WHT200/250

INTELLIGENT ENERGY / POWER METER

OPERATING GUIDE
VERSION 1 SEPTEMBER, 2014

GREYSTONE
ENERGY SYSTEMS INC

OPERATING GUIDE
WHT Intelligent Energy/Power Meter

The WHT energy/power meter comes with many configuration options which can be viewed/changed using the front panel LCD display and keys. This guide will explain how to navigate and change those configuration items. Physical installation of the meter is covered in a separate document.

All of the configuration options described in this document may also be viewed and changed using the WHT Desktop Software package and a programming cable which plugs into the meter's Data Port. The Desktop Software and programming cable may also be used to upgrade the WHT firmware at any time. This allows the user to add new features to existing meters installed in the field.

Run Mode Operation

When the meter is powered up, it goes to **Run Mode** where measurements are taken and displayed on the LCD. Only the measurements enabled for display will be shown. The choice of which measurements are displayed is configurable as explained later in this document.
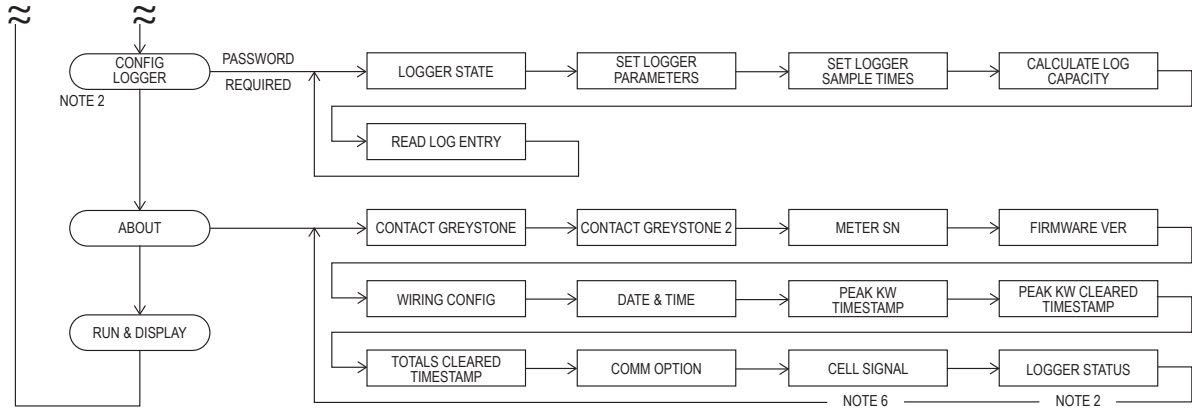
The measurements enabled for display may auto-rotate on the display if that feature is enabled (also configurable, explained later in this document).

In **Run Mode** the left-right keys may be used to select the measurement desired for display. If auto-rotate is turned off, the selected measurement will stay on the display indefinitely. If auto-rotate is turned on, after 10 minutes of no left-right key activity the auto-rotate feature will start again.

To exit **Run Mode** and go to **Setup Mode**, press the **Main Menu** or **Sub Menu** key. Operation of **Setup Mode** is described in the following pages.
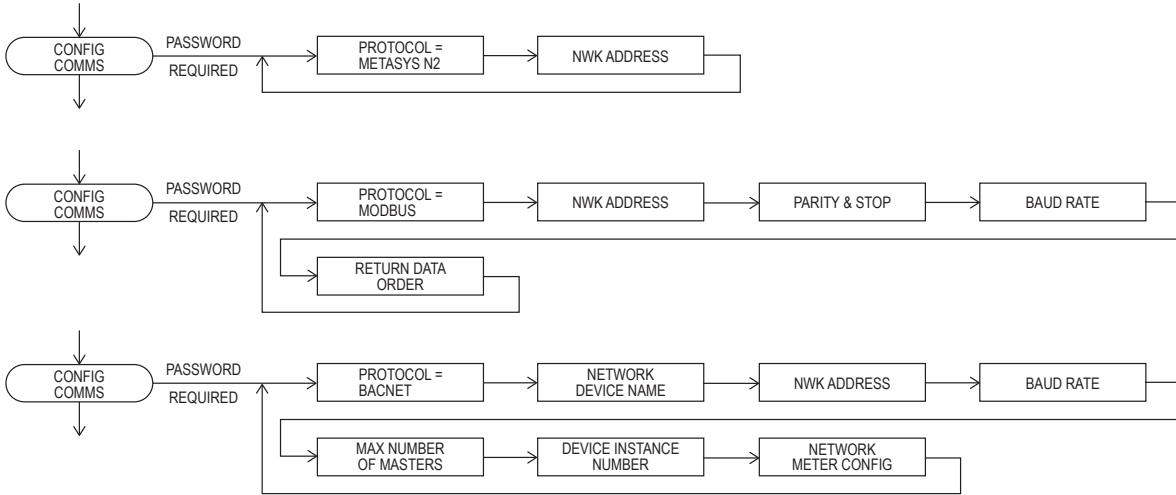
WHT Front Panel Operation

NOTE: Once you have entered the password for any branch you have access to all password-protected branches.

					NOTE 5		NOTE 5
CLEAR REGISTERS	PASSWORD REQUIRED		KWH/KVARH/KVAH	→ PEAK KWH	→ EXTERNAL COUNTER #1	→ EXTERNAL COUNTER #2	

DATA LOGGER

NOTE 2

CONFIG INPUTS — PASSWORD REQUIRED → PWRSYS TYPE → SYSTEM FS VOLTS → SYSTEM FS AMPS → CT TYPE

5A CT CALNUMS → WINDOW PERIOD → VOLT-AMP MATCH → CT POLARITIES

EXTERNAL INPUT #1 TYPE → EXTERNAL INPUT #2 TYPE

NOTE 4 — NOTE 4

CONFIG OUTPUTS — PASSWORD REQUIRED → CONTACT OUTPUT1 → CONTACT OUTPUT2 → MIN PULSEWIDTH → KWH/PULSE

LOW VOLTS ALARM THRESHOLD → UNBAL VOLTS ALARM THRESHOLD → MA OUTPUT

CONFIG COMMS — PASSWORD REQUIRED → PROTOCOL → PROTOCOL DEPENDENT → PROTOCOL DEPENDENT → PROTOCOL DEPENDENT

NOTE 3

PROTOCOL DEPENDENT → PROTOCOL DEPENDENT → PROTOCOL DEPENDENT → PROTOCOL DEPENDENT

CONFIG OTHER — PASSWORD REQUIRED → NAME TAG → DISPLAY ITEMS → DISPLAY ACTION → PASSWORD

SET DEFAULTS → SET TIME → SET DATE → ACTIVATE DATALOGGER

* NOTE 1

WHT Front Panel Operation (continued)

NOTES:

1. Only present before datalogger activated.

2. Only present after datalogger activated.

3. Only present if configurable communications card is installed.

4. Only present if communications card with configurable inputs is installed.

5. Only present if Note 4 and external inputs are configured as counters.

6. Only present if cellular modem card is installed.

WHT Communications Menus

CONFIG COMMS — PASSWORD REQUIRED → PROTOCOL = METASYS N2 → NWK ADDRESS

CONFIG COMMS — PASSWORD REQUIRED → PROTOCOL = MODBUS → NWK ADDRESS → PARITY & STOP → BAUD RATE
→ RETURN DATA ORDER

CONFIG COMMS — PASSWORD REQUIRED → PROTOCOL = BACNET → NETWORK DEVICE NAME → NWK ADDRESS → BAUD RATE
→ MAX NUMBER OF MASTERS → DEVICE INSTANCE NUMBER → NETWORK METER CONFIG

Setup Mode Overview

Main Menu Key Scrolls through the **Main Menu** categories.

Sub Menu Key   Scrolls through the **Sub Menu** categories under the selected **Main Menu**.

Direction Keys   Used to change the value of an item or scroll through possible predefined values for an item.

Enter Key   Activates sub-menu items, saves item value or selection choice, executes chosen action.

When the meter is in the **Run Mode**, pressing either **Main Menu** or **Sub Menu** will change the meter to the Setup Mode.

Entering Numerical Values

Wherever numerical values are to be entered, the display will prompt for the value with a series of dots showing how many digits are required. If the value you want to enter is less than the full number of digits, enter leading zeros. For example, if the display shows ….. (five dots) but you want to enter the value "150" then enter "00150."

The right-left keys select the digit to be set and the up-down keys select the value for the digit. When all digit values have been set press the **Enter** key. If the value entered is invalid for some reason (out of expected range for example), the value will be cleared from the display and you may try again.

Selecting From A List of Choices

Some sub-menus have a predefined list of possible choices rather than a numerical value to be entered. In this case the right-left keys will allow scrolling to the desired choice. When the desired choice is displayed on the screen, press the **Enter** key to save it.

Password

Most **Main Menu** categories require a password to be entered. The password is the same for any of the menus which require one. Once the password has been entered, all the password-protected menus become available.

The meter ships with the default password of 1234. The password must be 4 numerical digits. The password can be changed through the **Config Other** menu described below.

Saving Changes With Enter Key

When changing configuration parameters, changes are not saved until the Enter key is pressed. If you are in the middle of changing a parameter and decide that you want to keep the existing setting, just press the **Main Menu** or **Sub Menu** keys to back out of the change operation.

Key Inactivity Timeout

If meter is in the **Setup Mode** and there is no key activity for 10 minutes, the meter will automatically log the user out and revert to the **Run Mode**. Changes in progress will be discarded.

Main Menu Key

From the **Run Mode**, first press the **Main Menu** key until the desired category shows in the top line of the LCD display. The Main Menu categories are:

Clear Registers   Clears all the energy totalizers and/or the peak sliding window KW. Sets the timestamp(s) to show when the clear(s) occurred. Clears external counters if a communications card is installed with external inputs and the inputs are configured as counters. Clears data log if Data Logger option is activated.

Config Inputs   Configures the meter input items such as power system type, full-scale volts, full-scale amps, CT type used, sliding window KW period in minutes. Shows CT polarities and volt-amp phase matching, and allows these to be changed or Auto-Configure to be invoked. If communications card with external inputs is installed, configures inputs as on/off state sensors or counters.

Config Outputs   Configures the meter output items such as output contact functions, KWH/pulse, minimum pulse period, mA output function.

Config Comms   Configures communications options for an installed communications card. Options presented are dependent on the type of communications card installed.
NOTE: if no communications card is present, this category will not show up in the display.

Config Other   Configures name tag, measurements to display, display action in **Run Mode**. Allows changing password. Allows setting all options to default values. Allows setting the WHT realtime clock's time and date values. Allows activation of the Data Logger option if currently not activated (Activation Code required).

About   Provides useful information such as meter serial number, firmware version, Greystone phone number and website URL. Shows whether meter inputs were Manual or Auto-Configured. Displays timestamps of when Peak KW occurred, Peak KW was cleared, and when totalizers were cleared. Displays communications option (if any) installed. Displays cellular signal strength (if cellular modem option installed).
Displays data logger status (if Data Logger option is activated).

Run & Display   Exits the **Setup Mode** and puts meter back into **Run Mode**.

Sub Menu Key

The **Sub Menu** Key presents a different set of items to view/configure for each **Main Menu** category.

Press **Sub Menu** to show the items available under the selected **Main Menu** category. Items are shown on the bottom line of the display. At the right end of the bottom line you will see the letter '**E**'. This indicates that pressing the **Enter** key will activate that item. To skip that item and proceed on to other sub menu items just keep pressing the **Sub Menu** key.

When you press **Enter** to activate a sub menu item, three things may happen:

1. If the item was an action to take (like clearing the totalizers), the action will take place as soon you press **Enter** and the display will change to say "Done!"

2. If the item has various predefined choices for you to pick from, the bottom line will change to show those choices. At the right end of the line you will see "**<E>**". To activate the choice shown on the display, just press **Enter**. To see other choices, press the right or left keys. When **Enter** is pressed the changes are stored and the display will show "Done!"

3. If the item requires a numerical input, the display will show the current value with "<E>" at the right end of the line. If you want to keep the current value, just press **Enter**. If you want to change the value, press either the right or left key. The display will change to show the number of digits it expects with a row of dots. Use the left-right keys to select the digits and the up-down keys to set the digit values as explained earlier. Remember to pad a small number with leading zeros so that every digit position has a number. When the desired number is showing, press **Enter** to save it. The new value will be saved and the display will show "Done!"

Remember that you can always back out of a change operation by just pressing **Main Menu** or **Sub Menu** any time before the **Enter** key is pressed.

"Clear Registers" Sub Menu Items:

KWH/VARH/VAH	E	Clears all KWH, KVARH, and KVA energy totalizers. Updates the timestamp of when totalizers were cleared.
Peak KW	E	Clears the Peak KW sliding window value. Updates the timestamp of when Peak KW was cleared.
Ext Counter #1	E	Clears external pulse counter if the WHT is equipped with a
Ext Counter #2	E	communications card having external digital inputs AND if the inputs are configured as pulse counters.
Data Logger	E	Clears the contents of the data logger if the Data Logger option has been activated. If the data logger was running, it keeps running. If the data logger was stopped, it remains stopped.

"Config Inputs" Sub Menu Items:

PwrSys Type	E	Allows selection of the following choices for power system type: 2-Wire 1-Phase system 3-Wire 1-Phase system 4-Wire Wye system 3-Wire Delta system 4-Wire Delta system
Sys FS Volts	E	Allows entry of the full-scale line-line power system voltage. If using direct-connect (no potential transformers) then key in the nominal system voltage (120-600V). Max 32,000V. If using Potential Transformers for service greater than 600V, key in the voltage value on the PT label even if you are using the PTs on a slightly lower voltage system. For example, if you are using PTs rated for 10KV on a 9KV system, enter the PT rated voltage (10KV) rather than the working system voltage (9KV).
Sys FS Amps	E	Allows entry of the full-scale system amps. Valid range is 5 amps to 6000 amps.

CT Type	E	*** This item will not appear if the CTs were matched to the meter at the factory. Allows selecting the Current Transformer type being used with the meter: 0.333V secondary Safe-CTs 5A secondary conventional CTs (must install 5A adapter board)
5A CT CalNums	E	Allows entry of the calibration numbers written on the 5A adapter board installed in meter. Removes the tolerance error of the burden resistors used on the 5A adapter.
Window Period	E	Allows entry of the length in minutes of the KW sliding window. This is the length of time the instantaneous KW values are averaged to arrive at the sliding window KW value. Valid range is 5 minutes to 60 minutes.
Volt-Amp Match	E	Shows volt-amp phase matching in use. Each voltage input is represented by a number 1-3 and each current input is represented by a letter A-C. So a display of 1A 2B 3C means that L1 is paired with CTA, L2 is paired with CTB, and L3 is paired with CTC. You may use the left-right keys to select different matching combinations and press Enter to change. The left-right keys will also bring up the word AutoConfigure which, if Enter is pressed, will cause the WHT to attempt to automatically configure the volt-amp wiring (and CT polarities). If AutoConfig is invoked, a 3-stage countdown will show on the display followed by PASS or FAIL message. If AutoConfig passed, the result will show a small 'AC" logo on the left end of the display line. If AutoConfig failed, the "AC" logo will be absent.

CT Polarities	E	Shows whether each CT (A,B,C) has had its polarity electronically reversed. If the CT accidentally gets physically installed bacwards this can be used to correct the problem. You will see a + (normal polarity) or a − (reversed polarity) next to each CT letter.
		AutoConfigure can also be invoked from this sub-menu just as it can from Volt-Amp Match since AutoConfig affects both the volt-amp phase matching and the CT polarities.
ExtInput1 Type	E	Allows selection of external input as On/Off state sensing or as a
ExtInput2 Type	E	pulse counter. Only applies if a communications card with external digital inputs is installed.

"Config Outputs" Sub Menu Items:

ContactOutput1	E	Chooses the function to be performed by the contact output:
ContactOutput2	E	Positive KWH pulses.
		Negative KWH pulses.
		Low Volts alarm Normally Open (NO)
		Low Volts alarm Normally Closed (NC)
		Unbalanced Volts alarm Normally Open (NO)
		Unbalanced Volts alarm Normally Closed (NC)
		Low Volts OR Unbalanced Volts alarm NO
		Low Volts OR Unbalanced Volts alarm NC
		Network Control (General Purpose digital outputs independent of electrical metering.) Available through BACnet network protocol only.
Min PulseWidth	E	Allows selection of the minimum pulse width for contact outputs when they are selected for KWH pulses. The minimum pulse width should be set for the smallest value that the receiving device is capable of detecting. Minimum pulse width affects which KWH/pulse settings are possible to achieve. Setting a large value for minimum pulse width may make it impossible to use some of the finer KWH/pulse settings such as 0.1 or 0.01 KWH/pulse.
		The allowable range for minimum pulse width is 50 milliseconds to 2000 milliseconds.

KWH/Pulse	E	Allows selection of KWH Per Pulse for the contact outputs when they are selected for KWH pulses: 10 KWH/Pulse 1 KWH/Pulse 0.1 KWH/Pulse 0.01 KWH/Pulse **Note:** The meter uses power system type, full-scale volts, full-scale amps, and minimum pulse width to determine which values of KWH/Pulse are possible. In some cases not all values of KWH/Pulse are possible and the meter will not show those values as choices. **Be sure to set power system type, full-scale volts, full-scale amps, and minimum pulse width to proper values before selecting KWH\Pulse so only valid settings will be available on display.**
LowV Alarm	E	Allows setting the voltage threshold where alarm activates when contact output is used for low volts alarm. Expessed in percent of full-scale system volts. Default value 85%.
UnBalV Alarm	E	Allows setting the voltage imbalance threshold where alarm activates when contact output is used for unbalanced volts alarm. Expressed in percent of full-scale system volts. Default value 3%.
mA Output	E	Allows selection of measurement to be sent to 4-20 mA output: Total Positive KW Bidirectional KW (12 mA = Zero KW) Sliding Window KW Peak Sliding Window KW Total KVA Total Power Factor Average Amps Average Volts Network Control (General purpose 4-20 mA output independent of electrical metering.) Available through BACnet protocol only. To view the scaling equations for the various measurements, see Appendix A.

"Config Comms" Sub Menu Branch

The WHT supports several different models of communication cards. The presence or absence of the "Config Comms" branch of the menu and the parameters offered for configuration there vary with the model communication card installed. Here are some general rules:

No Communication Card Installed:

The "Config Comms" branch of the menu does not appear. The "Comm Option" display under the "About" menu branch displays "None".

Older Communication Card Designed for PT-9000 Meter Installed:

The "Config Comms" branch of the menu does not appear (these cards cannot be set up through the front panel, only by dipswitches mounted on the card). The "Comm Option" display under the "About" menu branch displays "Device_2400". The WHT will talk to the PT-9000 style card in Legacy Mode just as if the card were plugged into a PT-9000 meter. The card will only deliver over the network the parameters that can be read from a PT-9000 meter. To interpret the data over the network properly, you must use the point maps supplied on the PT-9000 communications card datasheet.

Fixed-Protocol, Changeable Parameters Communication Card Installed:

The "Config Comms" branch of the menu will be present. The first selection "Protocol" will show the protocol the card is running, but it cannot be changed using the <> keys. The other parameters following "Protocol" can be changed from the front panel. The "Comm Option" display under the "About" menu branch displays the protocol the card is running.

Changeable-Protocol, Changeable Parameters Communication Card Installed:
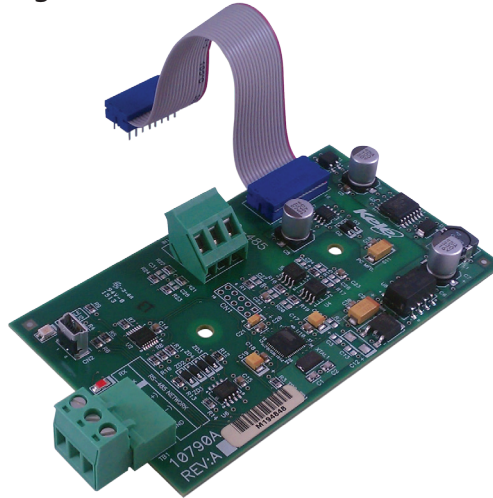
The "Config Comms" branch of the menu will be present. The first selection "Protocol" will show the protocol the card is running. The protocol can be changed using the <> keys. The other parameters following "Protocol" can be changed from the front panel. The "Comm Option" display under the "About" menu branch displays the protocol the card is running.

*** Network Troubleshooting Tip ***

If you have a changeable-protocol communications card installed and would like to take the WHT off-line temporarily to troubleshoot network problems, you can set the protocol selection to "None" and the WHT will go off-line until a new protocol is selected.

"Config Comms" Sub Menu Items:

<If a sub menu item does not apply to the selected protocol, it will be skipped>

Nwk Dev Name	E	Network Device Name assigned to this meter (BACnet)
Network Address	E	The network address assigned to this meter.
Parity & Stop	E	Parity selection and number of stop bits used (Modbus). Choices are: No Parity, 1 Stop Bit No Parity, 2 Stop Bits Even Parity, 1 Stop Bit Odd Parity, 1 Stop Bit
Baud Rate	E	Network Baud Rate (BACnet and Modbus).
Rtn Data Order	E	For 32-bit integer or floating-point values, determines whether the most-significant (High) or least-significant (Low) 16 bits is returned first (Modbus).
Max # Masters	E	Maximum number of masters on the network (BACnet)
Dev Instance #	E	Device Instance Number (BACnet)
Nwk Mtr Config	E	Allows or blocks setup of meter configuration parameters over the network (BACnet).

"Config Other" Sub Menu Items:

Name Tag	E	Allows entry of any text up to 12 characters long to identify the meter on the display when in the **Run Mode**. In this case the up and down keys also allow scrolling through all the letters of the alphabet and space.
Display Items	E	Allows selection of which measurements will be shown on the display in the **Run Mode** and which will be skipped. Possible measurements to display are: Total KW Sliding Window KW Total KVAR Total KVA Phase A KW Phase B KW Phase C KW Phase A KVAR Phase B KVAR Phase C KVAR Phase A KVA Phase B KVA Phase C KVA Total Power Factor Phase A Power Factor Phase B Power Factor Phase C Power Factor Average L-L Volts Average L-N Volts L1-L2 Volts L2-L3 Volts L3-L1 Volts L1-N Volts L2-N Volts L3-N Volts Average Amps Phase A Amps

Phase B Amps
Phase C Amps
Total Positive KWH
Total Negative KWH
Total Absolute KWH
Total Net KWH
Total Positive KVARH
Total Negative KVARH
Total Absolute KVARH
Total Net KVARH
Total KVAH
Phase A Positive KWH
Phase B Positive KWH
Phase C Positive KWH
Phase A Negative KWH
Phase B Negative KWH
Phase C Negative KWH
Phase A Positive KVARH
Phase B Positive KVARH
Phase C Positive KVARH
Phase A Negative KVARH
Phase B Negative KVARH
Phase C Negative KVARH
Phase A KVAH
Phase B KVAH
Phase C KVAH
Peak Sliding Window KW
External Counter 1
External Counter 2
Frequency
Name Tag
Contact Icons (small '1' and '2' on left end of top display line show when contacts 1 and 2 are closed)

Use the left-right keys to scroll through the various measurements on the bottom line. For each measurement displayed, use the up or down key to select Yes or No on the top display line. When you are satisfied with your selections, press **Enter** to save your choices.

** You can press **Enter** at any time, you do not have to scroll through all the display choices. Any item not modified will remain as-is.

Display Action	E	Allows choice of whether measurements selected for display are "auto-rotated" on the display during **Run Mode** or whether the measurement selected with left-right keys during **Run Mode** stays in the display continuously.
Password	E	Allows password to be changed to value other than default of "1234." The password must be a 4 digit numerical value.
Set Defaults	E	Sets meter configuration items to default values. Does **not** reset communications card options.
		The default configuration setup values are: 4-wire Wye power system 100A unmatched Safe-CTs 600V L-L full-scale system voltage 0.01 KWH/pulse Minimum pulse duration = 50 msec Output contact #1 = positive energy KWH pulses Output contact #2 = negative energy KWH pulses 4-20 mA output = Total positive KW Displayed values = Total KW, Total Positive KWH, Name Tag, Contact Icons Display action = auto-rotate displayed parameters
Set Time	E	Sets the hours and minutes in the battery-backed real-time clock.

| **Set Date** | E | Sets the month, day, and year in the battery-backed real-time clock. |

ActivateLogger   E   Allows user to enter an Activation Code to activate the Data Logger feature. Each WHT meter has a unique Activation Code based on its serial number. The Activation Code is NOT the same as the Password used to gain access to the configuration menus.

The Data Logger is a purchased option for the WHT. If the WHT was ordered with the Data Logger option, it should already be activated when you receive the meter or a note should be included with the meter giving you the Activation Code. If you want to activate the Data Logger in an existing meter, contact Greystone to purchase the option and obtain the Activation Code.

*** The Data Logger feature is available beginning with meter firmware Revision 1.06. If your meter has older firmware (look in the "About" menu branch), you will need to use the Desktop Software and programming cable to load new firmware, Rev 1.06 or higher.

Data Logger Operational Description

The WHT Data Logger option provides a way to selectively record measured values in nonvolatile memory for later recall either through the front panel or the Desktop Software.

You may choose up to 16 parameters to log. Each parameter may be assigned any of the meter measurement values. A parameter can also be assigned "None" if you do not wish use all 16 parameters for logging.

Each log parameter can be assigned its own sampling interval from once every 5 minutes to once every 24 hours in 5-minute increments. This maximizes efficient use of logger memory versus all measurements having to be sampled at the same interval. Items of lesser interest can be sampled less frequently, leaving more room in memory for those items of greater interest that can be sampled more frequently.

Log entries will be created using the smallest sampling interval assigned to any parameter. Since parameters can have different sample intervals, a log entry could have as few as 1 stored measurement value or as many as 16 stored measurement values.

Assigning a parameter a sampling rate of zero will cause that parameter to not be logged just as assigning the parameter a measurement type of "None" will cause it not to be logged.

A logger capacity calculation utility is provided in the WHT to show how many log entries will fit into logger memory (and how many days/hours/minutes this will cover) for a given number of assigned parameters and their assigned sample intervals. The user can experiment with changing the number of logged parameters and their sample intervals to see what effect this has on the total amount of log time available.

The Data Logger can run in NonStop Mode or OneShot Mode as described below:

In NonStop mode, when the logger memory is full the logger wraps around and continues to log new entries from the start of memory, overwriting the oldest entries as it goes.

In OneShot mode, when the logger memory is full the logger Auto-Stops and does not overwrite any older entries.

Clearing the Data Logger (from the "Clear Registers" menu branch) is independent of starting and stopping the logger. It can be performed at any time.

Shown below is a state diagram of Data Logger operation:
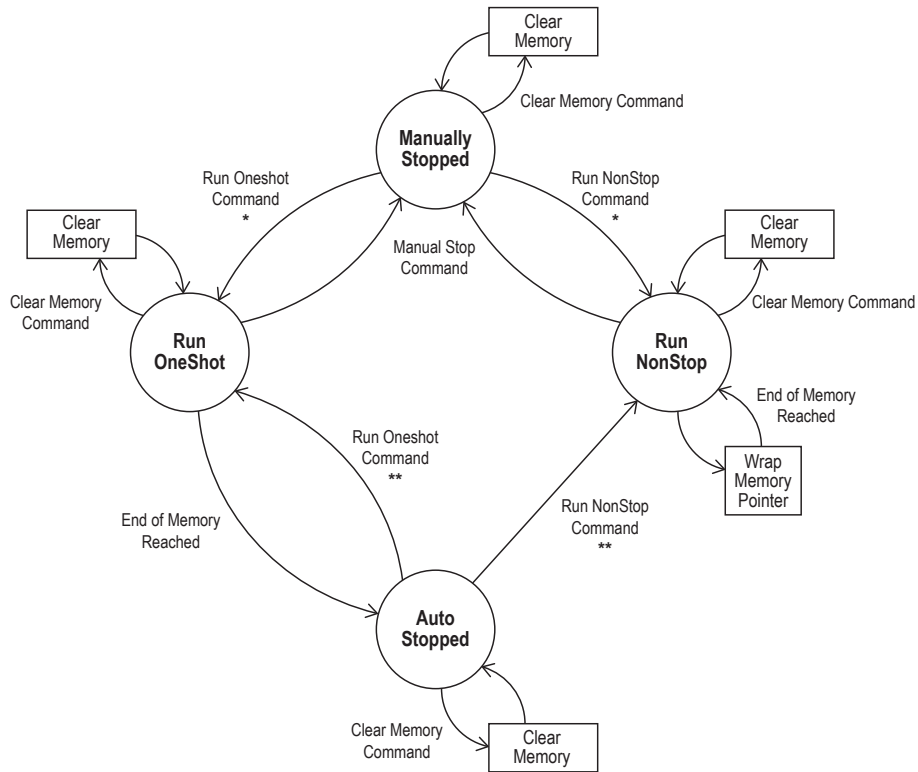
* Log memory is not cleared. Logging "picks up where it left off."
** Log memory is not cleared. Logging starts over at beginning of memory.

Logged data entries may be recalled from the front panel keypad (and Desktop Software) in the following ways:

Read Oldest Entry
Read Newest Entry
Read Entry By Timestamp
Read Next Entry (after reference point has been set by Oldest/Newest/Timestamp entry)
Read Previous Entry (after reference point has been set by Oldest/Newest/Timestamp entry)

If **Read Entry By Timestamp** is invoked and there is not a log entry with that exact timestamp, the closest timestamped entry either before or after the requested timestamp will be returned.

If **Read Next Entry** is invoked and the last entry read was the newest entry, the read operation will wrap around to the oldest entry. Similarly, if **Read Previous Entry** is invoked and the last entry read was the oldest entry, the read operation will wrap around to the newest entry.

"Config Logger" Sub Menu Items:

Logger State	E	Shows current state of logger and allows changing the state with the "<>" keys. Possible logger states are: Manual Stop (user can transition to Run NonStop or Run OneShot) Run NonStop (user can transition to Manual Stop) Run OneShot (user can transition to Manual Stop) Auto Stop (automatically set by logger logic from Run OneShot state) The user cannot transition from Run NonStop to Run OneShot mode or vice-versa directly, the logger must be set to Manual Stop before changing run modes. The user cannot set the logger to Auto-Stop because that is only done by the logger logic when the end of memory is reached in the OneShot mode. Refer to the logger state diagram.

Set Log Params   E   When this sub-menu is entered, the WHT makes a temporary copy of the 16-element array of parameter-measurement assignments. While working in this menu all new assignments made are updated in the temporary array. When the 16th parameter is selected and Enter is pressed, the temporary assignment array is copied back to the permanent assignment array. **No changes made take effect until the 16th parameter is selected and Enter is pressed, showing "Done!" on the display.**

For each parameter number shown on the top display line, the "<>" keys may be used to cycle through all the possible measurements that can be assigned to this parameter (shown on bottom line). When the desired measurement is displayed, pressing Enter will save that parameter-measurement assignment into the temporary array and the top display line will advance to the next parameter number. Even if you are not changing higher-numbered parameter assignments, you must still use Enter to advance all the way to the end of the assignment menu until you see "Done!" on the lower display line to save ANY new assignments made.

Set Log Times   E   When this sub-menu is entered, the WHT makes a temporary copy of the 16-element array of parameter sample interval assignments. While working in this menu all new assignments made are updated in the temporary array. When the 16th sample interval is selected and Enter is pressed, the temporary assignment array is copied back to the permanent assignment array. **No changes made take effect until the 16th sample interval is selected and Enter is pressed, showing "Done!" on the display.**

For each parameter number shown on the top display line, the "<>" keys may be used to enter a new sample interval for this parameter (shown on bottom line). Allowed sample intervals are from 0-1440 minutes in 5-minute increments. If a value is entered that is not a multiple of 5 minutes the it will be rounded to the nearest 5 minutes. If the desired value is less than 4 digits long, enter leading zeroes on the display.

Pressing Enter will save that sample interval time assignment to the temporary array and the top display line will advance to the next parameter number. Even if you are not changing higher-numbered parameter assignments, you must still use Enter to advance all the way to the end of the assignment menu until you see "Done!" on the lower display line to save ANY new assignments made.

Log Capacity   E   Selecting this menu item and pressing Enter will cause the log capacity to be calculated based on the current number of parameters enabled for logging and their assigned sample intervals.

When the capacity calculation is finished, the display will show the maximum number of entries that will fit in logger memory. Pressing the "<>" keys will show the equivalent number of days/hours/minutes of logger capacity. Further presses of the "<>" keys will toggle back and forth between the two result formats.

Read Log   E   Allows reading log entries stored in logger memory. When entered, the lower display line and "<>" keys will allow the user to select which type of log entry to retrieve:

Newest Entry
Oldest Entry
By Timestamp

If the user selects By Timestamp, additional lower display lines allow the user to enter the hour, minute, month, day, and year of the desired logger entry. The WHT then searches the log for an entry with a matching timestamp and returns it if found. If an exact timestamp match is not found, the closest entry below or above the desired timestamp will be returned.

The retrieved log entry is presented on the LCD display with the date and time on the top line and the recorded measurement values on the bottom line.

Pressing the Up key will fetch the Next Entry (newer) and pressing the Down Key will fetch the Previous Entry (older) relative to the currently displayed entry.

Due to space limitations on the LCD display, the lower display line will alternate the measurement name and its value.

Pressing the "<>" keys will rotate through other measurements, if any, that were saved in the same log entry."

"About" Sub Menu Items:

Contact Greystone	E	Displays Greystone Toll-Free phone number and website URL
Contact Greystone2	E	Displays Greystone phone number for international customers
Meter SN	E	Displays the meter serial number.
Firmware Ver	E	Displays the meter firmware version.
Wiring Config	E	Displays whether volt-amp input wiring was manually configured or auto-configured.
Date & Time	E	Displays the WHT real-time clock date and time values (static display, time does not advance)
Peak KW TStamp	E	Displays date & time that Peak sliding-window KW occurred
Clr Pek TStamp	E	Displays date & time that Peak KW was last cleared.
Clr Tot TStamp	E	Displays date & time that KWH/KVARH/KVAH Totalizers were last cleared.
Comm Option	E	Displays communication option (if any) installed in the WHT.
Cell Signal	E	Displays signal strength of cellular modem card (if installed)
Logger Status	E	Displays the current state (Run NonStop, Run OneShot, Manual Stop, or Auto Stop) of the logger if the Data Logger option has been activated.

"Run & Display" Sub Menu Items:

Go!	E	Exits the **Setup Mode** and enters the **Run Mode**.

Appendix A
Scaling Calculations for 4-20 mA Output

All KW and KVA measurements on the mA output make use of the "Maximum System KW" value calculated as follows:

For 2-Wire and 3-Wire 1_Phase systems: Max Sys KW = System Volts x System Amps/1000

For 3-Phase systems: Max Sys KW = System Volts x System Amps x 1.73/1000

For all KW measurements except BiDirectional KW:

If KW is negative, mA = 4.0
If KW is positive, KW = Max Sys KW x (mA value – 4mA)/16

Example: Max Sys KW = 150KW
                Measured mA = 10 mA
                Actual KW = 150KW x (10mA – 4mA)/16
                Actual KW = 56.25KW

For BiDirectional KW Measurement:

KW = (2 x Max Sys KW) x (mA value -12)/16
(all mA values below 12 mA indicate negative power)
(all mA values above 12 mA indicate positive power)

Example: Max Sys KW = 150KW
                Measured mA = 7 mA
                Actual KW = (2 x 150KW) x (7mA – 12 mA)/16
                Actual KW = -93.75KW

Example: Max Sys KW = 150KW
                Measured mA = 15 mA
                Actual KW = (2 x 150KW) x (15mA – 12mA)/16
                Actual KW = 56.25KW

For KVA measurement:

KVA = Max Sys KW x (mA value − 4mA)/16

Example: Max Sys KW = 150KW
                Measured mA value = 16 mA
                Actual KVA value = 150KW x (16mA − 4mA)/16
                Actual KVA value = 112.5KW

For Total PF:

Total PF = 1.00 x (mA value − 4mA)/16

Example: Measured mA value = 18.5mA
                Actual Total PF = 1.00 x (18.5mA − 4mA)/16
                Actual Total PF = 90.625

For Average Amps:

Average Amps = System Amps x (mA value − 4mA)/16

Example: System Amps = 400
                Measured mA value = 13.5mA
                Actual Average Amps = 400 x (13.5mA − 4mA)/16
                Actual Average Amps = 237.5 amps

For Average Volts:

Average volts is scaled with respect to 115% of stated system voltage because sometimes system voltages ARE a bit higher than the stated value.

Average Volts = (1.15 x System Volts) x (mA value − 4mA)/16

Example: Stated System Volts = 480V
                Measured mA value = 18mA
                Actual Average Volts = (1.15 x 480V) x (18mA − 4mA)/16
                Actual Average Volts = 483 volts

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