

SERIES 1200 TWO CHANNEL AMPERE-HOUR/MINUTE TOTALIZER/PUMP CONTROLLER

OPERATION AND
SERVICE GUIDE
O-1265A
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Refer to Bulletin A-104.

PRODUCT DESCRIPTION

When connected to a direct current shunt or multiple shunts (two max.), the dual input Ampere-Hour/Minute Controller calculates total integrated current over time to provide totalized ampere-hours or ampere-minutes on a digital readout. Typical applications include battery charge/discharge testing or chemical plating tank control. An output is also generated to control a chemical addition pump proportional to total plating current for the precise addition of brightener or other chemicals. The field programmable unit can be set up to provide direct readout in ampere-hours or ampere-minutes from a wide range of direct current shunts. A computer is not required for setup or operation.

A preset function is included to allow disabling the chemical pump and triggering an alarm relay after a preset ampere-hour/minute quantity has been totalized. A keypad button sequence resets the alarm preset/alarm function to place the unit back in operation. A keypad button sequence also allows resetting the totalizer readout to zero.

Electrical terminals are provided to disable the unit in the event of low chemical liquid level using an optional liquid level switch.

The shunt input signals are electrically isolated from each other to prevent "ground loop" problems when connecting to multiple shunts. One or two shunt inputs can be connected — the unit totalizes both inputs and controls the chemical pump proportional to the total input current. A 4-20 mAdc isolated signal is provided for recording total shunt current.

The front panel display allows reading accumulated ampere-hours/minutes and user setup information with entries made via the keypad. In the event of temporary or long term power interruption, register values are stored in non-volatile memory.

Accuracy: +/-0.5% and +/-one count over a range of 1% to 150% of connected shunt rating with ambient temperature range of 40 to 120°F. Does not include shunt accuracy. Totalizer accuracy maintained with input voltage variation of +/-20% and frequency variation of 45 to 100 Hz. Input impedance 100,000 ohms. Low pass filter included on shunt inputs to prevent errors due to electrical noise interface. Calibrated shunt leads are not required but should be shielded to reduce noise pickup.

Display: Eight (8) digit, 0.3 inch high alpha-numeric red LED. Resolution +/- one digit. Temporary power loss does not affect last totalizer reading.

Control output: Solid state relay contact closure, SPST, 5 Ampere N.O. may be connected for percentage ON/OFF controlling a 115/230 VAC motor driven chemical addition pump. Percentage (10% - 100%) cycle reset time is one minute.

Control Relay: Reed relay, SPDT, 0.1 mAdc for pulsing electronic chemical addition pump.

Alarm Relay: Solid state relay contact closure, SPST,

115/230 VAC, 5 Ampere, N.O.

Output Signal: 4-20mAdc, 600 ohm maximum, electrically isolated from other circuitry and shunt inputs, proportional to total shunt current.

Input Voltage: Switch selectable 115/230 VAC, 50/60 Hz. Fuse, 3AG, 7 ampere for solid state relay loads. Electronics fuse: 0.5 Amp Slo-Bl.

Status Indicators: 8-digit display LED show power is applied. Ampere-hour or ampere-minute LED shows display units. Program LED shows unit is in programming mode and not running. Preset LED shows a preset event has occurred. Low chemical LED shows the chemical supply level is low causing the alarm relay to operate. Pump output LED pulses with each stroke of the electronic chemical pump.

Programming: Keypad data input for user programming shunt current rating, ampere-hour or ampere-minute totalizing, totalizer reset, preset reset and preset values plus factory/field calibration.

INSTALLATION

Select a location for mounting the controller on a vertical wall, pole, or panel with good visual accessibility. Operating power must be supplied together with the shunt input signal. Also, the 4-20 mAdc output must be connected to the desired optional recording device. The chemical addition pump (electric, motor driven, or both), low liquid level switch and alarm relay connections must be connected as required for specific applications. A customer supplied external power disconnect switch with GFI must be provided as a power switch or GFI protector is not provided within the controller.

Refer to the connection layout figure for electrical connection to be made in accordance with local requirements. Position the voltage select switch for the anticipated operating voltage, either 115 or 230 VAC, 50/60 Hz. Units supplied by the factory to operate on 115 VAC are prewired with an eight foot, 3-wire cord and molded plug.

As indicated on the connection diagram, AC power is connected to TB101 as shown in the TB101 connection box. The unit is shipped with two wire jumpers connecting AC fused input to each solid state relay (SSR). SSR1 is for powering a motor operated chemical pump and SSR2 is for powering an alarm device such as a contactor, relay or other AC line powered signal device.

TB102 allows connecting the 4-20 mAdc output signal to an external device such as a recorder or datalogger. An external level switch is also connected to TB102, Terminals 5 and 6. Depending upon the level switch action, the controller must be programmed during the set-up procedure. Refer to Setup section.

The external shunts, one or two, are connected as indicated on TB103. The shunt leads should be shielded and routed away from power or control wires.

TB104-1, 2 is preconnected to a three pin female connector located on the enclosure bottom. A ten (10) foot cable is supplied with the controller to facilitate controlling an electronic pulsing type electronic pump.

PANEL CONTROL DESCRIPTION

1. LED Display

- Ampere Hours - Indicates unit has been programmed to totalize ampere hours; i.e., at the end of one hour, the display will show 100 if 100 amperes passed through a 100 ampere shunt for one hour.

- b. Ampere Minutes - Indicates the unit has been programmed to totalize ampere minutes; i.e., at the end of one minute, the display will show 100 if 100 amperes passed through a 100 ampere shunt for one minute or will display 6000 at the end of one hour.
- c. Program Mode - Indicates the unit is in the programming mode and will not totalize. All outputs disabled.
- d. Preset Reached - Indicates the totalizer has reached the previously programmed preset value, operated the alarm relay and disabled the pump output relays. The unit will no longer totalize when the preset is reached.
- e. Low Chemical - Indicates the optional remote liquid sensor has operated and activated the alarm relay. Totalizing will continue if shunt output voltage still exists.
- f. Pump Output - Indicates the pump signal operation. When programmed, the LED will blink 0 to 100 pulses per minute, proportional to total shunt current, for an electronic chemical pump.

2. EIGHT DIGIT DISPLAY

- a. When operating, the display shows totalized ampere hours or ampere minutes up to a total of 99999999 and then starts over from zero.
- b. During programming mode, the display shows the programmed shunt size for each of two shunt inputs, and the preset value. The various values are viewed by scrolling the arrow keys. Refer to the flow chart for the sequence.

3. KEYPAD

- a. 0 through 9 - Used to enter the value shown on key
- b. Mode - Used to enter/exit the programming mode
- c. Arrows (Up and Down) - Used to scroll through the shunt and preset settings.
- d. Enter - allows changing values for shunt or preset values.
- e. Clear - Used to clear existing entries for shunt or preset values, during data entry.
- f. FTN - Used in conjunction with other keys to perform special functions. After pressing FTN, the program LED will flash indicating a pending function request. This mode will remain active for 5 seconds or until another key is pressed. Special functions include:
 - FTN -Clear: Clears alarm preset/alarm condition
 - FTN -1: Resets totalizer to zero
 - FTN -2: Display actual Shunt #1 current in amperes
 - FTN -3: Display actual Shunt #2 current in amperes
 - FTN -4: Display actual Shunt #1 output in millivolts
 - FTN -5: Display actual Shunt #2 output in millivolts
 - FTN -6: Display current software version

SETUP

Programmable setup options are accessed by selecting Mode on keypad when operating power is applied. The display will show SET-UP. Use UP/DOWN to scroll through the menu options and press ENTER to activate a specific selection. If the keypad sees no activity for 5 seconds, the unit will time out and automatically revert to normal operating mode. To manually exit, press MODE on the keypad. Refer to the flow chart for the set-up sequence steps.

To prepare for operation, set-up the following parameters:

1. #Inputs - Total number of shunts connected to unit
2. Tot Mode - Totalize Ampere-Hour or Ampere-Minute
3. Shunt E - Shunt rated output voltage in millivolts
4. Shunt 1 - Shunt rated current in Amperes
5. Max. 1 - Shunt current for maximum pulse output in Amperes
6. Max Strk - Maximum pump output rating in strokes per minute
7. Preset - Totalizer preset value to disable pumps and operate alarm relay.
8. Ext. Dis - Indicates the remote liquid sensor has operated and activated the alarm relay. The disable feature may be

programmed to sense either a high or low (as compared to common) disable signal.

Total number of shunts connected to unit: total number of input shunts connected to the unit (2 max.). The totalized display will reflect the cumulative total of both shunts connected. Use UP/DOWN keys to toggle selection. Press ENTER to exit.

Totalize Ampere-Hour or Ampere-Minute: Determines the totalizing units with the appropriate status LED reflecting selection. Use UP/DOWN keys to toggle selection. Press ENTER to exit. The totalizer resets to zero when changing from one unit to the other.

Shunt Output Voltage: The full scale output voltage rating produced by the shunt in millivolts. If 2 -channel operation is selected, use the UP/DOWN keys to select desired channel, then press ENTER to display the setting for that channel. To change the value press CLEAR. Enter the new value on the keypad and press ENTER to accept the entry. If a mistake is made during keypad entry, press CLEAR and re-enter the value. Press ENTER to exit the option. Note the maximum value for the option is 600 millivolts. If a greater value is entered, the unit will prompt 600MX (maximum) and the last valid value entered remains.

Shunt Rated Current: The maximum current rating at the specified shunt output voltage for each shunt in amperes. If two channel operation is selected, use the UP/DOWN keys to select desired channel, then press ENTER to display the setting for each channel. To change the value, press CLEAR. Enter the new value on the keypad and press ENTER to accept entry. If a mistake is made during keypad entry press CLEAR and re-enter the value. Press ENTER to exit the option. Note the maximum value is 99999. If a greater value is entered, the unit will prompt 99999MX (maximum) and the last valid value entered remains.

NOTE: Direct current shunts are specific with a voltage output at a particular full range current. For example: 50 millivolt, 500 ampere shunt.

Shunt current required for Maximum Pulse Output: The amount of anticipated total shunt current required to achieve maximum pump pulse output. Useful when the process never approaches the maximum shunt rating, but still requires maximum pump output.

Press ENTER to display current setting. To change the value press CLEAR. Enter the new value on the keypad and press ENTER to accept the entry. If a mistake is made during keypad entry press CLEAR and re-enter the value. Press ENTER to exit the option. Note the maximum value is the anticipated sum of the shunt rated currents for the channels enabled. If a greater value is entered, the unit will prompt xMx (where x is the total current) and the last valid value entered remains.

PUMP PULSE OUTPUT: The maximum number of pump output pulses required per minute. Adjustable from 0 - 100 pulses per minute. Proper setting depends upon electronic pump manufacturer rating to prevent pump damage due to exceeding specified maximum pumping rate. Press ENTER to display current setting. To change the value press CLEAR. Enter the new value on the keypad and press ENTER to accept the entry. If a mistake is made during keypad entry press CLEAR and re-enter the value. Press ENTER to exit the option. Note maximum value is 100 pulses per minute. If a greater value is entered, the unit will prompt 100 MAX (maximum) and the last valid value entered remains. Note there is NO TIME-OUT. To exit the mode, press ENTER on the keypad.

TOTALIZER PRESET AMOUNT TO DISABLE RELAY PULSE OUTPUT: The totalized amount required to disable pump output and operate alarm relay. A value of zero (0) will

disable the preset action; the unit will still totalize but no preset event will occur. Press ENTER to accept the entry. If a mistake is made during keypad entry, press CLEAR and re-enter the value. Press ENTER to exit the option.

EXTERNAL DISABLE: The optional level detector is connected to TB102-5 and TB102-6. Depending on the selected disable signal sense, the external detector must be connected as follows:

- **Lo** (Default setting) Connect normally open (N.O.) (low level) TB102-5 and TB102-6. No connection on TB102-4.
- **Hi** Connect normally closed (N.C.) (low level) to TB102-5 and TB102-6. No connection on TB102-4.

Be sure to program external disable for the desired action.

USER CALIBRATION

User calibration options are accessed by selecting FTN on the keypad while in the User Programmable Mode. The display will show HDWR.CAL. Use UP/DOWN to scroll through the menu options and press ENTER to activate. If the keypad sees no activity for 5 seconds the unit will time out and automatically revert to normal operating mode. To manually exit, press FTN on the keypad. Refer to the flow chart for the sequence.

NOTE: A variable precision voltage source (0 to 500 millivolt range) is required to facilitate calibration. Do not attempt to calibrate the unit if a calibrated source such as a variable precision voltage source is not available. To abort the calibration process at any time press CLEAR.

Calibration allows adjustment of the following parameters:

1. Cal #1 - Calibrate channel #1
2. Cal #2 - Calibrate channel #2
3. Mntr. #1 - Monitor channel #1
4. Mntr. #2 - Monitor channel #2
5. Cal SPM - Calibrate strokes per minute
6. Cal 4-20 - Calibrate 4-20 mA Output
7. Fact Rst - Factory Reset

Calibrate Channel #1: Two point calibration of input Channel #1. Remove shunt connection to controller. Input OmV from the precision voltage source to Channel #1 as the display shows ZERO and press ENTER on keypad. With the display reading SPAN, apply the programmed full-scale shunt output voltage (defined in D. Set Up parameters) to Channel #1. Wait at least 1 second to allow the signal to settle, then press ENTER on the keypad. To abort the calibration process at any time press CLEAR. Error message will display if the calibration sequence or value is not correct.

Calibrate Channel #2: Two point calibration of input Channel #2. Remove shunt connection to controller. Input OmV from the precision voltage source to Channel #2 as the display shows ZERO and press ENTER on keypad. With the display reading SPAN, apply the programmed full-scale shunt output voltage (defined in D. SET UP parameters) to Channel #2. Wait at least 1 second to allow the signal to settle, then press ENTER on the keypad. To abort the calibration process at any time press CLEAR. Error message will display if the calibration sequence or value is not correct.

Monitor Channel #1: Allows continuous monitoring of shunt #1 mV output. Press ENTER to activate. Note there is NO TIME-OUT. To exit the mode, press ENTER on the keypad.

Monitor Channel #2: Allows continuous monitoring of shunt #2 mV output. Press ENTER to activate. Note there is NO TIME-OUT. To exit the mode, press ENTER on the keypad.

Calibrate SPM: Single point calibration for strokes per minute (SPM) output for electronic type pump. Press ENTER

to enable calibration and unit will output 100 SPM as shown on the display. Connect an oscilloscope or period counter to R115 (power supply PCB) and use UP/DOWN keys to adjust for a period of 600 milliseconds. Alternately, a stopwatch can be used to time the number of pulses generated in one minute. When adjusted, press ENTER to complete the calibration. Note if the calibration becomes difficult or confusing, perform the factory reset as described elsewhere in this manual.

Calibrate 4-20 mA Output: 2 point calibration of 4-20 mA output. Install a mAdc meter in the output loop. The unit will output 4mA and display 4mA OUT. Use UP/DOWN keys to slowly adjust the output, while #3 or 9 keys will quickly move the output. Once 4mA output has been corrected, press ENTER to adjust the next point. The unit will now output 20mA and display 20mA OUT. Adjust the output using the same keys as before and press ENTER to complete the calibration.

FACTORY RESET: Restores original factory presets on all parameters. Upon selecting, the unit will prompt RESET?? To reset the unit, press and hold ENTER, then press #1. Any other key operation will abort the reset process. When activated, the unit will display PROGRAM! as the factory defaults are being reprogrammed to the internal EPROM; the unit then "reboots" using the default parameters.

Note: The factory reset procedure will necessitate re-calibration per Section E for optimum performance. The factory defaults are as follows.

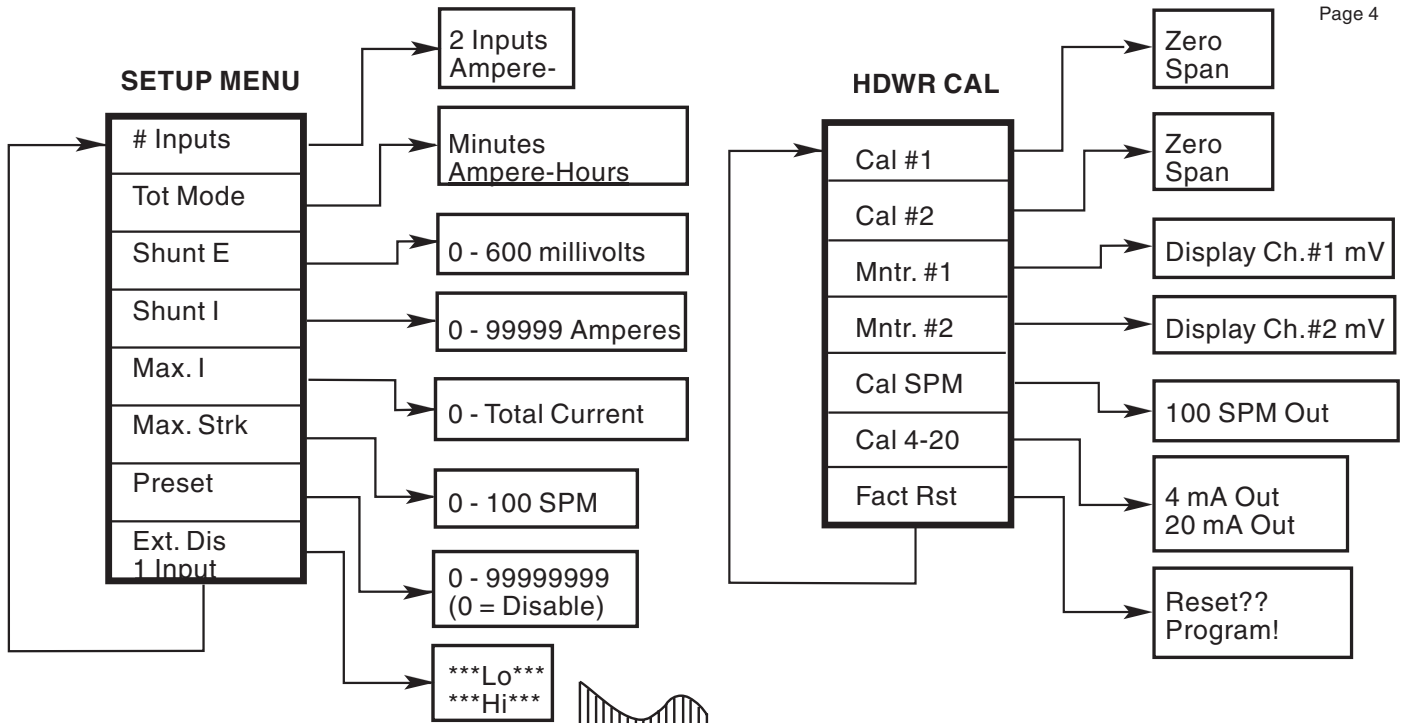
- | | | |
|-------------|---|------------------------|
| 1. #Inputs | - | 1 Input |
| 2. Tot Mode | - | Ampere Hour |
| 3. Shunt E | - | 500 millivolts |
| 4. Shunt 1 | - | 100 Amperes |
| 5. Max. 1 | - | 100 Amperes |
| 6. Max Strk | - | 100 Strokes per Minute |
| 7. Preset | - | 0 (No preset event) |
| 8. Ext. Dis | - | Lo |

ERROR MESSAGES

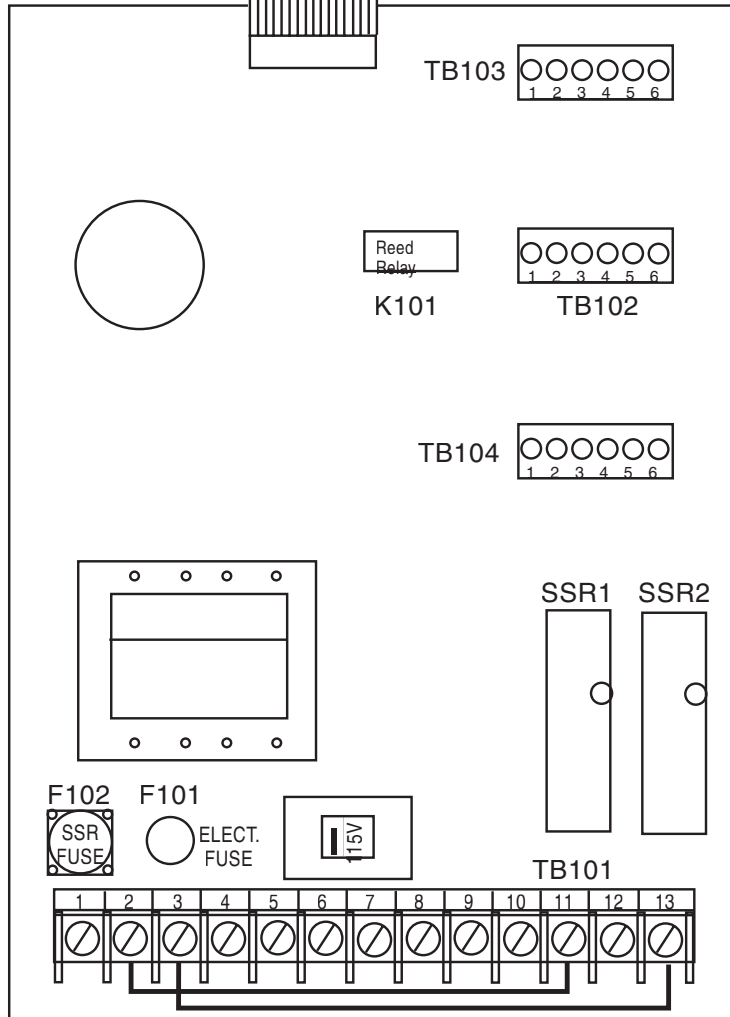
Error 1 - Improper Calibration. Unit was calibrated backwards (full-scale was applied at zero cal and zero was applied for span). Re-calibrate the unit using proper sequence.

Error 2 - A/D System Error. A problem has developed with the A/D converter system. Check shunt input leads for open or wrong polarity connections. Perform a factory reset. If error still remains, contact Application Engineering Department.

Error 3 - Internal System Error. A major failure has occurred within the unit. Contact Application Engineering Department.



- 1 - AC HOT (INPUT)
- 2 - AC FUSED
- 3 - AC FUSED
- 4 - AC COMMON (INPUT)
- 5 - AC COMMON (OUTPUT)
- 6 - AC COMMON (OUTPUT)
- 7 - EARTH (INPUT)
- 8 - EARTH (OUTPUT)
- 9 - EARTH (OUTPUT)
- 10 - SSRI (PUMP, AC)
- 11 - SSRI
- 12 - SSR2 (ALARM, AC)
- 13 - SSR2



- TB103**
- 1 - INPUT #1 + SHUNT
 - 2 - INPUT #1 - SHUNT
 - 3 - EARTH
 - 4 - EARTH
 - 5 - INPUT #2 + SHUNT
 - 6 - INPUT #2 - SHUNT

- TB102**
- 1 - EARTH
 - 2 - 4-20 mA OUT +
 - 3 - 4-20 mA OUT -
 - 4 - +12 VDC
 - 5 - ENABLE
 - 6 - COMMON

- TB104**
- 1 - RELAY COM.] Electronic Pump
 - 2 - RELAY N.O.]
 - 3 - RELAY N.C.
 - 4 - SPARE
 - 5 - SPARE
 - 6 - SPARE

F101=3AG, 0.1 AMP, SLO-BLO
F102=3AG, 5 AMP, SLO-BLO



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