with the inverter/charger.
No Comm	The BMK is not communicating with the inverter/remote. This is a normal status if there is no BMK connected in the system.
BMK not present	If a BMK is installed, view the BMK sense module's LED. a) If the LED is green, disconnect the terminal block for 5 seconds, and then reconnect it to ensure the terminal block is correctly seated into the sense module. b) If the LED is blinking red, there is no communication or there is an unrecognizable communication on the network. Check the communication cable—ensure it is connected correctly. If the ME-BMK communication cable is missing, a standard 2-conductor telephone cable may be temporarily substituted.
Factory Fault	The BMK has lost its factory-set internal calibration reference.
Power-up Fault	A fault occurred during the BMK's power-up sequence.
Unknown Fault ##	A fault code that is not recognized by the remote.

8.2.4.2 BMK Remote SOC Statuses

The following "SOC" statuses indicate the battery's current state of charge. Access the *METER: 05B Battery SOC* menu to view the BMK's current SOC status.

Note: If a fault condition (i.e., Factory, Power-up, or Unknown fault) is present and appears on the 05A BMK Status display, it will also appear on the 05B Battery SOC display as well until it has been resolved.

Table 8-2, BMK Remote SOC Statuses

Status	Description
Think'n	When the BMK sense module is first connected, the batteries need to be fully charged (i.e., SOC = 100%) to establish a SOC reference point. The BMK sense module is disconnected from power and the batteries require a full charge before the remote display begins providing SOC percentage information.
###%	The batteries are fully charged, the display has changed from "Think'n" to "100%" and is ready to provide accurate SOC percentage values.
Factory Fault	The BMK has lost its factory-set internal calibration reference.
Power-up Fault	A fault occurred during the BMK's power-up sequence.
Unknown Fault ##	A fault code that is not recognized by the remote.
No Comm	Refer to Table 8-1 above.

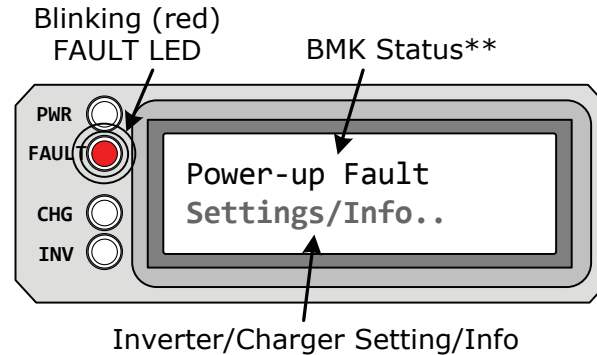
8.3 BMK Troubleshooting using the ME-ARC

This section assists you in using the remote to identify and resolve any faults or abnormal operational conditions within your BMK system.

8.3.1 BMK Fault Message Screens

When an BMK fault is detected, the ME-ARC's red FAULT LED comes on and the fault status is displayed on the LCD screen. Figure 8-3 is an example of how BMK fault messages appear on the ME-ARC remote. Use the remote's LCD screen and the information in this section to identify and correct the issue.

Note: The FAULT LED blinks and the fault alternates with the inverter/charger status.



**** BMK status alternates with inverter/charger status (scrolling).**

Figure 8-3, BMK Fault Message (Example)

8.3.2 Resolving BMK Faults using the ME-ARC

For the three BMK faults that follow, refer to the respective remedy.

- **Factory Fault** – The BMK has lost its factory-set internal calibration reference.
 - ☑ **Remedy:** Reset the battery monitor by removing all power from the BMK. If the fault remains or returns after resetting, the BMK will require repair at a Magnum Energy factory service facility.
- **Power-up Fault** – The BMK's power-up sequence failed.
 - ☑ **Remedy:** 1) Ensure the current sense wires are connected into pins 1 (blue wire) and 2 (orange wire), and the voltage wires are connected to pins 3 (black/negative) and 4 (red/positive). 2) Unplug the 4-port terminal block from the sense module, and then check for the correct DC voltage on pins 3 (-) and 4 (+). The voltage must be between 7-70 volts DC depending on the nominal voltage of the inverter.
- **Unknown Fault ##** – This fault message displays when the BMK has sent a fault code that is not recognized by the remote.
 - ☑ **Remedy:** Call the Technical Support department at Magnum Energy (425-353-8833) for assistance in determining and understanding the actual fault status.

9.0 Using an ACLD

This section discusses how to configure and monitor Magnum's AC Load Diversion controller (ACLD) using the ME-ARC remote. Refer to your ACLD owner's manual (PN: 64-0062) for additional information on setup and operation procedures.

IMPORTANT: An ACLD must be connected and communicating with the ME-ARC in order to monitor its operation. If the ACLD is not communicating or no ACLD is connected, "No ACLD Present" appears when accessing the *METER: 06 ACLD Meters* menu (unless the *TECH: 07 Show all Menus* menu is set to "Yes"). Refer to Section 3.2.5 for more information on the *TECH: 07* menu.

9.1 Setting Up the ACLD using the ME-ARC

During Standby and Active modes, the ACLD controller is in charge of monitoring and regulating the battery voltage and determining the battery's absorption charge time. Use the ME-ARC remote's SETUP button to set the amount of time that the battery will be in the Absorption stage. This is accomplished using the ARC's *SETUP: 03D Absorb Done Time* menu (see page 31).

Also, when the Magnum inverter is first turned on, its automatic Search feature is enabled. To ensure the transfer from Inactive to Standby/Active mode occurs smoothly, the ARC's *SETUP: 02A Search Watts* setting should be turned to OFF (see page 20).

9.2 Monitoring the ACLD using the ME-ARC

This section covers the menus under the ME-ARC's METER button that enable you to monitor the ACLD controller's operation.

9.2.1 ME-ARC Remote's ACLD METER Button Menus

Press the ME-ARC's METER button, rotate the SELECT knob to *06 ACLD Meters*, and then press SELECT to view the following menus.

METER: 06A ACLD Status

This read-only menu displays the ACLD's current status. These statuses (listed below) identify what state the ACLD is currently in—only one displays at a time (see also Figure 9-1).

Note: For specific information on each operational and fault status, refer to Table 9-1 & Section 9.3.2, respectively.



Info: This menu is important when determining if the ACLD is working correctly, or for troubleshooting an ACLD installation. Refer also to Section 9.3.

Operational Status:

- Active - Absorb
- Active - Bulk
- Active - Float
- Inactive
- No Comm (ACLD not present)
- Standby - Absorb
- Standby - Bulk
- Standby - Float

Fault Status:

- Desat Fault
- High Current
- High VAC In
- No Load
- Output Short
- Overcurrent
- Overtemp

METER: 06B ACLD Power Diverted

This read-only menu displays the amount of current diverted to the loads connected to the ACLD.

METER: 06C ACLD Temp

This read-only menu displays the ACLD's internal temperature.

METER: 06D Target Volts

This read-only menu displays the voltage regulation set-point after it has been compensated based on the battery temperature sensor (BTS) reading shown.

METER: 06E ACLD Version

This read-only menu displays the software version of the ACLD controller.

9.2.2 ME-ARC Remote's ACLD-specific TECH Menus

Press the ME-ARC's TECH button, and rotate the SELECT knob to access:

TECH: 01 Temperature (rotate SELECT knob until *ACLD Temp* displays)

- **ACLD Temp** – Displays the temperature of the ACLD load diversion controller plugged into the NETWORK port on the inverter (taken from the *METER: 06C ACLD Temp* display).

TECH: 02 Versions (rotate SELECT knob until *AGS* displays)

- **ACLD: #.#** – Displays the software version of the ACLD connected to the Magnum network (displays "0.0" if the remote does not sense an ACLD).

9.2.3 ACLD Menu Maps

The diagram below is a complete overview of the ACLD information displays available from the ME-ARC remote's METER button ACLD menu.

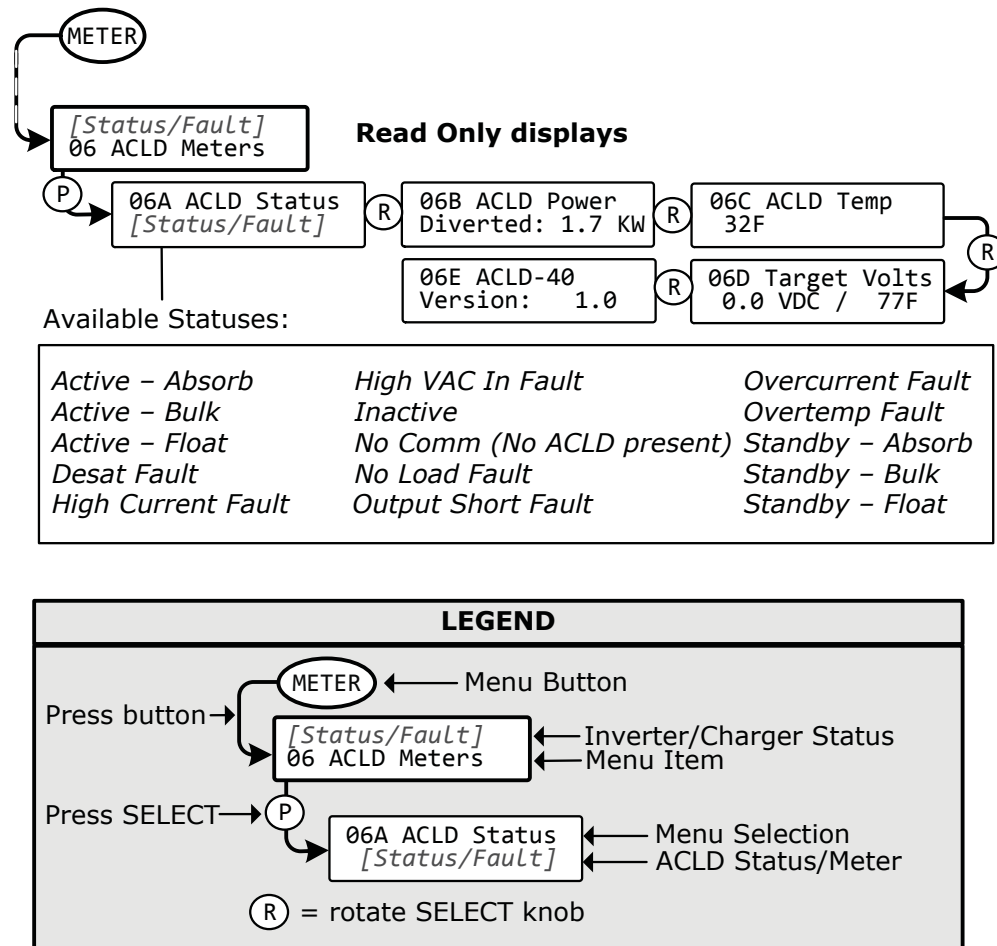


Figure 9-1, ACLD METER Menu Map

Using an ACLD: Monitoring

9.2.4 ACLD Remote Status Messages

A status message may be an operational or fault message. View the ACLD's current operating status using the *METER: 06A ACLD Status* menu. This menu is useful in determining if the ACLD is working correctly, or for troubleshooting an ACLD installation.

Note: "Fault statuses" indicate that the ACLD is not operating as intended. Refer to Section 9.3.2 "Resolving ACLD Faults using the ME-ARC" to identify and diagnose the problem.

9.2.4.1 ACLD Remote Statuses

Refer to Table 9-1 for a brief description of the possible ACLD operational statuses that may display (depending on your remote).

Table 9-1, ACLD Remote Operational Statuses

Status	Description
Active-Absorb	Current is actively being diverted to the external load to regulate the battery bank at the <i>Absorb Volts</i> setting*. The ACLD will remain in the Absorb stage until the <i>SETUP: 03D Absorb Done Time</i> setting has been satisfied.
Active-Bulk	If the battery voltage begins rising quickly, the ACLD activates and starts diverting current in an attempt to keep the voltage from rising above the <i>Absorb Volts</i> setting*. The ACLD remains in the Bulk stage until the battery voltage has reached the <i>Absorb Volts</i> setting.
Active-Float	Current is actively being diverted to the external load to regulate the battery bank at the <i>Float Volts</i> setting*. The ACLD remains in this stage unless the battery voltage falls to a low voltage, which re-initiates another Bulk stage.
Inactive	The ACLD is on, but inactive (not actively regulating the battery voltage) because utility power is connected to the Magnum inverter.
No Comm	The ACLD is not communicating with the inverter/remote. This is a normal status if there is no ACLD connected in the system. If an ACLD is installed, you may have a bad cable ("ACLD Not Present" displays).
Standby-Absorb	The ACLD is not actively diverting current, but the battery voltage has reached the <i>Absorb Volts</i> setting*. The ACLD remains in the Absorb stage until the <i>SETUP: 03D Absorb Done Time</i> setting has been satisfied, then goes into the Standby-Float stage.
Standby-Bulk	The ACLD is not actively diverting current, but the battery voltage is below the <i>Absorb Volts</i> setting*. The ACLD remains in the Bulk stage until the battery voltage has reached the <i>Absorb Volts</i> setting, then goes into the Standby-Absorb stage.
Standby-Float	The ACLD is not actively diverting current, but the battery voltage is now regulating at the lower float voltage level—after being at the higher absorb voltage level for the required period—to prevent the battery from being overcharged. While in this status, if the battery voltage falls to a very low level, another Bulk/Absorb regulation stage will start.

* - These settings are determined by the battery type settings in the Magnum inverter—which are communicated to the ACLD.

9.3 ACLD Troubleshooting using the ME-ARC

This section assists you in using your remote to identify a fault and to resolve an abnormal operational condition detected within your ACLD system.

9.3.1 ACLD Fault Message Screens

When an ACLD fault is detected (i.e., ACLD's LED blinks), navigate to the *METER: 06 ACLD Meters/06A ACLD Status* menu to view the fault status. Figure 9-2 is an example of how ACLD fault messages appear on the ME-ARC remote. Use the remote's LCD screen, your ACLD owner's manual, and the information in this section to identify and correct the issue.

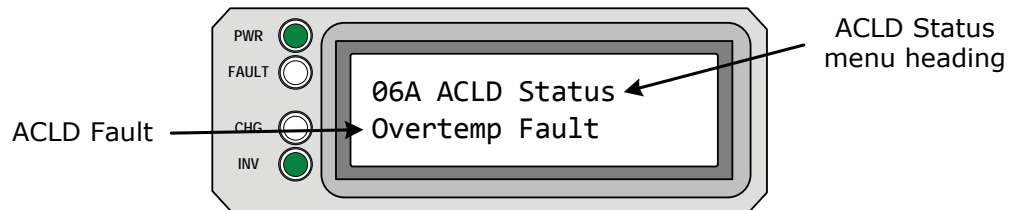


Figure 9-2, ACLD Fault Message (Example)

9.3.2 Resolving ACLD Faults using the ME-ARC

For the listed faults below, refer to their respective remedy.

- **Desat Fault** – Hardware saturation has occurred—indicates a possible catastrophic failure.

Remedy: This fault requires a reset of the ACLD. Press the ON/OFF switch on the side of the ACLD controller to remove power to the unit, and then press the ON/OFF switch again to restore power. If fault recurs, contact Magnum Energy for service.
- **High Current Fault** – The current is at least 30% above rated current. This may be the result of a load that is not sized correctly, or may be a bad power board.

Remedy: Ensure that the load is connected. Press the ON/OFF switch on the side of the ACLD controller to remove power to the unit, and then press the ON/OFF switch again to restore power.
- **High VAC In Fault** – The AC input voltage is above 275 VAC.

Remedy: This fault automatically clears once AC input voltage falls below 260 VAC.
- **No Load Fault** – No loads detected on either output terminals (or min. current flow to loads).

Remedy: Check to ensure that the loads are sized and connected correctly.
- **Output Short Fault** – A shorted output to loads has been detected.

Remedy: Check to ensure that the loads are sized and connected correctly. See the ACLD owner's manual for load sizing criteria.
- **Overcurrent Fault** – The current has reached an extremely high level (about twice the rated current). Possibly the result of too big of a load.

Remedy: Check to ensure that the loads are sized and connected correctly. Press the ON/OFF switch on the side of the ACLD controller to remove power to the unit, and then press the ON/OFF switch again to restore power. See the ACLD owner's manual for load sizing criteria.
- **Overtemp Fault** – The unit temperature has risen above 90°C—will automatically reset once temperature falls below 70°C.

Remedy: This fault automatically clears once the temperature falls below 70°C. See the ACLD owner's manual for load string criteria.

10.0 Using a PT Charge Controller

Pressing the SETUP button provides access to the menu items and settings that enable you to configure your PT charge controller. This section discusses how to set up and monitor the PT charge controller using the ME-ARC remote. It also covers other PT controller menu options that are available using this remote. Refer to your PT controllers owner's manual for more information on setup and operation procedures (PN: 64-0067).

IMPORTANT: The PT controller must be connected and communicating with the ME-ARC in order to set up and/or control its operation. If the PT controller is not communicating or there is no PT connected, "No PT Present" appears when accessing the *METER: 07 PT Meters*, *SETUP: 06 PT Setup* or the *CTRL: 04 PT Control* menus (unless the *TECH: 07 Show all Menus* menu is set to "Yes"). Refer to Section 3.2.5 for more information on the *TECH: 07* menu.

10.1 Setting Up the PT Controller using the ME-ARC

Use the ARC remote's SETUP button to identify a battery type and the *Absorb Done*, *Max Charge Rate/Time*, *Bulk Start*, *PT Aux Relay* and *PT Alarm* settings for your PT controller. Review each menu item to determine if you need to adjust any settings to meet your system requirements.



Info: If *Linked* displays on the ME-ARC for the *06A Battery Type* and *06B Absorb Done* settings, then that indicates that "Yes" has been selected from the *SETUP: 01E Link PT CHG Settings* menu. For additional information on linking the inverter's charge settings with the PT controller's charge settings, refer to page 20.

- **06A Battery Type:** This setting selects the battery type, which determines the battery charge profile and ensures the batteries are receiving the proper charge voltage. The charge voltage settings are fixed when using the *GEL*, *Flooded*, *AGM1*, or *AGM2* selections, but can be adjusted if using the *CC/CV* or *Custom* selections.

Default setting: *Flooded*

Range: *AGM1, AGM2, Flooded, GEL, CC/CV, Custom*

◆ **Set Battery Type (GEL, Flooded, AGM1, or AGM2)** – When the battery type selection is *GEL* (for Gel batteries), *Flooded* (for liquid lead acid batteries), *AGM1* (for Lifeline AGM batteries), or *AGM2* (for East Penn/Deka/Discover/Trojan AGM batteries), the charge voltage level for the Absorption, Float, and EQ charge modes are fixed as shown in Table 3-1—depending on the battery type selected and the nominal inverter battery voltage.



Info: The voltage settings shown in Table 3-1 are based on the Battery Temperature Sensor (BTS) at a temperature of 77°F (25°C), or not connected. If the BTS is connected, the actual charge voltage will increase if the temperature around the BTS is below 77°F (25°C), and decrease if higher than 77°F (25°C). This ensures the batteries receive the correct charge voltage regardless of temperature.

◆ **Set Battery Type (CC/CV)** – The *CC/CV* selection provides a 2-stage (i.e., Constant Current/Constant Voltage) charging method with an adjustable charge voltage and a setting that limits output current—if needed. It consolidates all the battery charge settings that are required for Constant Current and Constant Voltage charging cycles.

Note: *CC/CV settings only display if CC/CV is selected from the 06A Battery Type menu.*



Info: If *CC/CV* has been selected from the *06A Battery Type* menu, the *Absorb Done* and the *Volts* and *SOC* settings (under the *06E Bulk Start* menu) are no longer accessible and display "CC/CV Controlled" when selected. This is to prevent charging conflicts that could occur while in the *CC/CV* profile.



CAUTION: Whenever the *CC/CV* battery type is selected, some settings—within the menus that are no longer accessible—are internally linked to the *CC/CV* settings and can be automatically changed. Because settings can be automatically changed once *CC/CV* has been selected, if a different battery type is selected, then all charge settings must be reviewed to ensure they are correct for the new battery type selection.

- **Set Max Charge Amps** – Sets the maximum charge amperage allowed to charge the batteries during the CC/CV charge stage. The range of settings (20-990 ADC) are provided to limit the charge current to the battery bank, which helps prevent battery overheating caused by charging at too high a charge rate.

Default: 200 ADC

Range: OFF, 20 - 990 ADC



Info: If the BMK (Battery Monitor Kit) is connected, the DC amps value determined by the BMK (under *METER: 05D DC Amps-BMK*) will be used by the *Set Max Charge Amps* setting instead of the PT controller's current (shown under *METER: 07E Bat Amps-PT*)—as it is more accurate (+/- .1 ADC).

- **Set CV Charge Volts** – Sets the voltage level at which the charger will hold the batteries during the Constant Voltage stage.

Default: 13.8 VDC (12v), 27.6 VDC (24v), 55.2 VDC (48v)

Range: 12.0-16.6 VDC (12v), 24.0-33.2 VDC (24v), 48.0-66.4 VDC (48v)

⌘ **Set CV Chg Done** – These selections determine when the Constant Voltage stage of charging (displayed as "Absorb Charging") is finished. If using the *Hold CV Chg VDC* setting, the battery voltage is held at the *Set CV Charge Volts* setting. If using the *CV Chg Done Time* or *CV Chg Done Amps* selections, once the Constant Voltage charge stage is finished, it transitions to a Silent charge stage (displayed as "Float Charging"). After entering the Silent charge stage, the charger automatically stops charging, but is still actively monitoring the battery voltage. The charger will remain "Silent" until the battery voltage drops to the *Set Recharge Volts* setting, at which time the charger will start another Constant Current/Constant Voltage charge cycle (see Figure 10-1).

Default: Time

Range: Time, Amps, Hold CV Chg VDC

- * **Set CV Chg Done Time** – This setting determines how long the charger holds the battery voltage at the *CV Charge Volts* setting—based on a set time period. When using time, the battery bank size typically determines the length of the *CV Chg Done Time* setting. The larger the battery bank, the longer the time needed to ensure fully charged batteries. If the setting is 0.0 hrs, the charger transitions to Silent charge stage immediately after the charge voltage setting has been reached. If the setting is from 0.1 to 25.5 hrs, the charger transitions to the Silent charge stage after the battery voltage has been at the charge voltage setting for the selected time. Use Table 3-2 to assist in selecting the *CV Chg Done Time* setting based on the AHr capacity of your battery bank.

Note: After choosing Set CV Chg Done Time, the Set Max CC/CV Time and Set Recharge Volts settings must be determined (see next page).

Default: 2.0 Hrs

Range: 0.1-25.5 Hrs

- * **Set CV Chg Done Amps** – This setting—which requires a battery monitor to be installed—determines how long the charger holds the battery voltage at the *CV Charge Volts* setting—based on a minimum current setting (also known as "return amps"). During the Constant Voltage charge mode, as the battery charges, the current from the charger slowly decreases. When this current decreases below the *CV Chg Done Amps* setting, the charger transitions to the Silent charge stage. Most battery manufacturers recommend taking approximately 5% of the total battery bank size, and consider the battery totally charged when the charger's return amps drops to this level. Check with your battery manufacturer to find out what the correct return amp settings are for your batteries.

Note: After choosing Set CV Chg Done Amps, the Set Max CC/CV Time and Set Recharge Volts settings must be determined (see next page).

Default: 20 ADC

Range: 0-250 ADC

Using a PT Controller: Setup



Info: The ME-BMK battery monitor is required if the *CV Chg Done Amps* setting is used. The *CV Chg Done Amps* setting relies on the *METER: 05D DC Amps-BMK* value to determine when to transfer out of the Constant Voltage charge mode.



Info: Setting the *CV Chg Done Amps* value to zero keeps the charger in the Constant Voltage charge mode until the *Max CC/CV Time* setting (under *SETUP: 06A Battery Type: CC/CV*) is reached.

- **Set Max CC/CV Time** – This setting is a safety feature that ensures abnormal conditions do not cause the charger to hold batteries at a high voltage for a prolonged period of time. This menu sets a maximum time the charger is allowed to operate in either the Constant Current (Bulk charging) or Constant Voltage (Absorb charging) charge modes. If the charger reaches the *Max CC/CV Time* setting, it will transition to the Silent charge stage (status is *Float Charging*). The *OFF* selection can be used if there is an application where 25.5 hrs is not long enough.

Default: 12.0 Hrs

Range: OFF, 0.1-25.5 Hrs



CAUTION: If using "OFF", the batteries can be held at a high voltage for an extended time. Monitor the batteries to ensure they are not overcharged.



Info: The internal timer for the Set Max CC/CV Time feature increments when the battery voltage is above the *Float Volts* setting (from the *SETUP: 06A Battery Type* menu) and resets when the controller goes into Float charging.

- **Set Recharge Volts** – This setting determines the DC voltage set-point to which the batteries are allowed to fall—while the charger is in the Silent charge stage (status is *Float Charging*)—before the charger restarts and recharges to the *CV Charge Volts* setting. This setting should be slightly above the lowest DC volts level to which you want the batteries to fall. Typically, the lowest DC volts to which the batteries are allowed to fall is 12.0 to 12.2 VDC (12-volt systems), 24.0 to 24.4 VDC (24-volt systems), and 48.0 to 48.8 VDC (48-volt systems), respectively.

Default: 12.0 VDC (12v), 24.0 VDC (24v), 48.0 VDC (48v)

Range: 9.0-16.0 VDC (12v), 18.0-32.0 VDC (24v), 36.0-64.0 VDC (48v)

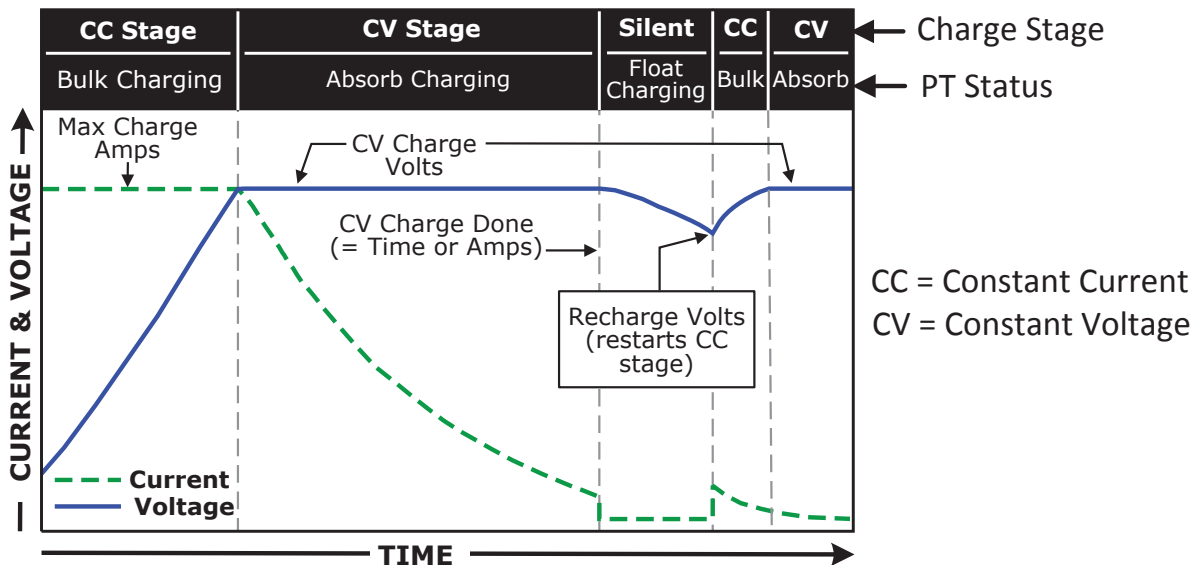


Figure 10-1, CV Charge Done Time/Amps (PT Controller)

* **Hold CV Chg VDC** – This setting holds the battery voltage at the *CV Charge Volts* setting. This is for a system that requires a constant charge voltage to be present at all times (see Figure 10-2).

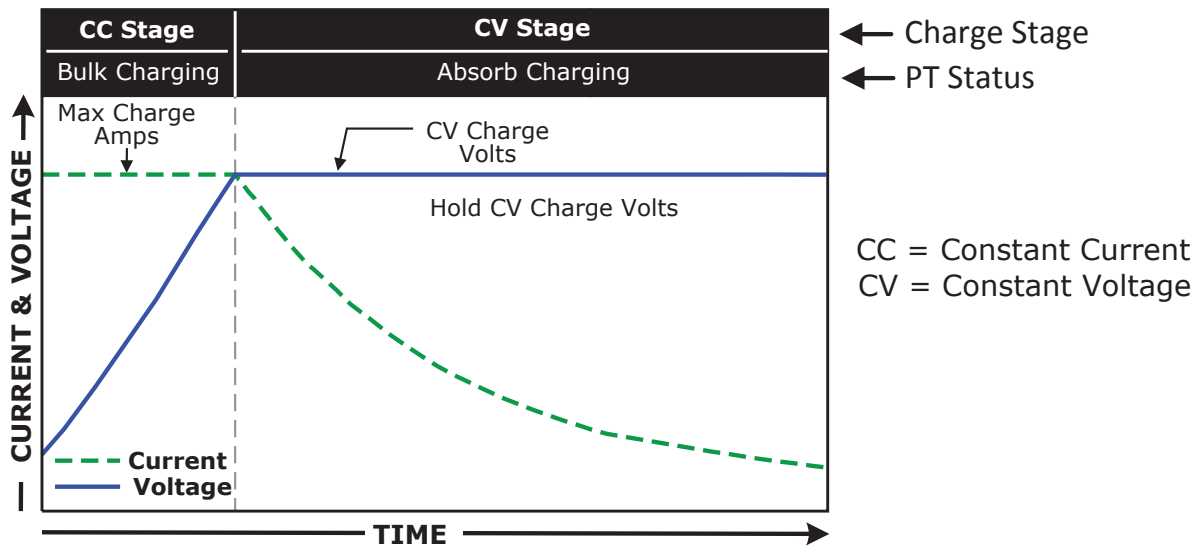


Figure 10-2, Hold CV Charge Volts (PT Controller)

◇ **Set Battery Type (Custom)** – This selection allows you to individually adjust the float, absorb, and equalization charge voltage settings and to set an equalization time for your batteries. This allows the multi-stage charging method (see Figure 10-3) to be customized specifically for your batteries. Use the following Custom battery settings to determine the battery’s absorption, float, and equalization voltages, and the maximum amount of time spent equalizing.

■ **Set Absorb Volts** – Sets the level at which the charging voltage is held constant during the Absorption charge.

Default: 14.4V (12v), 28.8V (24v), 57.6V (48v)

Range: 12.0-16.6V (12v), 24.0-33.2V (24v), 48.0-66.4V (48v)

■ **Set Float Volts** – Sets the level at which the charging voltage is held constant during the Float charge.

Default: 13.2V (12v), 26.4V (24v), 52.8V (48v)

Range: 12.0-16.6V (12v), 24.0-33.2V (24v), 48.0-66.4V (48v)

■ **Set EQ Volts** – Sets the level at which the charging voltage is held constant during the Equalization charge.

Note: The EQ Volts setting cannot be set lower than the Absorb Volts setting, or more than 2 volts (12v systems), 4 volts (24v systems), or 8 volts (48v systems) above the Absorb Volts setting.

Default: 15.6V (12v), 31.2V (24v), 62.4V (48v)

Range: 12.0-16.6V (12v), 24.0-33.2V, 48.0-66.4V (48v)

■ **Set EQ Done Time** – Sets the time (duration) the battery charges at the EQ Volts setting.

Default: 4.0 Hrs

Range: 0.1-25.5 Hrs



Info: The internal timer for the EQ Done Time setting counts when the battery voltage is equal to the EQ Volts setting, and clears when the controller status goes to *Float Charging*. It clears automatically when the EQ charging finishes, or can be manually cleared by selecting *Float Start* (under the CTRL: 04A PT CHG Ctrl menu).

Using a PT Controller: Setup

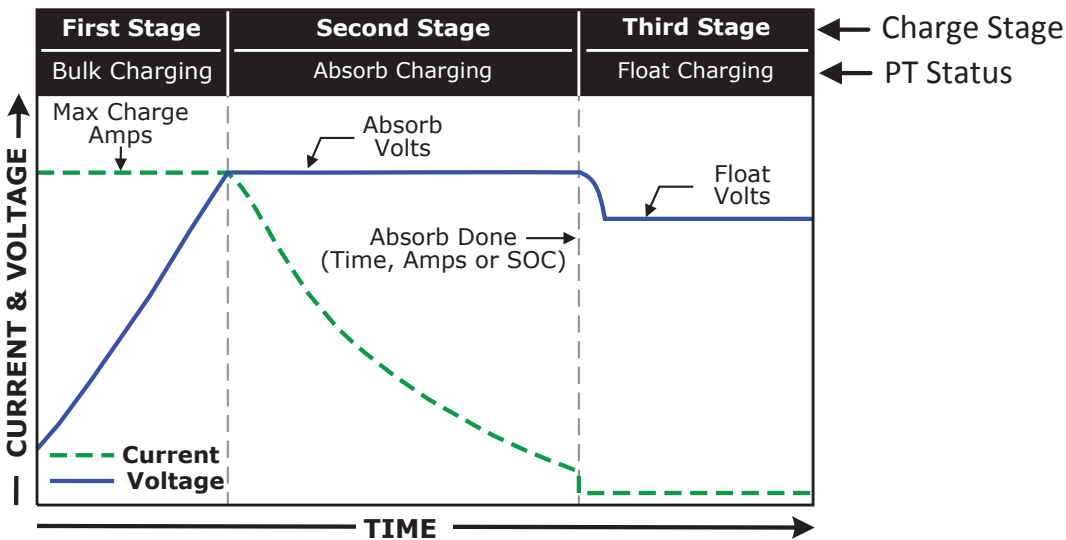


Figure 10-3, Multi-Stage Charging (PT Controller)

- 06B Absorb Done (Time, Amps, SOC)** – This setting identifies whether time, amps, or SOC are used to determine when the second stage of battery charging (Absorption) is finished. Absorption is the charge process that attempts to fully charge the batteries. Once this stage is finished, the charge cycle transitions to the third charge stage (Float).

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 06A Battery Type menu.



Info: If the Absorb stage is short or terminated, the batteries may not receive a full charge. In contrast, if the Absorb stage is too long the batteries may be overcharged. Either scenario may lead to poor performance or damage to the batteries. Contact the battery manufacturer to ensure the best charge settings are used for your batteries.

◆ **Set Absorb Done Time** – *Absorb Done Time* is used when a specific period of time is determined to be best for ending the Absorption stage. When using time, the size of the battery bank amp-hour capacity typically determines the length of the *Absorb Done Time* setting. The larger the battery bank, the longer the absorb time needed to ensure a full charge to the batteries. Taking specific gravity readings of the batteries and adjusting the absorb time may be needed in order to obtain the appropriate absorb time for your battery type and battery bank capacity. See Table 3-2 to help select the *Absorb Done Time* setting based on the amp-hour capacity of your battery bank.

Default setting: 2.0 Hrs

Range: 0.1-25.5 Hrs

◆ **Set Absorb Done Amps** – This setting—which requires a battery monitor to be installed—determines how long the charger holds the battery voltage at the *CV Charge Volts* setting—based on a minimum current setting (also known as "return amps"). During Absorb charge mode—as battery charges—the current required by the battery decreases. When the return amps decrease below the *Absorb Done Amps* setting, the charger transfers from the Absorption charge stage to the Float charge stage. Most battery manufacturers use a specific formula to determine the return amps needed to fully charge their type of battery. The formula used by most manufacturers to absorb the batteries is $C/20$, where C =Battery Bank's Total Amp Hours. Basically, they take approximately 5% of the total battery bank size and consider the battery totally charged when the charger's return amps drops to this level. Check with your battery manufacturer to find out what the correct return amp settings are for your batteries.

Default setting: 20 ADC

Range: 0-250 ADC



Info: The ME-BMK battery monitor is required if the *Absorb Done Amps* setting is used. The *Absorb Done Amps* setting relies on the *METER: 05D DC Amps-BMK* value to determine when to transfer out of the Absorption charge stage.

◆ **Set Absorb Done SOC** – This setting can be used if a battery monitor kit is installed and you want to use the SOC (State of Charge) of the battery bank to determine when the batteries are fully charged. During the Absorption charge mode, once the *METER: 05B Battery SOC* menu reaches the *Absorb Done SOC* setting, the charger transfers to the Float charge stage.

Note: The SOC is the best way to determine when the batteries are fully charged (any DC loads or other charge sources connected to the battery bank will not affect the SOC reading).

Default setting: 100%

Range: 50-100%



Info: A ME-BMK is required in order to use the *Absorb Done SOC* setting. If a valid SOC number is not displayed under the *METER: 05B Battery SOC* menu (i.e., *Think'n*, *No Comm*, *Power-up Fault*, or *Factory Fault* are not valid SOC numbers), then the PT reverts back to *Absorb Done Time*.

- **06C Max Charge Rate** – This setting is the maximum current allowed to charge the batteries during Bulk, Absorption, Float and Equalize charging, and is provided to limit the charge current to the battery bank to prevent battery overheating caused by charging at too high a charge rate. A 100% setting uses the maximum charging capability of the PT controller to charge the batteries if needed, while a 0% setting minimizes the charging current. The *Max Charge Rate* setting is provided as a percentage of the PT controller's maximum charging capability (100%=100 amps). See the example below for information on how to determine your inverter's *Max Charge Rate* setting.

Default setting: 100%

Range: 0-100%

Example: The maximum charge rate of the PT-100 controller is 100 amps and you need to limit the charge rate to 60 amps. Choose a *Max Charge Rate* = 60% (i.e., 60 amps = 60% of 100 amps).

How do I determine where to set my Maximum Charge Rate? Generally, set to a C/5* rate (C = the total AH capacity of the battery bank—using the 20-hour AH rate). The C/5 rate is usually used when the objective is to quickly charge the batteries (i.e., 400 AH ÷ 5 = 80 amp max charge rate). A lower rate such as C/20* is used when the batteries need to be slowly charged.

* C/5 or C/20 rate – charge rates are commonly expressed as a ratio of the total amp-hour (AH) capacity of the battery bank. For example, with a 400 AH battery bank (C = 400), the C/5 charge rate is 80 A (400/5 = 80 A).



CAUTION: The C/5 or C/20 charge rate settings are general guidelines on how to set your battery charge rate. For specific charge rate requirements, refer to your battery manufacturer.



CAUTION: If multiple controllers are used on a single battery bank, ensure that the total charge rate from all controllers is limited to the maximum charge rate needed for your battery bank. The *Max Charge Rate* setting only limits the charging on each controller individually, not on all controllers.

Using a PT Controller: Setup

- **06D Max Charge Time** – This setting is a safety feature that ensures abnormal conditions will not cause the controller to hold batteries at a high voltage for a prolonged period of time. This menu sets a maximum time the controller is allowed to operate in either the Bulk, Absorption, or Equalization charge modes. If the controller reaches the maximum charge time setting, it will transition to the Float charge stage. The "OFF" selection can be used if there is an application where 25.5 hrs is not long enough.

Default setting: 12.0 Hrs

Range: OFF, 0.1-25.5 Hrs



CAUTION: If using "OFF", the batteries can be held at a high voltage for an extended time. Monitor the batteries to ensure they are not overcharged.



Info: If the time the charger has been in Bulk, Absorption, or EQ charge modes exceeds the *Max Charge Time* setting, the "PT Max Charge Time" scrolls across the LCD display.

Where should I set my Max Charge Time? To ensure a complete charge cycle is accomplished, adjust the *Max Charge Time* setting to a time period that will normally be longer than the settings in the following SETUP menu items: *06B Absorb Done Time/Amps/SOC*. The *Max Charge Time* setting has priority over these menus and will stop the charge cycle once that setting is satisfied.

Example: *Max Charge Time* set at 6 hours, but the *Absorb Done Time* is set at 8 hours. After 6 hours in the Absorption charge cycle, the charger then transitions to the Final Charge stage.

- **06E Bulk Start** – The settings available from this menu allow the PT controller to automatically start a Bulk charge cycle based on different conditions (i.e., daily at sunup, battery voltage, or battery SOC). One, two, or all three of these conditions can be enabled to determine when a Bulk charge cycle begins.

◆ **Daily/SunUp** – This menu provides the option to set the PT controller to start the Bulk charge cycle each new day at sun-up.

Note: A "new day" is defined as: for a networked PT = after midnight, for a standalone PT = two hours of no sun.

Note: If the Daily/SunUp bulk start condition is set to No (disabled), on a new day the PT controller stays in the same charge mode as the previous day.

Default setting: YES

Range: YES, NO

◆ **Volts** – This menu provides the option to set a DC voltage level that will start the Bulk charge cycle when the battery voltage decreases to or below this setting continuously for at least one minute. This one minute delay time is to prevent a Bulk charge cycle when a heavy load causes the battery to momentarily dip.

Default setting: 12.0 VDC (12v), 24.0 (24v), 48.0 VDC (48v)

Range: OFF, 9.0-16.0 VDC (12v), 18.0-32.0 VDC (24v), 36.0-64.0 VDC (48v)

Note: If "CC/CV Controlled" displays on this menu's screen, you will not be able to adjust the settings as "CC/CV" has been selected as the battery type from the 06A Battery Type menu.

Where should I set Bulk Start – Volts? The Bulk Start voltage must be high enough to not over-discharge the battery, but low enough to keep from starting the Bulk charge unnecessarily. Typically, battery voltage SOC charts show approximately 12.2 VDC (for a 12-volt system) to be approximately 50% of the battery capacity. However, these charts show the battery at "rest", meaning it has no load connected and has been at rest for a minimum of 30 minutes. While this voltage is accurate under these at rest conditions, this same voltage with a load applied means the battery is well above 50% SOC. Normally, the battery is loaded (inverter connected or DC loads), so the voltage used to determine 50% battery capacity should be set much lower than what is shown on typical battery voltage charts. A typical bulk start voltage setting would be between 11.0 VDC - 11.5 VDC (for a 12-volt system).



Info: The Bulk Start – Volts feature uses the DC voltage displayed from the *METER: 07C Bat Volts-PT* menu to determine when to start another Bulk cycle.

◇ **SOC** – This menu requires the ME-BMK to be installed and sets the battery’s SOC level to start the Bulk charge cycle. The SOC value is provided from the attached battery monitor and is shown on the *METER: 05B Battery SOC* menu display. The SOC level is considered the best overall method for determining when to start another Bulk charge cycle. Since the ME-BMK already uses voltage, time, and current to determine the true SOC of the batteries, there is little guesswork or calculating needed to determine what settings to use.

Default setting: 80%

Range: OFF, 50-99%

Note: If “CC/CV Controlled” displays on this menu’s screen, you will not be able to adjust the settings as “CC/CV” has been selected as the battery type from the 06A Battery Type menu.



Info: The *METER: 05B Battery SOC* menu’s meter must have a valid SOC number for the Bulk Start – SOC feature to determine when to start the Bulk charge cycle based on the battery SOC. Under the *METER: 05B Battery SOC* menu, Think’n, No Comm, or any BMK fault (i.e., Factory Fault, Power-up Fault, or Unknown Fault ##) are not valid SOC numbers.

Where should I set Bulk Start – SOC? Most battery manufacturers recommend that a deep-cycle battery should not be discharged below 50% SOC. Set the *Bulk Start – SOC* level to 50%, or if you do not want to discharge the batteries quite as much, set it to 60% SOC.

- **06F PT Aux Relay** – The Aux Relay in the PT controller becomes a battery voltage-controlled relay when VDC is selected from the *CTRL: 04B PT Aux Relay* menu. It can be programmed to engage or disengage on DC volts with an adjustable delay using the following settings.



Info: This Aux Relay has three contacts, N.O. (Normally Open), COM (COMmon), and N.C. (Normally Closed). This means this relay has two sides; COM to N.O. is one side, and COM to N.C. is the other side. Having two sides means either side can be open or closed at any time, so using the terms “open” or “close” doesn’t appropriately describe the relay status.

When describing this relay’s contact status or operation, the terms “engage” (or “engaged”) and “disengage” (or “disengaged”) are used. When the PT controller energizes the Aux Relay to engage, the COM to N.O. contact closes, and the COM to N.C. contact opens. When the Aux Relay is no longer energized, the Aux Relay disengages, the COM to N.O. contact opens, and the COM to N.C. contact closes.

◇ **Relay Engage Volts** – This setting is the battery voltage trip point at which the *Relay Engage Delay* time begins. Once the battery voltage has reached this setting continuously for the duration of the *Relay Engage Delay* setting, the Aux Relay contacts will engage (N.O. to COM closed, N.C. to COM opened). This setting can be below or above the *Relay Disengage Volts* setting, depending on if you want the Aux Relay to work as active low or active high.

Default setting: 10.0 VDC (12V), 20.0 VDC (24V), 40.0 VDC (48V)

Range: 8.0-16.6 (12V), 16.0-33.2 (24V), 32.0-66.4 (48V)

◇ **Relay Engage Delay** – This setting determines how long the *Relay Engage Volts* parameter must be continuously maintained before the Aux Relay engages. Use this setting to delay the time that the Aux Relay engages once the battery voltage trip point has been reached—so the Aux Relay does not cycle unnecessarily.

Default setting: 10 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

◇ **Relay Disengage Volts** – This setting is the battery voltage trip point at which the *Relay Disengage Delay* time begins. Once the battery voltage has reached this setting continuously for the duration of the *Relay Disengage Delay* setting, the Aux Relay contacts disengage (N.O. to COM opened, N.C. to COM closed). This setting can be below or above the *Relay Engage Volts* setting, depending on if you want the Aux Relay to work as active low or active high.

Default setting: 14.0 VDC (12V), 28.0 VDC (24V), 56.0 VDC (48V)

Range: 8.0-16.6 (12V), 16.0-33.2 (24V), 32.0-66.4 (48V)

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◇ **Relay Disengage Delay** – This setting determines how long the *Relay Disengage Volts* parameter must be continuously maintained before the Aux Relay disengages. Use this setting to delay the time that the Aux Relay disengages once the battery voltage trip point has been reached—so the Aux Relay does not cycle unnecessarily.

Default setting: 10 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 sec, then 1-min increments)

- **06G PT Alarm** – The alarm in the PT controller can be programmed to be a high or low battery voltage alarm when VDC is selected from the *CTRL: 04C PT Alarm Control* menu. Use the following settings to adjust the battery voltage levels (with an adjustable delay) that determine when the alarm turns on and off.

◇ **Set Alarm ON Volts** – This setting is the battery voltage trip point at which the *Alarm ON Delay* time begins. Once the battery voltage has reached this setting continuously for the duration of the *Alarm ON Delay* setting, the alarm will turn on. This setting can be below or above the *Alarm OFF Volts* setting, depending on if you want the alarm to work as active low or active high.

Default setting: 10.0 VDC (12V), 20.0 VDC (24V), 40.0 VDC (48V)

Range: 8.0-16.6 (12V), 16.0-33.2 (24V), 32.0-66.4 (48V)

◇ **Set Alarm ON Delay** – This setting determines how long the *Alarm ON Volts* parameter must be continuously maintained before the alarm turns on. Use this setting to delay the time that the alarm turns on once the battery voltage trip point has been reached—so the alarm does not turn on unnecessarily.

Default setting: 10 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 secs, then 1-min increments)

◇ **Set Alarm OFF Volts** – This setting is the battery voltage trip point at which the *Alarm OFF Delay* time begins. Once the battery voltage has reached this setting continuously for the duration of the *Alarm OFF Delay* setting, the alarm will turn off. This setting can be below or above the *Alarm ON Volts* setting, depending on if you want the alarm to work as active low or active high.

Default setting: 14.0 VDC (12V), 28.0 VDC (24V), 56.0 VDC (48V)

Range: 8.0-16.6 (12V), 16.0-33.2 (24V), 32.0-66.4 (48V)

◇ **Set Alarm OFF Delay** – This setting determines how long the *Alarm OFF Volts* parameter must be continuously maintained before the alarm turns off. Use this setting to delay the time that the alarm turns off once the battery voltage trip point has been reached—so the alarm does not turn off unnecessarily.

Default setting: 10 Sec

Range: 0-127 Sec, 1-127 Min (1-sec increments up to 127 secs, then 1-min increments)

- **06H PowerSave PT Display** – The PowerSave feature is provided to conserve energy by turning off any indicator that is not needed. While the PT controller is in the PowerSave mode, the period (or decimal) of each LED segment (3 periods total) comes on one at a time (from left to right, then right to left). The rest of the PT display and its four relevant LED indicators are off to conserve energy. During the day—while charging—the charger status LED will still be on during PowerSave; at nighttime—since there is no charging—the charger status LEDs will be off.

The controller goes into PowerSave mode if there hasn't been a button press or fault message for a set period of time, depending on the setting (15 Min is the default setting). Whenever the controller goes into PowerSave mode, the display and its relevant LEDs can be reactivated by pressing any pushbutton.

If the AUX relay is energized, the AUX LED will remain on during PowerSave mode. If there is a fault during PowerSave, the display and Fault LED will come on and stay on as long as a fault is active.

Default setting: 15 Min

Range: OFF, 1-60 Min (1-min increments)

10.2 Operating/Monitoring the PT Controller using the ME-ARC

This section provides the PT menus under the ME-ARC's CTRL and METER buttons that determine how to control and operate the charge controller.

10.2.1 Operating the PT Charge Controller

The charge mode is automatically activated and begins when acceptable PV power is connected to the PV input of the controller. When the controller is actively charging, the display may show: *Bulk Charging, Absorb Charging, Float Charging, or Equalizing.*

CTRL: 04A PT CHG Ctrl

Generally, the *PT CHG Ctrl* menu is left in the *Multi-Stage* selection. To change this selection, press the CTRL button and rotate the SELECT knob to the *04 PT Control* menu, and then press the SELECT knob to enter this menu.

Default setting: *Multi-Stage*

Range: *Multi-Stage, Charger Off, Start Float, Start Bulk, Start EQ (5sec)*

- **Multi-Stage** – This charge profile causes the charger to automatically operate through the multi-stage (Bulk, Absorption, and Float) charge cycles. When PV is connected and charge mode begins¹, the battery voltage is monitored to determine the charging stage. If the battery voltage is low, the charger begins Bulk charging. If the DC voltage is high, the charger skips the Bulk and Absorb charge stages and goes directly to the Float charge stage.



Info: Unlike the inverter/charger, the PT controller's multi-stage charge profile does not go silent. Once the Bulk and Absorption charge stages are complete, the controller enters the Float charge stage (or, the Constant Current and Constant Voltage modes if battery type CC/CV is selected).

Note¹ – *When the charge mode begins, if the 06A Battery Type selection is CC/CV the charger enters Constant Current mode.*

- **Charger Off** – The *Charger Off* selection stops the controller from charging. Even if PV is available on the PV input, the controller is not allowed to charge. To resume charging, select a setting other than "*Charger Off*".
- **Start Float** – This selection restarts the Float charge cycle from any stage in the charge cycle as long as the controller is actively charging.



Info: The *Start Float* selection automatically returns to the *Multi-Stage* setting once the PT controller status displays as "*Float Charging*" on the ARC remote.



Info: If battery type CC/CV is chosen, the *Start Float* selection transfers the charger to Silent mode (remote displays "*Float Charging*")—unless "*Hold CV Chg Volts*" is selected—then, the charger enters Constant Current charge mode (displays "*Bulk Charging*").

- **Start Bulk** – This selection restarts the Bulk charge cycle from any stage in the charge cycle as long as the controller is actively charging. The *Start Bulk* setting is useful when an additional charge cycle is required to bring the specific gravity of the batteries to the proper level.



Info: The *Start Bulk* selection automatically returns to *Multi-Stage* once the PT's status displays "*Bulk Charging*".



Info: If battery type CC/CV is chosen, the *Start Bulk* selection transfers the charger to Constant Current mode.



Info: If you have to continually restart the bulk cycle in order to fully charge the batteries, check the charge settings from the *SETUP: 06 PT Setup* menu to ensure the batteries are fully charged at the end of a regular multi-stage charge cycle.



CAUTION: Frequently restarting the Bulk charge cycle may result in overcharging of the batteries.

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- **Start EQ (5sec)** – This selection starts the Equalize charge cycle from any stage in the charge cycle as long as the controller is actively charging. To enable the EQ charge cycle, press the SELECT knob for 5 seconds at the “Start EQ (5sec)” display to start a 5-second countdown timer. Once the countdown has finished, the Equalize charge cycle starts and the lower line on the display shows “EQ STARTED”. After the Equalize charge cycle has started, it will automatically stop after 4 hours; unless “Custom” is selected from the *SETUP: 06A Battery Type* menu. In this case, the Equalize charge continues for the duration of the *Set EQ Done Time* setting (default of 4.0 hours). The Equalize charge cycle can also be manually stopped by using the *CTRL: 04 PT Control* menu to allow you to choose a different selection.



Info: If the EQ charging time exceeds the *Max Charge Time* setting, “PT Max Charge Time” scrolls across the LCD display.



WARNING: Do not perform an Equalization charge without reading and following all safety precautions pertaining to charging/equalization per the battery manufacturer, the inverter owner’s manual, and as noted in Section 5.3.2 in this manual.

CTRL: 04B PT Aux Relay Ctrl

This menu allows the Aux Relay in the PT controller to be programmed to automatically engage or disengage based on battery voltage, or used to indicate a PT controller fault has occurred. This menu also allows the Aux Relay to be manually engaged or disengaged. View the Aux Relay status from the *METER: 07A PT Status/Relay Status* menu.

Default setting: DISENGAGE

Range: DISENGAGE, VDC, FAULT, ENGAGE



Info: When the relay is engaged, the AUX LED on the PT controller display is on (yellow). When the relay is no longer engaged (disengaged), the LED is off.

- **DISENGAGE** – Manually forces the Aux Relay contacts to stay disengaged. When the Aux Relay is disengaged, the COM to N.O. contact is open, and the COM to N.C. contact is closed. This setting can be used to manually control the device connected to the Aux Relay, or can be used to test the Aux Relay’s operation.
- **ENGAGE** – Manually forces the Aux Relay contacts to stay engaged. When the Aux Relay is engaged, the COM to N.O. contact is closed, and the COM to N.C. contact is open. This setting can be used to manually control a device connected to the Aux Relay, or can be used to test the Aux Relay’s operation. This setting also allows the Aux Relay to stay energized until the *06F PT Aux Relay/Relay Disengage Volts* setting is reached. Normally, under the *VDC* setting, the Aux Relay is disengaged until the *Relay Engage Volts* setting is reached. However, if *ENGAGE* is selected first, and then *VDC*—if the battery voltage is between the engage and disengaged volt settings after *VDC* is selected—the relay will stay engaged until the *Relay Disengage Volts* setting (and any delay time) is reached.



Info: When the *DISENGAGE* and *ENGAGE* options are selected, the Aux Relay will activate without any time delay.

- **VDC** – Automatically activates the Aux Relay based on adjustable DC voltage settings from the *SETUP: 06F PT Aux Relay* menu. The relay uses the *Relay Engage Volts* and *Relay Disengage Volts* settings to activate based on a low or high DC voltage, and allows the relay to be configured to activate either as an “active high” or “active low” type relay. This relay also uses the *Relay Engage Delay* and *Relay Disengage Delay* settings to automatically control the Aux Relays engage and disengage delay times (refer also to the *SETUP: 06F PT Aux Relay* menu on page 106 for more information on these settings).
- **FAULT** – This setting causes the Aux Relay to stay disengaged during normal operation, but engages when a PT controller fault is detected (see Section 5.3.4 “Fault Mode Messages” for a list of PT controller faults).

Note: The Aux Relay automatically disengages when the PT fault is cleared.

CTRL: 04C PT Alarm Control

The alarm inside the PT controller can be programmed to turn on and off based on the battery voltage, or turn on if a PT controller fault has occurred.

Default setting: OFF

Range: OFF, VDC, FAULT, ON



Info: The alarm buzzer is located inside the controller and its sound level may be low. If a louder sounding alarm is required, connect an external alarm to the Aux Relay.



Info: When the *ON*, *OFF*, and *FAULT* settings are selected, the alarm turns on/off without any time delay. The VDC setting has adjustable on and off delay settings.

- **OFF** – Manually forces the alarm to stay off.
- **ON** – Manually forces the alarm to stay on. This setting can also be used to test the alarm's sound and operation.
- **VDC** – Automatically sounds the alarm based on adjustable DC voltage settings from the *SETUP: 06G PT Alarm* menu. The alarm uses the *Alarm ON Volts* and *Alarm OFF Volts* settings to activate based on low or high battery voltage, and allows the alarm to be configured to activate either as an "active high" or "active low" type alarm. This alarm also uses the *Alarm ON Delay* and *Alarm OFF Delay* settings to control the PT alarm's delay times (refer to the *SETUP: 06F PT Aux Relay* menu on page 106 for more information).
- **FAULT** – This setting causes the alarm to stay off during normal operation, but sounds when a PT controller fault is detected (see Section 5.3.4 "Fault Mode Messages" for a list of PT controller faults).

Note: *The Aux Relay automatically disengages when the PT fault is cleared.*

CTRL: 04D PT MPPT Ctrl

To maximize energy harvest under partially shaded conditions, the PT controller performs an initial sweep of the entire power-voltage characteristic of the array. It does this to ensure the approximated Maximum Power Point (MPP) is detected under partially shaded conditions. After this initial sweep occurs, the sweep frequency (or how often the sweep occurs) can be changed in an attempt to match the environmental conditions—using the following settings.

Default setting: 15 Min Sweep

Range: 5 Min Sweep, 15 Min Sweep, 1 Hour Sweep, Fixed Sweep



Info: Unless there is an unusual environmental event that can change the MMP quickly, such as fast moving clouds, then it is highly suggested that you not change the default setting (15 Min Sweep).

- **5 Min Sweep¹** – After the initial sweep, performs a full sweep every 5 minutes.
- **15 Min Sweep¹** – After the initial sweep, performs a full sweep every 15 minutes.
- **1 Hour Sweep¹** – After the initial sweep, performs a full sweep every 60 minutes.
- **Fixed Sweep** – With this setting, there is no full sweep. At sunrise, the sweep begins and holds at the first peak and then increments around this point until sunset.



Info: The *Fixed Sweep* setting is advantageous if used in areas with normally clear skies and no obstructions on or around the array. However, if there are multiple peaks as the result of partial shading, the controller may not be fixated on the maximum power point.

Note¹ – *In each of these time sweeps, the PT controller continually increments to find the MPP.*

Using a PT Controller: Operation/Monitoring

10.2.2 Monitoring the PT Charge Controller

The ME-ARC remote's METER button has additional menus that are helpful for the proper operation and monitoring of your PT controller system.

10.2.2.1 ME-ARC Remote's PT Controller METER Menus

Press the ME-ARC remote's METER button, rotate the SELECT knob to the *07 PT Meters* menu, and then press the SELECT knob to access the *07 PT Meter* read-only menus. Rotate the SELECT knob to view the various PT meters.

METER: 07A PT Status

This read-only menu allows you to scroll through three separate screens to display: the PT's charging status/fault, the Power status, and finally the Relay status.



Info: This menu is used to determine if the PT controller is working correctly and for troubleshooting. For any fault mode displayed in the status menu, refer to Section 10.3.2.

There are 24 different status/fault messages that can display to identify what state the PT is currently in—only one displays at a time (refer also to Figure 10-5, and Tables 10-2 and 10-4).

PT Charging Status:

- Absorb Charging
- Bulk Charging
- Equalizing
- Float Charging
- Sleeping
- UnknownStatus ##

PT Faults:

- ARC Fault-PT
- BTS Open-PT
- BTS Shorted-PT
- FET Overtemp-PT
- Ground Fault-PT
- HiBatt Temp-PT
- High Bat VDC-PT
- High PV VDC-PT
- Ind Overtemp-PT
- Int Hardware-PT
- Int NTC-PT
- Int Overload-PT
- Int Phase-PT
- Int Power-PT
- Int Pwr Sup-PT
- No PV Input-PT
- Unknown Fault ##

There are eight different PT Power statuses and two PT Relay statuses that can display (refer also to Figure 10-5, and Tables 10-3 and 10-5).

PT Power Status:

- Limit: Above VDC
- Limit: Int Hz
- Limit: Int Temp
- MPPT On
- No Power Out
- Regulating: Amps
- Regulating: VDC
- Unknown Power ##

PT Relay Status:

- Disengage
- Engage

METER: 07B PV Volts-PT

This read-only menu displays the input voltage from the PV array.

METER: 07C Bat Volts-PT

This read-only menu displays the voltage to the controller's battery voltage terminals.

Note: *Normally, this voltage is the same as the battery bank voltage as long as there is no voltage loss in the cables.*

METER: 07D Target Volts

When charging, this read-only menu displays the voltage regulation set-point after it has been compensated based on the battery temperature sensor (BTS) reading shown. The PT controller uses the temperature around the BTS to determine how much the voltage should decrease or increase from the actual voltage regulation setting (i.e., *Absorb Volts*, *Float Volts*, or *EQ Volts* settings). The temperature compensated voltage regulation set-point will be lower than the actual setting if the temperature shown is greater than 25°C (77°F), and will be higher than the actual setting if the temperature shown is lower than 25°C (77°F). This may give the appearance that the batteries are being overcharged when cold and undercharged when hot. However, this voltage change improves the performance of the batteries in cold weather and reduces gassing in hot weather.

Note: The PT controller temperature compensates the battery charging voltage (i.e., target voltage) down to -20°C (-4°F), but the BTS temperature value displayed on this meter has a low range of 0°C (32°F). Therefore, if the actual BTS temperature is 0°C (32°F) or lower, the temperature displayed is held at the low range of 0°C (32°F), but the target voltage displayed on the 07D Target Volts meter will be correct.

Also, the BTS temperature value displayed on this meter is 152°C (305°F) if no BTS is detected, and 151°C (304°F) if a shorted BTS is detected; in either of these situations (open or shorted BTS), no temperature compensation is applied to the battery charging voltage.

Note: If using SETUP: 06A Battery Type: CC/CV, and CV Chg Done Time (or Amps) is selected, once the charger finishes the Constant Voltage (CV) charge, the charger goes silent (i.e., not actively charging). After the PT controller goes silent, this menu displays a voltage regulation set-point that is just above the inverter's LBCO level. This voltage regulation set-point allows the PT controller to use as much PV current as possible to ensure the battery voltage—at the inverter's terminals—stays above the inverter's LBCO set-point to prevent the inverter from shutting down.



Info: The battery temperature reading is from the BTS connected to the networked Magnum inverter. However, if a BTS is not connected to the inverter, then this display uses the temperature readings from the BTS that is connected to the PT controller.

METER: 07E Bat Amps-PT

This read-only menu displays the real-time current out of the PT controller to the battery.

METER: 07F Power to Bat

This read-only menu displays three separate menus to show power out of the PT controller:

- **Now:** This display shows the power out of the PT controller occurring now (in Watts).
- **Life:** This display shows the total power out of the controller since it was installed (shown in Megawatt-hours or MWh). To reset this display, access the *Reset* menu, then press and hold the SELECT knob for approximately 5 seconds. Once the *Reset* meter is cleared, return to the *Life* menu, and then press and hold the SELECT knob approximately 10 seconds to clear the *Life* meter. This meter value has a maximum range of 655.36 MWh (.01 MWh resolution).



Info: The *Life* menu may be reset if the PT controller changes ownership, or if the user purchases a new array and wants to only monitor lifetime power out of the PT controller to the new array.

- **Reset:** This display shows the total power out of the controller since the last time it was reset (shown in Kilowatt-hours or KWH). To reset this display, press and hold the SELECT knob for 5 seconds. This meter value has a maximum range of 6553.6 KWH (0.1 KWH resolution).

METER: 07G Ground Fault

This read-only menu displays the real-time measurement of the controller's ground fault current.

Note: This meter can be monitored to give an indication of developing ground faults.

METER: 07H PT Data

This menu enables you to access the PT Data matrix (see Figure 10-6). The PT Data feature uses the ME-ARC's internal clock to capture daily PT data events (see the list of data events on the next page). Each separate data capture includes PT data from a designated time period (12:00AM-11:59PM each day). The PT data summary for each time period is displayed in reverse chronological order (i.e., first today's data, then yesterday's data, and so on up to 255 days prior to today). Figure 10-6 also provides an example of how to navigate the PT Data matrix.

Note: If there is no PT data, then "No Data Recorded" displays on the ME-ARC when you select this menu. PT data is continually updated for the current day (i.e., Today's data).



Info: Press and hold the SELECT knob for 3 seconds to return to the 07H PT Data main menu from any screen within the PT Data matrix.

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Info: The ME-ARC's time clock is a critical piece in accurately capturing that day's PT data. Refer to the *SETUP: 01 System Setup/01A Set Clock* menu in Section 3.2.4 for information on setting the ARC's time clock.

Note: *The ME-ARC obtains power from the inverter. If the ME-ARC is disconnected from the inverter, the ME-ARC's time clock will reset.*

- **Harvest Total** – Displays the total amount of energy in kilowatt hours (shown as KWH) delivered to the batteries. The maximum range is 25.5 KWH (0.1 KWH resolution).
- **Max PV** – Displays the highest voltage received from the PV array and the time of day that it occurred (to nearest 6-minute increment). The voltage shown on the display is averaged each second, and this allows you to check your PV charging system to ensure the PV voltage does not normally exceed the Upper V_{MP} level.
- **Max Bat** – Displays the highest battery voltage since the last reset and the time of day that it occurred (to nearest 6-minute increment). The voltage shown on the display is averaged each second, and is helpful for troubleshooting or detecting an over-charge condition.
- **Min Bat** – Displays the lowest battery voltage since the last reset and the time of day that it occurred (to nearest 6-minute increment). The voltage shown on the display is averaged each second, and is helpful for troubleshooting or detecting an over-discharge condition.
- **On/Work Time** – Displays the number of hours of active production by the PV array (to nearest 6-minute increment).
- **AH to Batt** – Displays the total amp-hours (AH) delivered from the PT array to the DC system. This display can be used as a battery load indicator to help identify and monitor the battery load consumption. The maximum range is 2,550.0 AH (10.0 AH resolution).
- **Max Pwr** – Displays the maximum power output from the PV array in kilowatts (shown as KW) and the time of day it occurred (to nearest 6-minute increment). The max range is 25.5 KW (.1 KW or 100W resolution).

METER: 07I Clear PT Data History

This read-only menu enables you to delete the PT's data history displayed in the *METER: 07H PT Data* menu's PT Data matrix. Press and hold the SELECT knob for 5 seconds until "HISTORY CLEARED" displays. **Note:** *This only clears all previous days' PT data, not today's PT data.*

METER: 07J PT Version

This read-only menu displays the current software version of the connected PT charge controller. If "0.0" displays, the PT controller might not be correctly connected.

10.2.2.2 ME-ARC Remote's PT-specific TECH Menus

Press the ME-ARC's TECH button, and rotate the SELECT knob to access:

TECH: 01 Temperature (rotate SELECT knob until PT BTS displays)

- **PT BTS** – Displays the temperature of the Battery Temp Sensor (BTS) that is connected to the PT controller. Refer to info on the *METER: 07D Target Volts* menu on page 111.
Note: *Shows 152°C (305°F) if no BTS is detected, and 151°C (304°F) if a shorted BTS is detected. In either situation (open or shorted BTS), there is no temperature compensation applied to the battery charging voltage.*
- **PT FETs** – Displays the temperature of the PT controller's FETs (Field Effect Transistors).
- **PT Inductor** – Displays the temperature of the PT controller's internal inductor.

TECH: 02 Versions (rotate SELECT knob until PT displays)

- **PT: #.#** – Displays the software version of the PT controller connected to the Magnum network (displays "0.0" if the PT controller is not communicating on the network).

TECH: 04 Fault History

Press the SELECT knob, rotate the knob to the *04C PT Faults* menu, and then press the SELECT.

- **04C PT Faults** – This menu displays a history of the last nine PT controller faults. Information for each fault displays from the most recent fault (H1) to the earliest/past recorded faults (H2 up to H9). **Note:** *See Section 3.2.5 for procedures on clearing PT fault history data.*

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First screen – The top line displays the PT fault condition. The bottom line displays the fault history number (ex. H1), day(s) since this fault occurred, and the time that this fault occurred.

Continue to rotate the SELECT knob to display subsequent screens (bottom lines) for this fault.

Second screen – Displays the PT’s operational status at the time of this fault.

Third screen – Displays the PT’s power status at the time of this fault.

Fourth screen – Displays the PT’s relay status at the time of this fault.

Fifth screen – Displays the battery’s voltage and the battery’s amperage at the time of this fault.

Sixth screen – Displays the voltage of the PV array at the time of this fault.

Seventh screen – Displays the temperature of the PT’s BTS at the time of this fault.

Eighth screen – Displays the temperature of the PT’s FETs at the time of this fault.

Ninth screen – Displays the temperature of the PT’s internal inductors at the time of this fault.

Continue to rotate the SELECT knob to display earlier faults (as applicable).

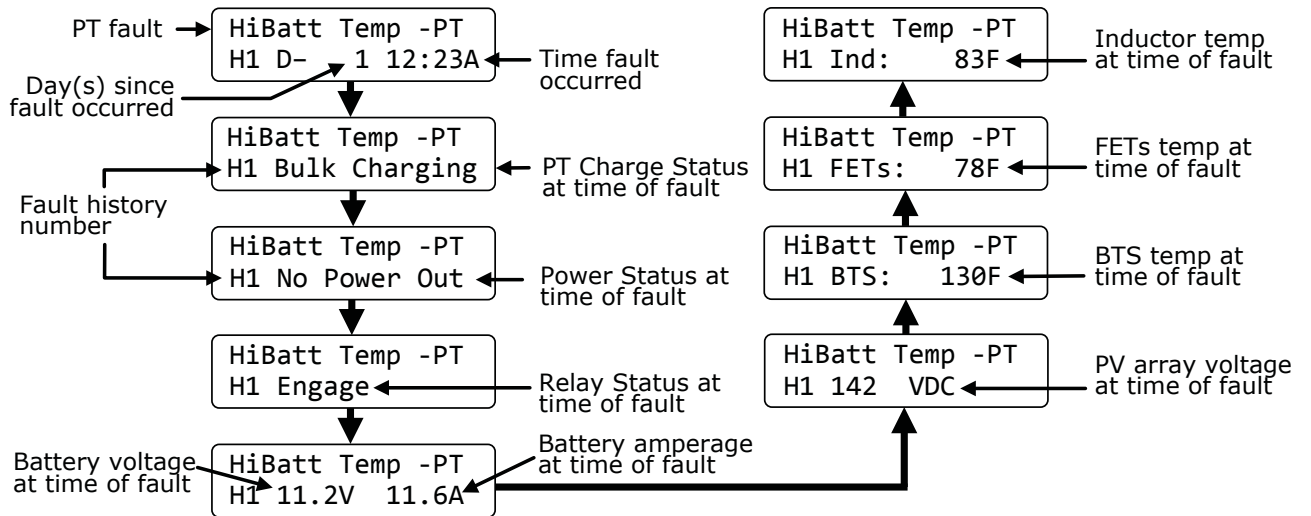


Figure 10-4, PT Fault History Screens

Table 10-1, PT Default Settings on ME-ARC

Menu Items	Default Settings
Battery Type	Flooded
Absorb Done	Time = 2.0 Hrs
Max Charge Rate	100%
Max Charge Time	12.0 Hrs
Bulk Start	Daily/SunUp = YES Volts = 12.0 (12V), 24.0 (24V), 48.0 (48V) SOC = 80%
PT Aux Relay	Engage Volts = 10.0 (12V), 20.0 (24V), 40.0 (48V) Engage Delay = 10 Sec Disengage Volts = 14.0 (12V), 28.0 (24V), 56.0 (48V) Disengage Delay = 10 Sec
PT Alarm	Alarm ON Volts = 10.0 (12V), 20.0 (24V), 40.0 (48V) Alarm ON Delay = 10 Sec Alarm OFF Volts = 14.0 (12V), 28.0 (24V), 56.0 (48V) Alarm OFF Delay = 10 Sec
PowerSave PT Display	15 Min

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10.2.3 PT Charge Controller Menu Maps

Figures 10-2 through 10-5 are a complete overview of the PT settings and information displays available from the ME-ARC remote's CTRL, METER, and SETUP menus.

Note: When applicable, battery voltage defaults and ranges are shown for a 12-volt battery (24-volt systems multiply by 2; 48-volt systems multiply by 4).

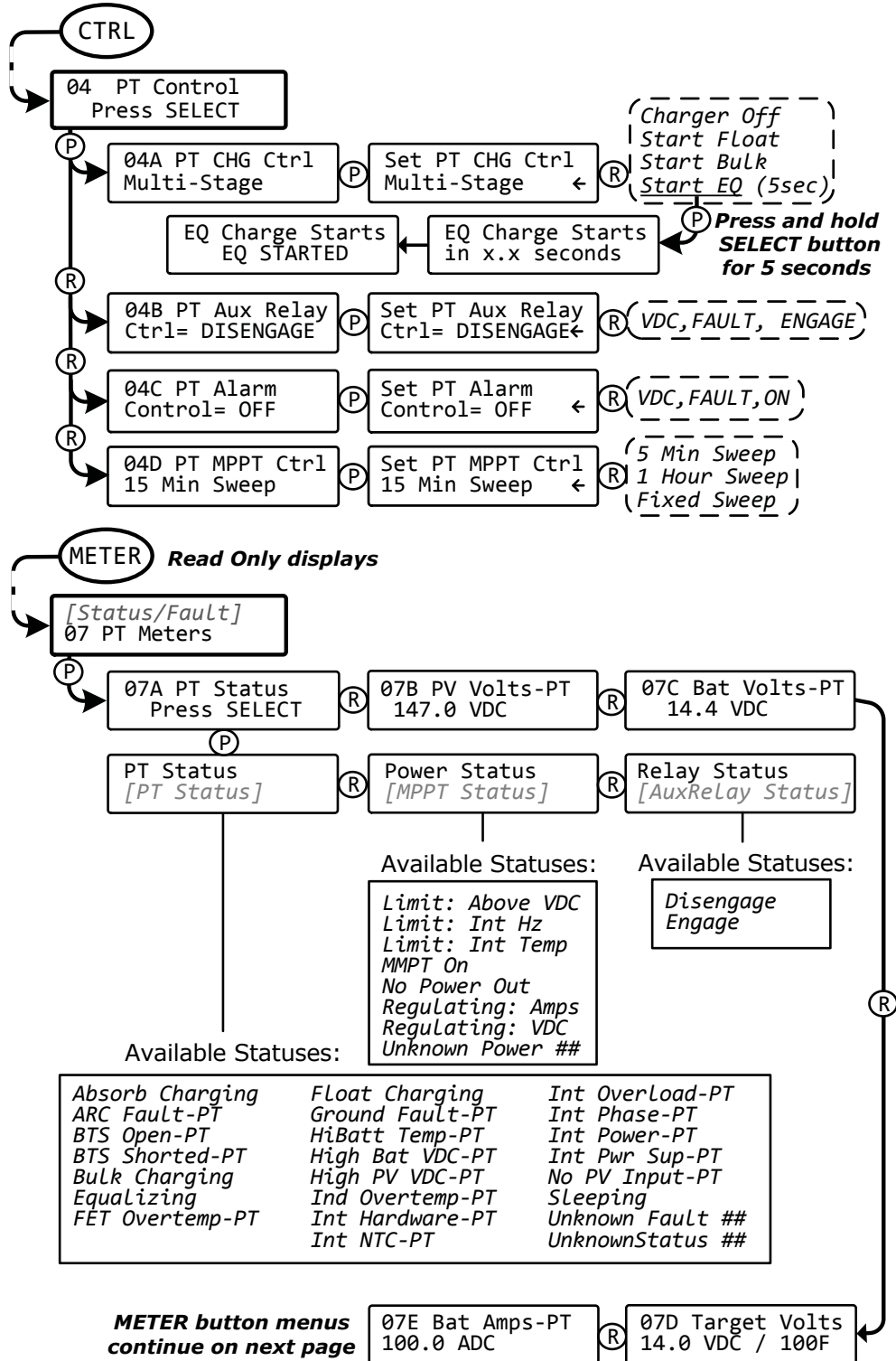


Figure 10-5, PT Charge Controller CTRL/METER Menu Map

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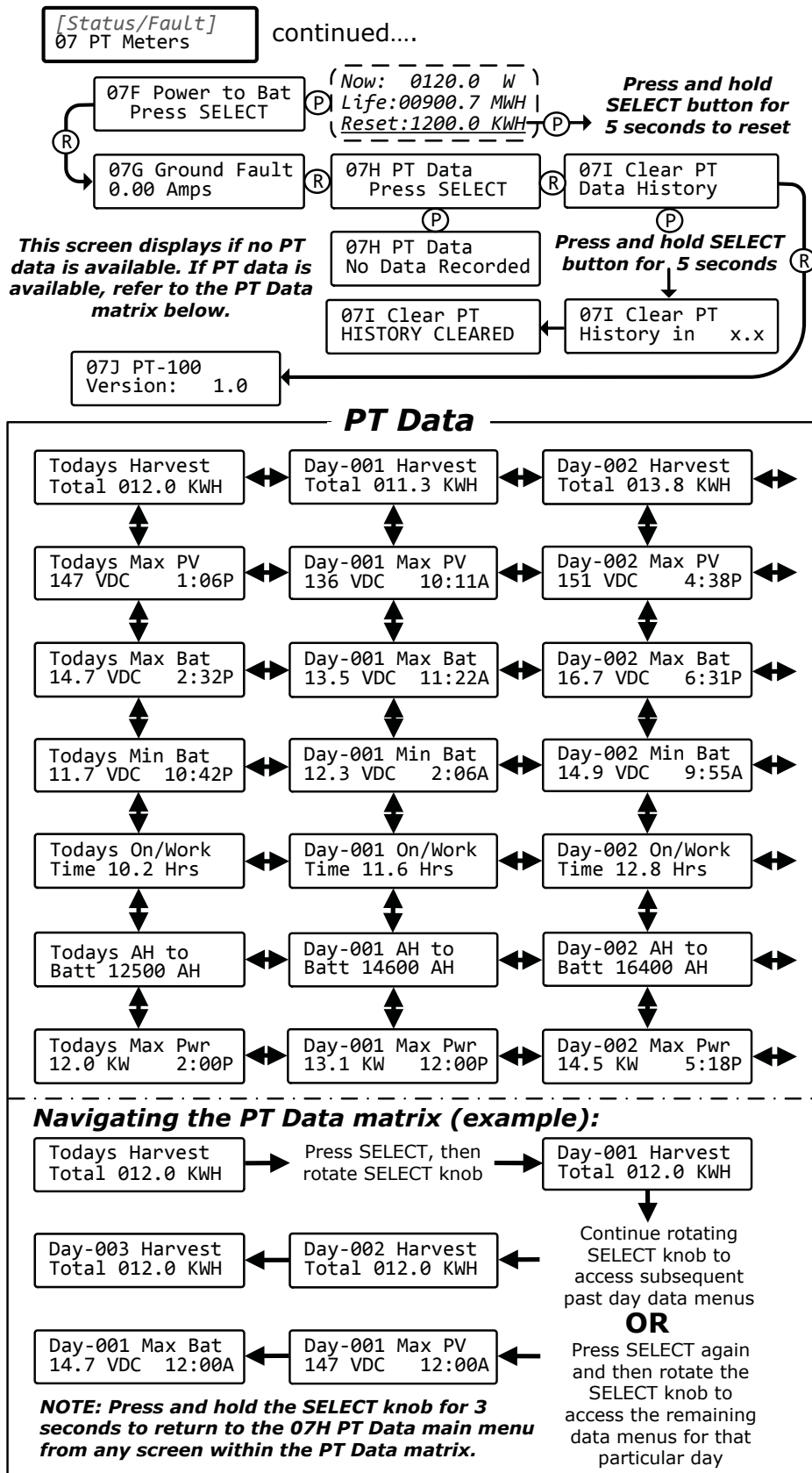


Figure 10-6, PT Charge Controller METER Menu Map

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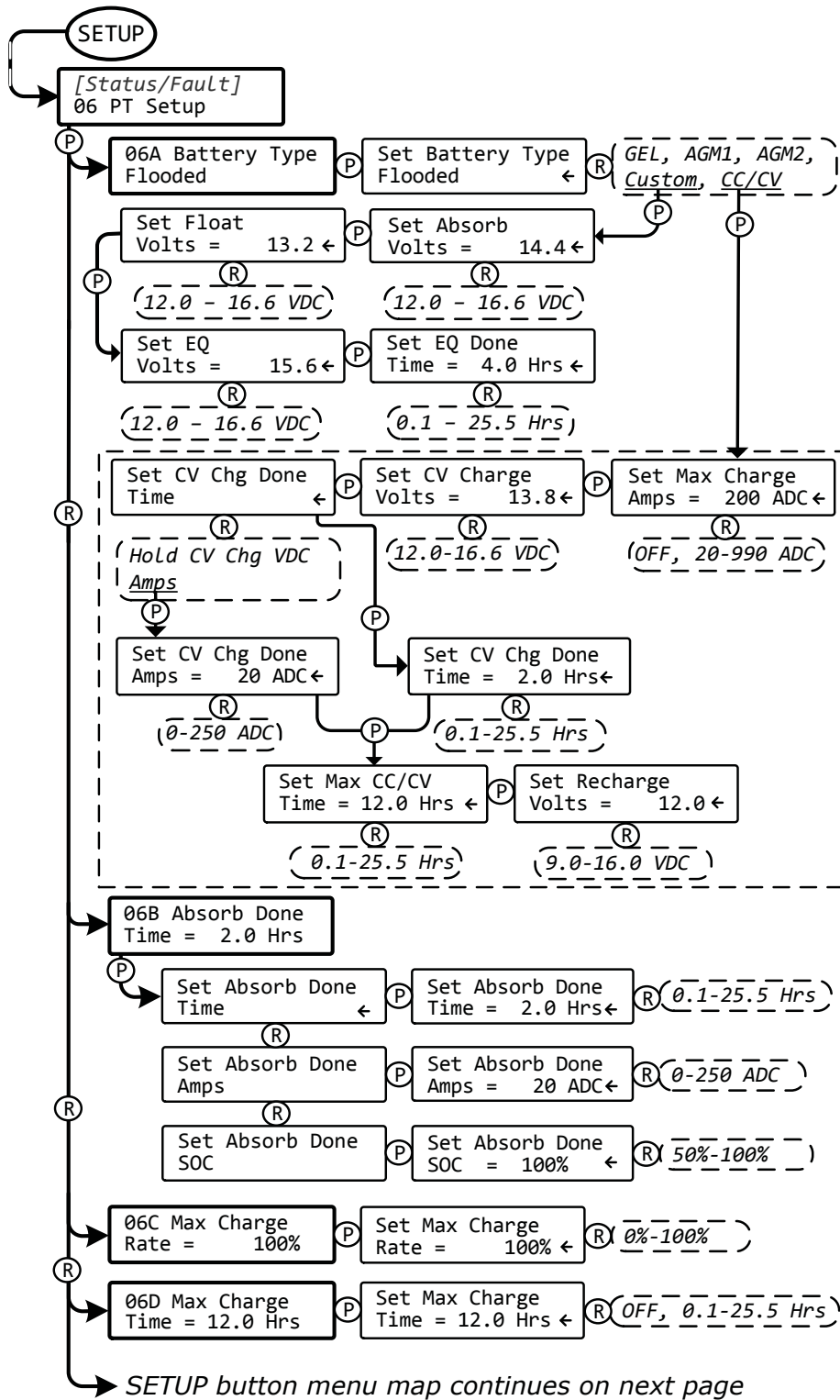


Figure 10-7, PT Charge Controller SETUP Menu Map

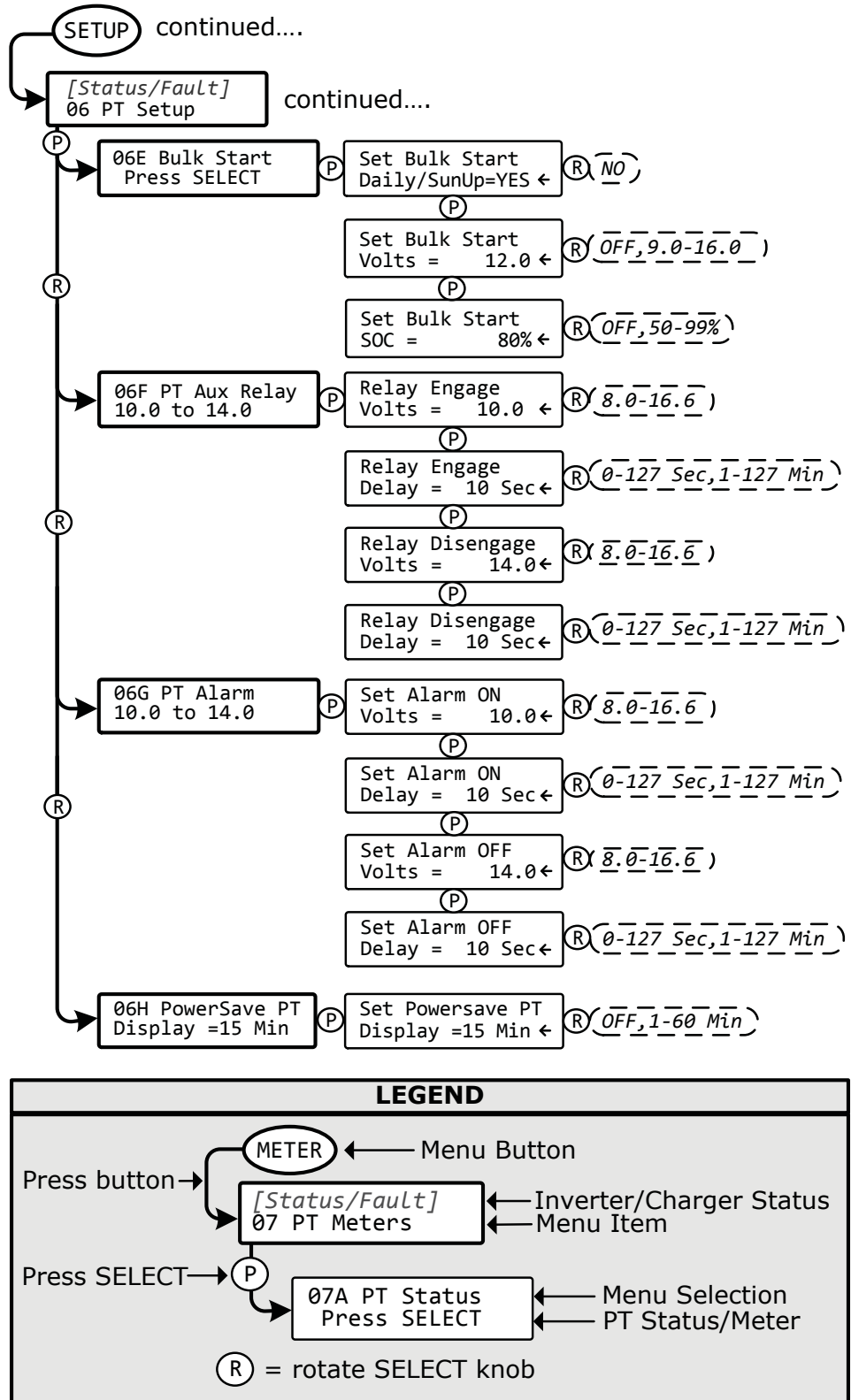


Figure 10-8, PT Charge Controller SETUP Menu Map

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10.2.4 PT Charge Controller Remote Status Messages

A PT status may be an operational, relay, fault, or power status message. The *METER: 07A PT Status* menu displays the PT's current operating status. This menu is important when determining if the PT is working correctly, or for troubleshooting a PT installation.

10.2.4.1 PT Remote Operational Statuses

Refer to Table 10-2 below for a brief description of the possible PT charge controller operational statuses that may display (depending on your remote).

Table 10-2, PT Controller Remote Operational Statuses

Status	Description
Absorb Charging	This charging stage begins after the absorb voltage has been reached. Absorb charging provides the batteries with a constant voltage and reduces the DC charging current to maintain the absorb voltage setting.
Bulk Charging	This is the initial stage of charging. While bulk charging, the charger supplies the battery with controlled constant current. The charger will remain in bulk charge until the absorption charge voltage is achieved.
Equalizing	Battery equalization is in process and the PT controller is trying to maintain the battery at the equalize target voltage.
Float Charging	The third charging stage occurs at the end of the Absorb charge stage. The charge voltage is reduced to the float charge voltage and kept fully charged—unless the battery type is CC/CV. When the battery type is CC/CV the controller stops charging, but is actively monitoring the battery voltage. If the battery voltage drops to the <i>Set Recharge Volts</i> setting, another Constant Current (Bulk)/Constant Voltage (Absorb) charge cycle begins.
Sleeping	The PV controller is not charging the battery because it has either been turned off or has determined that there is no sun. The PT controller can be manually turned off by selecting <i>Charger Off</i> from the <i>04A PT CHG Ctrl</i> menu. No sun is based on low PV voltage and no effective power (i.e., nighttime).
UnknownStatus ##	This status message displays when the inverter/charger has sent a fault code that cannot be determined by the ME-ARC remote.

10.2.4.2 PT Remote Relay Statuses

The following "Relay" statuses indicate whether the Aux Relay is "engaged" or "disengaged".

Table 10-3, PT Remote Relay Statuses

Status	Description
Disengage	This status indicates that the PT controller is no longer energizing the Aux Relay. When the Aux Relay status shows " <i>Disengage</i> ", the COM to N.O. contact is open, and the COM to N.C. contact is closed.
Engage	This status indicates that the PT controller has energized the Aux Relay. When the Aux Relay status shows " <i>Engage</i> ", the COM to N.O. contact is closed, and the COM to N.C. contact is open.



Info: The Aux Relay can be activated manually; or activated automatically based on battery voltage or if a PT controller fault occurs. Refer to the *CTRL: 04B PT Aux Relay Control* menu to see the selection that is used to activate the Aux Relay.

10.2.4.3 PT Remote Fault Statuses

The following "Fault" statuses (Table 10-4) display on the remote to indicate that the PT is not operating as intended. Refer to Section 10.3.2 for help in diagnosing/resolving the problem.

Note: The fault codes (example: "F12") listed below only appear on the PT's LCD display to identify the particular PT fault. These fault codes do not appear on the ME-ARC remote's LCD display.

Table 10-4, PT Remote Fault Statuses

Status	Description
No PV Input-PT (F01)	The PT controller turned off because there has been no source of PV power detected on the PV terminals (i.e., PV+ to PV-) for more than 24 hrs.
Int Pwr Sup-PT (F02)	The PT controller turned off because the voltage from the auxiliary power supply in the controller has dropped to a low level.
High PV VDC-PT (F03)	The PT controller turned off because a very high PV voltage (>187 VDC) has been detected on the PV terminals (i.e., PV+ to PV-).
High Bat VDC-PT (F04)	The PT controller turned off due to instantaneous high voltage (≥ 68 VDC) detected on the battery terminals (i.e., BAT+ to BAT-).
BTS Shorted-PT (F05)	The PT controller continues to run, but a problem with the BTS has been detected (temp sensor has shorted). When this happens, the temp-compensation is fixed at a temperature of 77°F/25°C.
FET Overtemp-PT (F06)	The PT controller turned off because the internal FETs (Field Effect Transistors) have exceeded their safe operating temperature ($\geq 85^{\circ}\text{C}/185^{\circ}\text{F}$).
HiBatt Temp-PT (F07)	The PT controller turned off because the BTS has reached a very high temperature ($\geq 55^{\circ}\text{C}/\geq 131^{\circ}\text{F}$).
Int Overload-PT (F08)	The PT controller turned off because the current to an internal sensor has exceeded the controller's protection limits.
Int Phase-PT (F09)	The PT controller turned off because one of the internal phases is faulty or the phase signals are not in sync with each other.
BTS Open-PT (F10)	The PT controller continues to run, but the BTS has opened or is no longer connected. When this happens, the temp-compensation is fixed at a temperature of 77°F/25°C.
Int Power-PT (F11)	The PT controller turned off because the internal power control circuitry reached its protection limits.
Ground Fault-PT (F12)	The PT controller turned off because the GFP fuse has opened due to a ground-fault condition.
ARC Fault-PT (F13)	The PT controller turned off because a series ARC fault has been detected.
Int NTC-PT (F14)	The PT controller turned off because the internal NTC (Negative Temperature Coefficient) temperature sensor suddenly caused a large, unexpected temperature change.
Int Hardware-PT (F15)	The PT controller turned off because a redundant hardware protection circuit that monitors the internal temperature has exceeded a safe operating limit.
Ind Overtemp-PT (F16)	The PT controller turned off because the charger's inductors have exceeded their safe operating temperature ($\geq 32^{\circ}\text{C}/\geq 270^{\circ}\text{F}$).
Unknown Fault ## (F##)	The PT controller turned off because the PT controller has sent a fault code that cannot be determined by the ME-ARC remote.


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10.2.4.4 PT Remote Power Statuses

The following "Power" statuses show the status of the controller's Power Point Tracking.

Note: The power status codes (example: "P04") listed below only appear on the PT's display to identify the particular PT power status.

Table 10-5, PT Remote Power Statuses

Status	Description
MPPT On (Pon)	Power Maximized (MPPT is On) – The MPPT circuit is delivering the maximum power from the array to the battery.
No Power Out (P00)	No Power Output – The PT controller is turned off, the controller is sleeping (during night-time), or a shutdown fault has occurred.
Regulating: VDC (P01)	Battery Voltage Regulation (Normal Current Regulation) – The PT controller is regulating the current to the batteries to keep them at their target voltage in the Absorb, Float or Equalization stage.
Regulating: Amps (P02)	Battery Current Regulation (Normal Current Regulation) – The PT controller is regulating the current to the battery to ensure the controller's maximum output current is not exceeded.
Limit: Int Temp (P03)	Power Limited (Internal High Temperature) – The temperature inside the PT controller is getting high, so the output current is being limited in an attempt to prevent the controller from shutting down.
Limit: Int Hz (P04)	<p>Power Limited (Internal Frequency) – The controller includes a variable frequency converter—this power status displays if the output current is being dialed back to prevent the frequency from going either too high or too low.</p> <p> Info: If the PV voltage is sized too close to the battery voltage, a <i>Limit: Int Hz</i> power status can occur. If this status occurs often, the array may need to be re-configured to increase the PV voltage.</p>
Limit: Above VDC (P05)	Power Limited (Above Voltage Regulation) – The voltage on the battery bank is above the target voltage set-point. Generally, this is due to an external charger being set to charge at a higher voltage level. The PT controller is limiting the output current in an attempt to prevent the battery voltage from increasing to a voltage level that would trigger a <i>High Battery In</i> (F04) fault.
Unknown Power ## (P##)	This status message (with the hex code number) displays when the ARC remote cannot determine the power status code that was received.

10.3 PT Controller Troubleshooting using the ME-ARC

This section assists in using your remote control to identify a fault, and to resolve an abnormal operational condition detected within your AGS system.

10.3.1 PT Controller Fault Message Screens

When a PT fault is detected, the ME-ARC's red FAULT LED lights and the fault status is displayed on the LCD screen (see Figure 10-9 example). Use the remote's LCD screen and the information in this section to identify and correct the issue.



Figure 10-9, PT Controller Fault Message (Example)

10.3.2 Resolving PT Faults using the ME-ARC

For the listed faults below, refer to their respective remedy.

- **ARC Fault-PT** – A series ARC fault has been detected on the PV input side of the PT. The PT turned off to reduce current flow in an attempt to extinguish the DC arc in the PV system.



Remedy: A breakdown in the wiring or in an electrical connector has the potential for producing a DC ARC fault. Look for any loose or intermittent connection, or a defective component (i.e., connectors, cables, PV controllers, or junction box) in the PV circuit.

Note: When the cause of the ARC fault has been corrected, manually clear this fault by pressing the PT controller's RESET pushbutton for one second.



Info: The PT controller contains an ARC fault test button to verify the operation of the ARC fault detection/indication circuit. See the PT owner's manual for more information on the ARC fault test button.



Info: The ARC fault circuit is normally enabled. However, if an external system ARC fault detection/indicator is installed, the ARC fault detection circuit inside the PT can be disabled. See the PT owner's manual for information on disabling the ARC fault circuit.

- **BTS Open-PT** – The BTS has opened or is no longer connected. This fault causes the BTS to show 152°C (305°F) on the TECH: 01 Temperatures/PT BTS display. With a defective or disconnected BTS, there is no temperature compensation applied to the battery charging voltage.



Remedy: Normally when a BTS is connected, it communicates temperature information to the PT controller. This fault occurs when the PT controller is no longer receiving this information, which can occur if the BTS cable becomes disconnected or damaged. See if the BTS cable has fallen out of the BTS port on the PT controller. If still connected, check for any damage to the BTS cable.

Note: The fault will automatically clear once a good BTS is reconnected. If the BTS is determined to be faulty, this fault can be cleared manually by removing the faulty BTS and pressing the PT controller's RESET pushbutton for one second.

- **BTS Shorted-PT** – A shorted BTS has been detected. This fault causes the BTS temperature to show 151°C (304°F) on the TECH: 01 Temperatures/PT BTS display. With a defective BTS, there is no temperature compensation applied to the battery charging voltage.



Remedy: This can be caused by a shorted BTS cable or debris within the BTS RJ11 terminal. Either remove or replace the BTS (and cable), check the BTS connector to ensure there are no shorted pins, or check inside the BTS RJ11 terminal for debris.

Note: If caused by a faulty BTS, the fault automatically clears once the BTS is removed.

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- **FET Overtemp-PT** – The internal FETs (Field Effect Transistors) have exceeded their safe temperature operating range ($\geq 85^{\circ}\text{C}/185^{\circ}\text{F}$).



Remedy: If this fault happens often, ensure the controller is not in a hot area, has proper ventilation, and the cooling fans inside are working.

Note: This fault automatically clears and the unit resumes operation when the FET temperature has cooled down to $83^{\circ}\text{C}/181^{\circ}\text{F}$ or below. Manually clear by pressing the PT's RESET pushbutton for one second once the FET temperature falls below $85^{\circ}\text{C}/185^{\circ}\text{F}$.

- **Ground Fault-PT** – The PT controller turned off because the GFP fuse inside the PT has opened due to a ground-fault condition.



WARNING: Conductors that were normally grounded may have become ungrounded and energized if a ground fault is indicated.



Remedy: Find and correct the ground-fault condition and replace the GFP fuse. Once the ground-fault condition is corrected and the GFP fuse is replaced, manually clear this fault by pressing the PT controller's RESET pushbutton for one second.



Info: See the PT owner's manual for the GFP fuse location and type.

- **HiBatt Temp-PT** – The temperature around the BTS has risen to $55^{\circ}\text{C}/131^{\circ}\text{F}$ or above.



Remedy: Check the area where the BTS is located. Ensure that the BTS hasn't been placed in a hot area or near a hot device. If the BTS was placed on a battery ensure the batteries are not overheated. If neither of these are the issue, then remove the BTS from the BTS port. If the fault clears, replace the BTS. If the fault continues, then inspect the BTS port for cleanliness and/or have the controller serviced.

Note: This fault automatically clears and the unit resumes operation when the BTS temperature has cooled down to $50^{\circ}\text{C}/122^{\circ}\text{F}$ or below. Manually clear by pressing the PT's RESET pushbutton for one second once the BTS temperature falls below $54^{\circ}\text{C}/129^{\circ}\text{F}$.

- **High Bat VDC-PT** – High voltage (≥ 68 VDC) has been detected on the battery input terminals (i.e., BAT+ to BAT-).



Remedy: Check the voltage on the battery terminals. High voltage can be caused by an incorrect connection of the PV array to the battery terminals, or the battery bank being charged by an external means and the voltage is >68 VDC (including ripple voltage).

Note: The fault automatically clears and the unit resumes operation once the voltage to the battery input terminals is ≤ 66.4 VDC. Manually clear the fault by pressing the PT controller's RESET pushbutton for one second when the voltage falls below 68 VDC.



CAUTION: The PT controller can be damaged if the voltage to the battery input terminals is above 68 VDC.

- **High PV VDC-PT** – A very high PV voltage (>187 VDC) has been detected on the PV terminals (i.e., PV+ to PV-).



Remedy: Check if the sizing of the PV array voltage is too high or too close to the maximum PT input operating voltage during cold weather periods. To prevent this fault and keep the controller running, size the PV array to ensure the PV input voltage stays below 187 VDC under any weather condition.

Note: The fault automatically clears and the unit resumes operation once the voltage to the PV input terminals is less than 187 VDC.



CAUTION: The PT controller can be damaged if the voltage to the PV input terminals is more than 200 VDC above the battery voltage or greater than the 240 VDC maximum, whichever is less.

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- **Ind Overtemp-PT** – The PT controller turned off because the internal inductors have exceeded their safe operating temperature ($\geq 132^{\circ}\text{C}/270^{\circ}\text{F}$).
 - ✔ **Remedy:** If this fault frequently occurs, ensure the controller is not in a hot area, has proper ventilation, and the cooling fans inside are working.
Note: This fault automatically clears and the unit resumes operation when the IND temperature has cooled down below $127^{\circ}\text{C}/261^{\circ}\text{F}$. Manually clear by pressing the PT's RESET pushbutton for one second once the FET temperature falls below $132^{\circ}\text{C}/270^{\circ}\text{F}$.
- **Int Hardware-PT** – The redundant hardware protection circuit that monitors the internal temperature has exceeded a safe operating limit.
 - ✔ **Remedy:** When a fault condition occurs, the PT controller shuts down to protect itself. Press and hold the PT's RESET pushbutton for 10 seconds to turn the controller on and to verify the fault has cleared. If the fault remains, the controller will require repair.
- **Int NTC-PT** – The internal NTC (Negative Temperature Coefficient) temperature sensor detected a large, unexpected temp change.
 - ✔ **Remedy:** When this fault condition occurs, the PT controller shuts down to help protect itself. Press and hold the PT's RESET pushbutton for 10 seconds to turn the controller on and to verify the fault has cleared. If the fault remains, the controller will require repair.
- **Int Overload-PT** – The current to an internal sensor has exceeded the PT's protection limits.
 - ✔ **Remedy:** When this fault condition occurs, the PT controller shuts down to help protect itself. Press the PT's RESET pushbutton for one second to turn the controller on and to verify the fault has cleared. If the fault remains, the inverter will require repair.
- **Int Phase-PT** – The internal phases is faulty or the phase signals are not in sync with each other.
 - ✔ **Remedy:** When this fault condition occurs, the controller shuts down to help protect itself. Press the PT's RESET pushbutton for one second to turn the controller on and to verify the fault has cleared. If the fault remains, the controller requires repair.
- **Int Power-PT** – The internal power control circuitry reached its protection limits.
 - ✔ **Remedy:** When this fault condition occurs, the controller shuts down to help protect itself. Press the RESET pushbutton for one second to turn the controller on and to verify the fault has cleared. If the fault remains, the controller will require repair.
- **Int Pwr Sup-PT** – The voltage from the auxiliary power supply in the controller has dropped to a low level.
 - ✔ **Remedy:** Check for a loading of the power circuit on the PT controller's NETWORK or STACK port. This happens if an accessory cable that is plugged into the PT controller has shorted, or an accessory—that should be powered externally—is plugged into the PT controller and is attempting to be powered from one of the PT's ports.
Remove any cable plugged into the NETWORK (or STACK) port and also check these two ports for debris, then clear the fault by pressing the PT's RESET pushbutton for one second. If the fault continues—after removing all cables, checking the ports for cleanliness and pressing the RESET button—the controller requires service.
- **No PV Input-PT** – No source of PV has been power detected on the PV input terminals (i.e., PV+ to PV-) for more than 24 hours.
 - ✔ **Remedy:** Check for an open breaker to the PV input, a bad PV wire connection to the PV terminals on the PT controller, or a long period (>24 hours) of no sun or very low sun.
Note: The fault automatically clears and the unit resumes operation once the voltage to the PV terminals is >5 volts above the battery voltage.
- **UnknownFault ##** – The PT controller has sent a fault code that cannot be determined by the ARC.
 - ✔ **Remedy:** Contact Magnum Energy Technical Support (425) 353-8833 for assistance in identifying the actual fault condition.

Appendix A – ME-ARC Compatibility Matrix

A-1 Remote Feature to Inverter Compatibility

The ME-ARC has many settings and is designed to work with the advanced features in your Magnum inverter—and/or other Magnum devices (i.e., ME-AGS-N, ACLD-40, PT-100 or ME-BMK). The remote communicates with your inverter to allow the set up and enabling of these advanced features. However, when the ME-ARC is released with new software, some of the features and functionality in the remote may not be available in an inverter or networked accessory that has an earlier software level. In this case, the advanced setting is not recognized and will not function. Use the steps below to help you determine which ARC (Version 4.0) menus/features are compatible with your inverter.

1. Go to: <http://magnumenergy.com/inverter-compatibility/> to determine your inverter's compatibility level (L1, L2, L3, or L4).
2. Use Table A-1 to determine which ME-ARC 'features/settings' you want to use and what inverter compatibility level is required (see the "Model/Level Required" column in Table A-1).
3. If your inverter compatibility level is the same or greater than the level required, your inverter can support the device setting/feature you want.
4. If your inverter does not have the required compatibility level for a feature/setting you want, contact Magnum Energy for a software upgrade.



Info: The ME-ARC compatibility matrix below is also available online to download or to print as a single page document. To download or to print, go to: <http://magnumenergy.com/inverter-compatibility/>

Table A-1, ME-ARC (Version 4.0) Compatibility Matrix

Button	Features/Settings			Model/Level Required	Default
	Main Menu	Menu Heading/Item	Selections/Adjustments Range		
CTRL	01 ACIn Control		Auto Connect	≥Level 1	Auto Connect
			VDC Connect, Time Connect, ACIn – Disabled	≥Level 3 [1]	
			SOC Connect	≥Level 3 [1][6]	
		02 CHG Control	Multi-Stage, Start Float, Start Bulk	≥Level 4	Multi-Stage
		03 Gen Control	OFF, ON, AUTO	≥Level 1 [7]	OFF**
	04 PT Control	04A PT CHG Ctrl	Multi-Stage, Charger Off, Start Float, Start Bulk, Start EQ	≥Level 4	Multi-Stage
		04B PT Aux Relay Ctrl	DISENGAGE, VDC, FAULT, ENGAGE		DISENGAGE
04C PT Alarm Control		OFF, VDC, FAULT, ON	OFF		
04D PT MPPT Sweep		5 Min, 15 Min, 1 Hour, Fixed Sweep	15 Min Sweep		
METER	01 DC Meters	01A DC Volts	Read Only display	≥Level 1	Read Only
		01B DC Amps			
	02 AC Meters	02A AC Output	Read Only	≥Level 4	Read Only
		02B Load Amps			
		02C Input Amps		≥Level 4 [3]	
		02D Inv/Chg Amps			

Appendix A – ME-ARC Compatibility Matrix

Button	Features/Settings			Model/ Level Required	Default
	Main Menu	Menu Heading/Item	Selections/ Adjustments Range		
METER	02 AC Meters	02E Input AC1	Read Only	MSH models	Read Only
		02F Input AC2		MSH-RE	
	03 Timers	03A Charge Time	Read Only	≥Level 1	Read Only
		03B Since Absorb Done			
		03C Since EQ Start			
	04 AGS Meters	04A AGS Status	Read Only	≥Level 1	Read Only
		04B DC Volts-AGS			
		04C Gen Run Time			
		04D AGS Temp			
		04E Since GenRun		≥Level 1 [6]	
		04F Since 100%		≥Level 1	
		04G Hour Meter			
	05 BMK Meters	05A BMK Status	Read Only	≥Level 1 [6]	Read Only
		05B Battery SOC			
		05C DC Volts-BMK			
		05D DC Amps-BMK			
		05E AH In/Out			
		05F Reset AH Out			
		05G Total AH Out			
		05H Minimum VDC			
		05I Maximum VDC			
		05J Days Since 100% SOC			
	06 ACLD Meters	06A ACLD Status	Read Only	≥Level 1	Read Only
		06B ACLD Power Diverted			
		06C ACLD Temp			
		06D Target Volts			
		06E ACLD-40 Version			
07 PT Meters	07A PT Status	PT Status	≥Level 1	Read Only	
		Power Status			
		Relay Status			
	07B PV Volts-PT	Read Only	≥Level 1	Read Only	
	07C Bat Volts-PT				
07D Target Volts					
07E Bat Amps-PT					

Appendix A – ME-ARC Compatibility Matrix

Button	Features/Settings			Model/ Level Required	Default	
	Main Menu	Menu Heading/Item	Selections/ Adjustments Range			
METER	07 PT Meters	07F Power to Bat	Now:	Read Only displays	≥Level 1	Read Only
			Life:			
			Reset:			
		07G Ground Fault	Read Only display			
		07H PT Data	PT Data			
07I Clear PT Data History	Clear PT History					
07J PT Version	Read Only display					
SETUP	01 System Setup	01A Set Clock	Time = 12:00A - 11:59P	≥Level 1	12:00A**	
		01B Screen Setup	Brightness = 0-100%	≥Level 1	50%**	
			Contrast = 0-100%		100%**	
			Pwr Save = OFF, 1-60 Min		15 Min	
		01C Temp Display	Fahrenheit, Celsius	≥Level 1	Fahrenheit	
		01D Max Charge Amps	OFF, 20-990 ADC	≥Level 1	200 ADC	
	01E Link PT CHG settings	YES, NO	≥Level 1	YES		
	02 Invert Setup	02A Search Watts	OFF, 5-50 Watts	≥Level 1	5 Watts	
		02B LBCO Setting	9.0-12.2*VDC	≥Level 2	10.0*V	
		02C AC In - Time	Connect Time = 12:00A - 11:45P	≥Level 3 [1]	6:00A	
			Disconnect Time = 12:00A - 11:45P		6:00P	
		02D AC In - VDC	Connect Volts = 9.0-15.9*	≥Level 3 [1]	11.0*V	
			Disconnect Volts = 9.1-16.0*		14.1*V	
		02E AC In - SOC	Connect SOC = 20%-99%	≥Level 3 [6]	80%	
	Disconnect SOC = 21%-100%		100%			
	02F Power Up Always	OFF, ON	≥Level 1	OFF		
	03 Charger Setup	03A AC Input Amps	AC1 Input Amps = 5-60	≥Level 1 [1]	30A	
			AC2 Input Amps = 5-60	MSH-RE only	20A	
03B VAC Dropout		AC1 = 60-100 VAC, UPS Mode	U.S. Models	80 VAC		
		AC2 = 60-100 VAC	MSH-RE Models	70 VAC		
		110-190 VAC, UPS Mode	Export models	150 VAC		

Appendix A – ME-ARC Compatibility Matrix

Button	Features/Settings			Model/ Level Required	Default	
	Main Menu	Menu Heading/Item	Selections/ Adjustments Range			
SETUP	03 Char- ger Setup	03C Battery Type	Gel, Flooded, AGM1, AGM2	≥Level 1	Flooded	
			Custom	Absorb (12.0-16.0)*	≥Level 3 [2]	14.4*
				Float (12.0-16.0)*		13.2*
				EQ (12.0-16.0)*		15.6*
				EQ Done (0.1-25.5)		4.0 Hrs
			CC/ CV	Max Charge = OFF, 20-990ADC	≥Level 4	200ADC
				CV Charge = 12.0-16.0* VDC		13.8*V
				CV Chg Done = Time, Amps, Hold CV Chg VDC		Time
				Time = 0.1-25.5		2 Hrs
				Max CC/CV Time = OFF, 0.1-25.5 Hrs		12 Hrs
				Recharge Volts = 12.0-16.0* VDC		12.0*V
				Amps = 0-250 ADC		20 ADC
				Max CC/CV Time = OFF, 0.1-25.5 Hrs		12 Hrs
			Recharge Volts = 12.0-16.0* VDC	12.0*V		
			Hold CV Chg VDC			
			03D Absorb Done	Time = 0.1-25.5 Hrs	≥Level 4 [4]	2.0 Hrs
				Amps = 0-250 ADC	≥Level 4 [5]	20 ADC
				SOC = 50-100%	≥Level 4 [5]	100%
	03E Max Charge Rate	10-100%	≥Level 2	100%		
		0-100%	≥Level 3			
	03F Max Charge Time	OFF, 0.1-25.5 Hrs	≥Level 4 [5]	12.0 Hrs		
	03G Final Charge Stage	Multi, Float	≥Level 4 [5]	Multi		
		Silent Rebulk = 12-16V*	≥Level 4	12.0*V		
	03H EQ Reminder Days	OFF, 1-255 Days	≥Level 1	OFF		
04 AGS Setup	04A Gen Run VDC	Start Volts = OFF, 9.0-15.9*	≥Level 1	11.5*V		
		Start Delay = 0-127s, 1-127m		120 Sec		
		Stop = 9.1-16.0*, Float		14.4*V		
		Stop Delay = 0-127s, 1-127m		120 Sec		
	04B Gen Run Time	OFF, ON - Start Time = 12:00A-11:45P	≥Level 1	OFF		
		Stop Time = 12:00A-11:45P		12:00A		
	04C Gen Run Amps	Start Amps = OFF, 5-60A	≥Level 4	OFF		
		Start Delay = 0-127s, 1-127m		120 Sec		
		Stop Amps = 4-59A		4A		
		Stop Delay = 0-127s, 1-127m		120 Sec		

Appendix A – ME-ARC Compatibility Matrix

Button	Features/Settings			Model/ Level Required	Default		
	Main Menu	Menu Heading/Item	Selections/ Adjustments Range				
SETUP	04 AGS Setup	04D Gen Run SOC	OFF, Start Gen SOC = 20-99%	≥Level 1	OFF		
			Stop Gen SOC = 21-100%	[6]	90%		
		04E Gen Run Temp	Start = OFF, Ext Input, 65-95F (18-35C)	≥Level 1	OFF		
			Run Time = 0.5-25.5 Hrs		2.0 Hrs		
		04F Max Gen Run Time	OFF, 0.1-25.5 Hrs	≥Level 1	12.0 Hrs		
		04G Quiet Time	OFF, ON-Start = 12:00A - 11:45P	≥Level 1	OFF		
			Stop Quiet Time = 12:00A - 11:45P				
			Quiet Time Topoff = OFF, 30-120 Min		OFF		
		04H Gen Exercise	Days = OFF, 1-255 days	≥Level 1	OFF		
			Run Hour/Min/AM-PM = 12:00A - 11:45P				
	Run Time = 0.1-25.5 Hrs		1.0 Hrs				
	04I Gen Warm-up Time	0-127 sec, 1-127 min	≥Level 1	60 Sec			
	04J Gen Cooldown Time	0-127 sec, 1-127 min	≥Level 1	60 Sec			
	04K Gen 100% SOC Start Days	OFF, 1-255 Days	≥Level 4 [5]	OFF			
		SOC Hour/Minute/AM-PM = 12:00A - 11:45P					
	05 BMK Setup	05A Charge Eff	Auto, 50-99%	≥Level 1 [6]	Auto		
		05B AmpHour Size	200-2500 AH	≥Level 1 [6]	400 AH		
	06 PT Setup	06A Battery Type	Gel, Flooded, AGM1, AGM2		≥Level 1	Flooded	
			CC/ CV	Max Charge = OFF, 20-990A		≥Level 1	200 ADC
				CV Charge = 12.0-16.6* VDC			13.8*
CV Chg Done = Time, Amps, Hold CV Chg VDC				Time			
Time = 0.1-25.5				2.0 Hrs			
Max CC/CV Time = OFF, 0.1-25.5 Hrs				12.0 Hrs			
Recharge = 9.0-16.0* Volts				12.0*			
Custom			Absorb (12.0-16.6)*		≥Level 1	14.4*	
			Float (12.0-16.6)*			13.2*	
			EQ (12.0-16.6)*			15.6*	
	EQ Done (0.1-25.5)			4.0 Hrs			

Appendix A – ME-ARC Compatibility Matrix

Button	Features/Settings			Model/ Level Required	Default	
	Main Menu	Menu Heading/Item	Selections/ Adjustments Range			
SETUP	06 PT Setup	06A Battery Type	CC/ CV	Amps = 0-250 ADC	≥Level 1	20 ADC
				Max CC/CV Time = OFF, 0.1-25.5 Hrs		12.0 Hrs
				Recharge = 9.0-16.0* V		12.0*
				Hold CV Chg VDC		
		06B Absorb Done	Time = 0.1-25.5 Hrs	≥Level 1	2.0 Hrs	
			Amps = 0-250 ADC		20 ADC	
			SOC = 50-100% [6]		100%	
		06C Max Charge Rate	0-100%	≥Level 1	100%	
		06D Max Charge Time	OFF, 0.1-25.5 Hrs	≥Level 1	12.0 Hrs	
		06E Bulk Start	Daily/SunUp = YES, NO	≥Level 1	YES	
			Volts = OFF, 9.0-16.0*		12.0*	
			SOC = OFF, 50-99% [6]		80%	
		06F PT Aux Relay	Engage Volts = 8.0-16.6*	≥Level 1	10.0*	
			Engage Delay = 0-127s, 1-127m		10 Sec	
			Disengage Volts = 8.0-16.6*		14.0*	
			Disengage Delay = 0-127 Sec, 1-127 Min		10 Sec	
		06G PT Alarm	ON Volts = 8.0-16.6*	≥Level 1	10.0*	
			ON Delay = 0-127s, 1-127m		10 Sec	
			OFF Volts = 8.0-16.6*		14.0*	
			OFF Delay = 0-127s, 1-127m		10 Sec	
06H PowerSave PT Display	OFF, 1 - 60 Min	≥Level 1	15 Min			

* 12-volt values shown; for 24v systems – x2, for 48v systems – x4.

** These settings return to the factory default setting when power to the remote is removed.

ME-ARC Compatibility Matrix Notes:

[1] Not available on MM/MM-E/MM-AE/MMS/MMS-E models.

[2] Activate AC Couple Mode using Battery Type: Custom with MS-PAE Series ≥Version 4.1.

[3] The AC meter displays are only accurate when used with MS-PE, MS-PAE or MSH Series inverters. The meters do not display unless the inverter is ≥ Level 4.

[4] Level 2 and 3 inverters can be used, but:

Level 2 inverters are limited from 1.0-4.5 hours,

Level 3 inverters <Version 4.1 are limited from 1.0-6.5 hours,

Level 3 inverters ≥Version 4.1 (and MMS Version 1.5) are limited from 1.5-6.5 hours.

Any setting outside these limited ranges are not recognized and reverts to the inverter's default absorption time (2.0 hours).

[5] Requires ≥Level 4 to display.

[6] SOC features require the ME-BMK (Battery Monitor Kit) to be installed.

[7] To manually turn the generator on with the remote, a ME-AGS-N Version 5.0 or higher is required.

Appendix B – Warranty & Service

B-1 Limited Warranty

Magnum Energy, Inc., warrants the ME-ARC to be free from defects in material and workmanship that result in product failure during normal usage, according to the following terms and conditions.

1. The limited warranty for this product extends for a maximum of 12 months from the product's original date of purchase.

Note: *Extend the normal one-year warranty on the ME-ARC to 5 years simply by ordering it with and installing it on one of Magnum's MP or MMP panel systems. To be eligible for the 5-year warranty extension, a proof-of-purchase is required at the time of repair/service showing that the ME-ARC and the MP or MMP panel system were purchased at the same time.*

2. The limited warranty extends to the original purchaser of the product and is not assignable or transferable to any subsequent purchaser.
3. During the warranty period, Magnum will repair or replace at Magnum's option any defective parts—or any parts that will not properly operate for their intended use—with factory new or remanufactured replacement items if such repair or replacement is needed because of product malfunction or failure during normal usage. The limited warranty does not cover defects in appearance—cosmetic or decorative—or any structural or non-operative parts. Magnum's limit of liability under the limited warranty shall be the actual cash value of the product at the time the original purchaser returns the product for repair—determined by the price paid by the original purchaser. Magnum shall not be liable for any other losses or damages.
4. Upon request from Magnum Energy, the original purchaser must prove the product's original date of purchase by a dated bill of sale, itemized receipt.
5. The original purchaser shall return the product prepaid to Magnum Energy in Everett, WA. After the completion of service under this limited warranty, Magnum Energy will return the product prepaid to the original purchaser via a Magnum selected non-expedited surface freight within the contiguous United States and Canada; this excludes Alaska and Hawaii.
6. If Magnum repairs or replaces a product, its warranty continues for the remaining portion of the original warranty period or 90 days from the date of the return shipment to the original purchaser, whichever is greater. All replaced products and parts removed from repaired products become the property of Magnum Energy.
7. This limited warranty is voided if:
 - the product has been modified without authorization
 - the serial number (if serialized) has been altered or removed
 - the product has been damaged thru abuse, neglect, accident, high voltage or corrosion
 - the product was not installed and operated according to the owner's manual

B-2 How to Receive Repair Service

If your product requires warranty service or repair, contact either:

- An authorized service center, as listed on the Magnum Energy website at: <http://magnumenergy.com/authorized-service-centers/>, or
- Magnum Energy, Inc. at: Telephone: 425-353-8833, Fax: 425-353-8390
Email: warranty@magnumenergy.com

If returning your product directly to Magnum Energy for repair, you must:

1. Return the unit in the original, or equivalent, shipping container.
Note: *Damage from shipping is not covered under warranty, ensure it is properly packaged.*
2. Receive a Return Materials Authorization (RMA) number from the factory prior to the return of the product to Magnum Energy for repair.
3. Place RMA numbers clearly on the shipping container or on the packing slip.

A RETURN MATERIAL AUTHORIZATION (RMA) NUMBER IS REQUIRED TO RETURN A UNIT



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