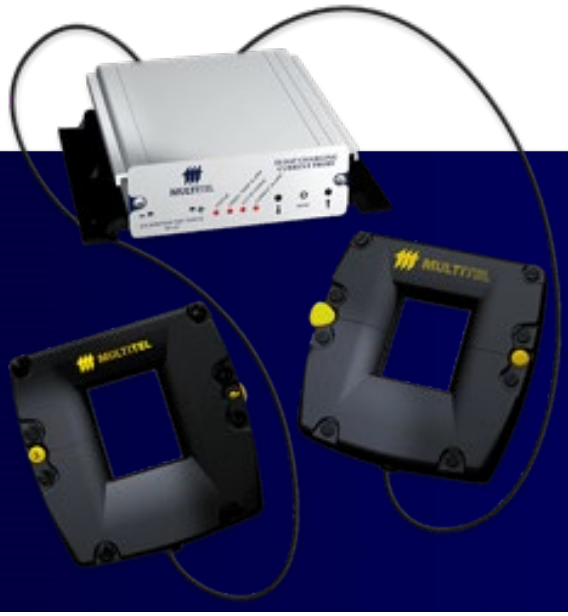

USER MANUAL
FCCP

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Revised by :	B. Méthot
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If the equipment is used in a manner not specified by the Multitel, the protection provided by the equipment may be impaired.

TABLES:

FIGURES:

CONTROL SHEET

ISSUE	*DATE*	*DESCRIPTION*	*ORIGINATOR*
1.0	2000/02/07	First release	A. J. Brown
1.1	2000/12/10	Minor corrections and improvements. New Quick installation section.	G. Watelle D. Vautour K. Simard
1.2	2001/03/20	Review and minor corrections.	K. Simard
1.3	2001/11/28	Added guideline for finding float current	D. Vautour
1.4	2003/10/21	Added difference between high float current alarm delay and low float current alarm delay.	D. Vautour, EIT
1.5	2004/04/28	Review the power connection identification	F.Dionne
1.6	2004/06/29	Removed references to high temperature threshold.	D. Vautour, ing
1.7	2005/12/10	Minor corrections	A. Dion
1.8	2010/03/21	Added new UPS models, and minor modification to section 2, 3 and section 6	S. Methot
1.9	2011/10/07	Change adress	E. Boivin
1.92	2015/04/23	Note added to "Table 1"	S. Méthot
1.93	2016/02/10	Changed Certification Agency	S. Méthot
1.94	2017/06/07	Visual modifications	M. Greaves
2.0	2019/04/04	New 4-20mA analog ouptuts.	S. Methot
2.01	2019/09/16	Correction in table 9 – Current scale	S. Méthot
2.02	2022/03/03	Additionnal sensor installation	B. Méthot

1. QUICK INSTALLATION

This section contains a quick installation and programming procedure. If you need more information about installation or programming, read the chapters 7 and 8. It is strongly recommended that you read the entire manual before using the FCCP.

⚠WARNING !

Protect equipment and power system

All connections to live voltage must be protected with a fuse (500 mA, 250 V, slow blow) located as close as possible to the voltage source.

⚠WARNING !

The PWR terminals must be supplied from an SELV source in accordance with IEC 1010-1 appendix H.

⚠WARNING !

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.1 TOOLS AND MATERIALS REQUIRED

- Wire stripper, Cutters and pliers
- Crimping tool for alarm and analog output wiring
- Digital Voltmeter/Ammeter, 3½ digit (or better) with 0.8 inch or 2mm probe tips

- Pointed-end tool, such as a multimeter equipped with probes (for pressing the limited-access button).
- A calculator, if you need to determine your float current.

1.2 QUICK INSTALLATION PROCEDURE

1. Install the sensors around the battery cables:

    - If the sensor is installed on the positive side of the battery, the arrow on the sensor must point toward the pole.
    - If the sensor is installed on the negative side of the battery, the arrow on the sensor must point toward the load. Refer to figure 5.
    - For more information, read section 6.2.

2. Insert the sensor head's connector on the SENSOR connector at the back of the control unit.

3. Install the power cable but do not connect it to the monitor at this point. For more information, read section 6.3.
4. Connect the FCCP's form-C dry contact alarms to the local alarm collector. For more information, read section 6.7.
5. Calibrate the sensors:
   - Position the sensors next to the cable (for calibration, it is important that the sensor has the same orientation as when it is installed). There should be no wire passing through the sensor head.
   - While holding the UP (🡅) and DOWN (🡇) buttons, connect the power connector to the back of the control unit.
   - When all LEDs are activated, release the buttons.
   - Wait for approximately one (1) minute or until the LEDs on the front panel become deactivated.
   - For more information, read section 6.8.
6. Reinstall the sensor around the current carrying conductor (pay attention to polarity).

If necessary, fasten the sensor head in place using tie wraps.

1.3 QUICK PROGRAMMING PROCEDURE

1. Consult your battery manufacturer or its representative in order to determine the float current and its appropriate high and low thresholds or, use the proposed threshold set up procedure in section 7 for the corresponding battery type.
2. Then use Table 5 – Scale Reference Table provided by MULTITEL to determine scale reference:

   High threshold _____mA, giving _____mVdc

   Low threshold _____mA, giving _____mVdc
3. Insert the multimeter probes into the CALIBRATION TEST POINTS on the control unit's front panel. Set the multimeter to read mVdc.
4. Set the low float charging current threshold for sensor A:
   - Press the MODE button once.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	OFF	OFF	OFF

   - Press the UP (🡅) or DOWN (🡇) button until reaching the mVDC reading for the low threshold value.
   - For more information, read section 7.2.
   - Set the high float charging current threshold for sensor A:
   - Press the MODE button a second time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	OFF	OFF	ON

- Press the UP (🡅) or DOWN (🡇) button until you reach the mV reading for the high threshold value.

5. If your FCCP comes equipped with two (2) sensors heads, set the low threshold for the sensor B:
   - Press the MODE button a third time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	OFF	ON	OFF

   - Press the UP (🡅) or DOWN (🡇) button until you reach the mVDC reading for the low threshold value.
6. Set the high threshold for the sensor B:
   - Press the MODE button a fourth time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	OFF	ON	ON

   - Press the UP (🡅) or DOWN (🡇) button until you reach the mVDC reading for the high threshold value.
7. Activate or disable the maintenance timer:
   - Press the mode button a fifth time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	ON	OFF	OFF

   - Press the DOWN (🡇) button until you reach 0mVdc to disable the timer.
   - Press the UP (🡅) button until you reach the mVDC reading corresponding to the correct number of weeks. Refer to Table 7 – WEEK SCALE REFERENCE TABLE for reference voltage.
   - For more information, read section 7.4.
8. Activate or disable threshold compensation according to temperature:

   Attention : this feature **must be disabled** for Ni-Cd batteries at all times.

   - Press the MODE button a sixth time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	ON	OFF	ON

- If the batteries are installed in a controlled environment or if a temperature compensated battery charger is used, disable this option by pressing the DOWN (🡻) button until you reach 0 mVDC.
- If not, press UP (🡹) button until you reach 50mVdc to activate compensation.
- For more information, read section 7.5.

9. Activate or disable alarm latching:
   - Press the MODE button a seventh time.
   - Check LEDs on the front panel. The display should correspond to the following:

STATUS	TIMER	OUT OF RANGE	CURRENT ALARM
ON	ON	ON	OFF

   - Press the DOWN (🡻) button until you reach 0mVdc to disable alarm latching.
   - Press the UP (🡹) button until you reach 50mVdc to enable alarm latching.
   - For more information, read section 7.6.
10. Exit program mode:
    - Press the MODE button.
    - All LEDs should become deactivated.
11. Check installation and configuration:
    - Wait for 25 minutes.
    - In the meantime, fill the following information:

Make: _____ Battery model: _____

Battery capacity: _____ A-Hr Operating voltage: _____Vdc

Is the battery installed in a controlled environment? (Yes) (No)

Is there a temperature-compensated rectifier? (Yes) (No)

12. Verify that no LED becomes activated during the 25-minute period.

2. INTRODUCTION

2.1 DESCRIPTION

Congratulations! You are now the proud owner of a MULTITEL Float Charging Current Probe (FCCP) featuring user-adjustable low and high current thresholds, a user-adjustable maintenance timer, and user-selected latching alarms and threshold temperature compensation. The FCCP is patented in Canada and in the United States. Before using your FCCP, **please read the instructions** in this manual carefully to get to know the operation and care of your FCCP.

Studies have demonstrated that before any other visible sign of degradation can be observed, battery float charging current will show signs of thermal runaway.

2.2 APPLICATION

In typical standby power applications using constant voltage, such as in telecom sites, float charging current flows through battery strings to maintain cell polarisation and charge. Monitoring this small current is an effective way to detect changes in battery integrity, which can result in thermal runaway.

The FCCP is a non-intrusive sensor that helps identify the onset of thermal runaway before it becomes a critical condition, thus improving safety in telecom sites and helping in the prevention of loss of service due to battery failure.

The FCCP contains a proprietary and innovative digital measurement technique that analyses float charging current behaviour throughout the life of your battery. Maintenance personnel can be notified of abnormal float charging current, indicating that battery evaluation should be performed using recommended battery maintenance practices (IEEE 1188-1996).

2.3 FCCP OPTIONS

This product is best suitable to valve regulated lead acid (VRLA) and Nickel-Cadnium (Ni-Cd) battery standby application. However, it also usable with flooded type batteries. Depending on the standby battery application you have, few options are available and should be reviewed with your Multitel sales representative to provide you with the best fit for your application.

Some of the various difference resides in high float current alarm delay: 24 hours for Ni-Cd versus 6 hours for the VRLA. Ni-Cd batteries take more time to get back to full state of charge after discharging. The threshold temperature compensation must be **DISABLED** for application with Ni-Cd batteries.

FCCP Firmwares, for VRLA batteries, we have 2 firmware available, first one for 48Vdc and 125Vdc dc power systems respectively found in telecom and power utility substation. The other one is best suited for UPS system independent of the dc voltage application.

The difference resides in the measurement responce time. The M-5604 and M-5605 are typically recommended for UPS using a burst mode charging method and thus, it provides a greater rejection noise and very low frequencies in the mHz range. However the time to react (responce time) will be slower than M-5601 and M-5602 models.

Also, new part number have recently been added to provide a 4-20mA output signal which is better suitable to interface with building automation systems, PLCs or remote monitoring devices.

Contact your Multitel representative to know more about your FCCP options.

2.4 CONTENT

In addition to chapter 1, which introduces a quick install procedure, this document contains the following chapters:

Chapter 2, INTRODUCTION, presents a brief description of the FCCP.

Chapter 3, COMPONENTS, describes the device's technical specifications.

Chapter 4, THEORY OF OPERATION, explains the theory behind the FCCP, to make the technical specifications possible.

Chapter 5, USING THE FCCP, shows how to use the FCCP in the normal mode.

Chapter 6, INSTALLATION, describes the hardware installation procedure of the FCCP.

Chapter 7, PROGRAMMING, contains the procedure for programming the FCCP after the installation.

Chapter 8, MAINTENANCE, describes the necessary maintenance after the installation and a troubleshooting section.

3. COMPONENTS

3.1 GENERAL DESCRIPTION

Below is an illustration of the FCCP's front and back panels. Acquaint yourself with the location of the three (3) buttons and of the LED display. These make up the FCCP`s user interface and are referred to throughout the manual.

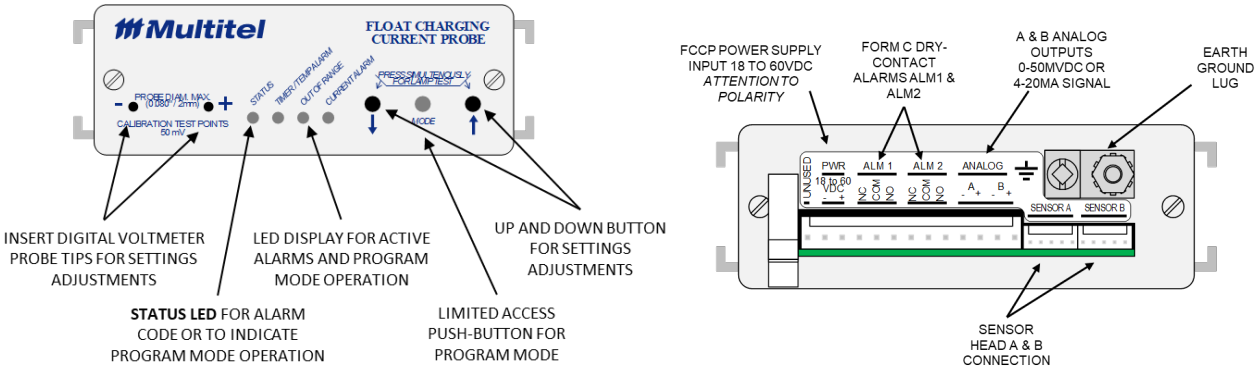
False alarms are difficult to deal with and are typically very costly. Your FCCP is equipped with a comprehensive combination of digital signal processing and solid-state filtering to remove all nuisance alarms. Depending on the conditions it is analyzing, the FCCP will mask alarms long enough to ensure they are undisputable.

3.2 BEST UTILIZATION PRACTICE

Following are a few comments for best operation and utilization of the product:

1. Determine the FCCP that suits your VRLA application, for UPS using a burst mode charging method, use the M-5604 and M-5605 models.
2. The 0-50mVdc or 4-20mA analog output provides a mean to perform trending study. It is not recommended to generate low or high charging current alarm from this signal. Use the ALM1 and ALM2 instead.
3. Read chapter 7 thoroughly as it provides essential information regarding thresholds adjustments, especially the high float charging current for detection of thermal runaway.
4. When defining your threshold levels, take in consideration the following:
5. Battery room temperature and float voltage levels
6. On-line resistance test which may generate false alarm when in progress,

Figure 1 - Front and Back Panels



3.3 FUNCTIONAL SPECIFICATIONS

The robust and rugged FCCP can operate in extreme conditions encountered in telecommunications and data center sites. The FCCP conforms to the following specifications:

Operating and storage temperature	-40°C at +65°C (-40°F at 149°F)
Operating and storage humidity	5% to 95% non condensing for continuous operation
Altitude	61 meters (200 feet) below sea level to 3,962 meters (13,000 feet) above sea level.
Input voltage requirements	• 18Vdc to 60Vdc - Use a Class 2 power supply • Reverse polarity protected • Do not exceed 75Vdc • Order part No. for 120Vac power supply
Optional 120Vac power supply for the FCCP controler	Part No: **C-M835AS** 
Power consumption	2.85 watts typical (3.8 watts maximum) for FCCP with one sensor, 3.1 watts typical (5 watts maximum) for FCCP with two (2) sensors.
0-50mVdc analog outputs	• 100 Ω output impedance, • 75Vdc over voltage protection via non-replaceable fuse (must be serviced by manufacturer) • Outputs are not isolated from FCCP power supply input.
4-20mA loop analog outputs	• Passive 4-20mA loop, use of 12Vdc power supply is recommended. • **Do not exceed 30Vdc** to prevent unit damage. • Reverse polarity protected. • 4-20mA loop is isolated from power supply up to 500V
Form-C dry-contact relay alarm outputs	Contact ratings: 0.5 A @ 60 VDC/33 Vrms
Pollution degree	2

3.4 CERTIFICATIONS

Your FCCP has been designed and has met the strictest of certifications:

EMC	EN 61326 - *Electrical equipment for measurement, control and laboratory use.* FCC Part 15 Subpart B Class B
Electrical Safety	CSA/UL/EN 61010 - *Electrical equipment for measurement, control and laboratory use.*
CE	CE marking is applied to this product in compliance with the European Union and a declaration of conformity has been produced.

NOTE :

- This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

4. THEORY OF OPERATION

4.1 A UNIQUE DATA ACQUISITION TECHNIQUE

Generally, VRLA battery expected life depends on battery design and operating conditions. In typical standby power applications using constant voltage such as in telecommunications sites, float charging current flows through battery strings to maintain cell charge and polarization. Several VRLA battery studies conclude that float-charging current is the most significant parameter to monitor. Measuring this small current is an effective way to detect changes in battery integrity, thermal runaway phenomena and other predominant failure modes, at the root.

Your FCCP contains a proprietary and innovative digital measurement technique that analyzes float charging current behaviour throughout the life of your battery string. Your FCCP has the capability to notify the maintenance personnel of abnormal float charging current, at which time battery maintenance can be made using recommended practices (IEEE 1188-1996).

A United States and a Canadian Patent protects this product.

4.2 NORMAL MODE

NORMAL MODE is the default operation mode. It features automatic analysis of the measured float charging current, as well as the output of the appropriate alarms by activating front panel LEDs and Form-C Dry-Contact Relay Alarm outputs.

While in the NORMAL MODE, the FCCP measures and outputs the actual current measurement to its analog output ports (labelled 0-50mVdc or 4-20mA on the back panel), which can be connected to your remote monitoring equipment, building automation system and/or PLCs.

4.3 PROGRAM MODE

Activate PROGRAM MODE at any time by pressing the MODE limited-access button. A pointed object (such as a voltmeter probe) is required to reach this button. While in PROGRAM MODE the user can press the UP (🡅) and DOWN (🡇) buttons to adjust settings as well as press the MODE limited-access button to scroll through different user-adjustable parameters.

Once in PROGRAMM MODE, the FCCP reverts to NORMAL MODE if no button is pressed for two (2) minutes. To manually revert to NORMAL MODE, scroll through the user-adjustable parameters until all LEDs are OFF.

4.3.1 Current Thresholds

The lower and upper current thresholds determine where and when an alarm becomes present. Set these parameters according to the particular battery manufacturer's or battery manufacturer representative's recommendations. These parameters come pre-set to the default value of zero.

4.3.2 Maintenance Timer

Set the maintenance timer to alert you when periodic maintenance must be performed on battery strings. The maintenance timer can be set to a maximum of 100 weeks (a little under two (2) years) in increments of one week. When the maintenance timer expires, the FCCP alerts the user by activating the summary alarm relay output and LEDs on the front panel display. The timer, as well as alarms, may only be reset, disabled or cleared by physically attending to the FCCP. The delay for a reset is a few seconds.

To clear a maintenance timer alarm, the user must access the PROGRAMM MODE. The active alarm is then cleared once PROGRAMM MODE is exited. To reset a maintenance timer, the user must reprogram it with the desired value.

4.3.3 Threshold Temperature Compensation

A battery's float charging current depends on temperature as well as charging voltage. Threshold Temperature Compensation (TTC) permits an adjustment of the current thresholds according to temperature variations. Set the TCC if your FCCP will be installed in a non-environmentally controlled application.

Thresholds given by battery manufacturers or battery manufacturer representatives are typically defined for 25°C (77°F) operating temperature. When TTC is enabled, the FCCP will compensate its programmed current thresholds according to ambient temperature. This prohibits false alarms generated by wide temperature fluctuations.

Disable TTC if your system is operating in an environmentally controlled application or if a temperature-compensated battery charger is used. Then, if your environmental control sub-system fails, the FCCP will activate an alarm when the monitored float current(s) exceeds the programmed thresholds.

For Ni-Cd applications, temperature compensation should be DISABLED.

4.3.4 Latching Alarms

Latching alarms forces you to physically investigate a situation. Enable Latching alarms when you prefer the alarm relay outputs to be reset locally only (by physically pressing the MODE limited-access button). When the alarm condition is present the corresponding LED is activated and the status LED blinks the proper alarm code. When the alarm condition has ended the alarm relay outputs remain engaged and the STATUS LED blinks the alarm code. The MODE limited-access button releases the latched alarms and enters PROGRAM MODE.

Disable latching alarms if you prefer the FCCP to automatically release visual and remote alarms when the alarm condition disappears.

4.3.5 FCCP Memory

The FCCP stores its data (thresholds, maintenance timer, TTC, latching alarms) in a non-volatile EEPROM memory. Hence, if your FCCP is powered down, it will keep this data until the next power-up.

Contrary to battery-supported backup memory, EEPROM memory does not lose its data after a set period or when backup power fails. Your FCCP's data will remain in the EEPROM permanently.

5. USING THE FCCP

The NORMAL MODE is the default mode of operation for the FCCP. The FCCP is in NORMAL MODE when first powered. While in NORMAL MODE the FCCP systematically performs these tasks:

- Measures up to two (2) different currents flowing through conductors. The conductors are physically routed through the sensor heads of the FCCP.
- Scales the measured values of current and sends them to its analog outputs. Depending on the FCCP model, the analog output scales are calibrated at 0 to 5 amperes equals 0 to 50mVdc or 4 to 20mA.

5 A = 50mV or 5A = 20mA

- Filters and analyzes the measured currents to accurately update the LED display.
- Activates the alarm outputs according to given conditions.
- Sends special battery mode notification values to the analog outputs according to given battery recharge or discharge conditions.

5.1 INTERPRETING THE FORM-C DRY-CONTACT RELAY OUTPUTS

There are two (2) alarm relay outputs available on the back of the FCCP. The first, labelled ALM 1, is a summary alarm. It triggers when the FCCP detects any anomaly in normal battery operation. The second, labelled ALM 2 is triggered only by a high float current condition. High current during float charging is a possible indication of oncoming catastrophic battery failure. The following table outlines the conditions the FCCP detects and the associated state of each of the alarm relay outputs

NOTE: High float charging current alarm has been designed with a 6-hour delay in order to eliminate false alarms following charging of batteries. A high float charging current condition must be present for six (6) consecutive hours before an alarm is activated. For Ni-Cd model, this delay is 24 hours.

Low float charging current alarm has a 30 minutes delay.

⚠WARNING

The ALM2 (High float charging current alarm) is deactivated whenever the battery current exceeds 5.3A. This is a normal operation as the battery current is outside the usable FCCP measurment range of 0A to 5.3A.

Figure 2 – FCCP back panel with 50mV analog outputs

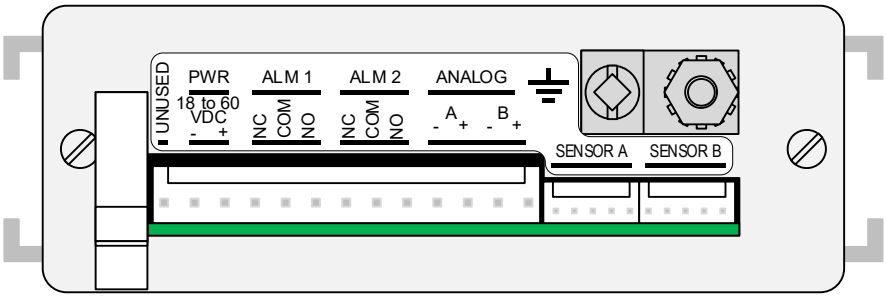


Figure 3 – FCCP back panel with 4-20mA analog outputs

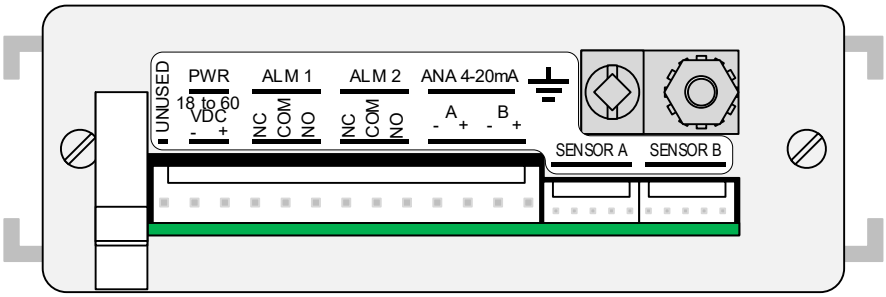


TABLE 1 - Alarm relay outputs behavior

The information herein provided is true when FCCP is power up.	***ALARM 1 (ALM 1) SUMMARY ALARM***	***ALARM 2 (ALM 2) HIGH CURRENT ALARM***
Normal battery operation	De-energized	De-energized
Low current condition Maintenance timer expired notification FCCP hardware failure condition	Energized	De-energized
High current condition	Energized	Energized

5.2 INTERPRETING THE ANALOG OUTPUTS

No matter if the FCCP you purchased came with one sensor or two sensors, there's always two analog outputs available at the back panel of the FCCP. Each analog output corresponds to its respective sensor, see section 6.4 for analog output locations.

The FCCP scales the respective float current measurement and sends it in real time to the analog output in two available signal types: 0-50mVdc or 4-20mA loop. The analog output scale is scaled at **5 A = 50mV** for the 0-50mV signal or **5A = 20mA** for the 4-20mA current loop. The following table outlines the conditions the FCCP detects and the associated state of the analog output signal.

TABLE 2 - Analog outputs behavior

Battery operating modes	Battery current	Analog output signal	
		0-50mV	4-20mA
Battery on float	Current between 0-5 amperes	0-50mVdc scaled to current measurement by the ratio of: 0A = 0mVdc 5A = 50mVdc	4-20mA scaled to current measurement by the ratio of: 0A = 4mA 5A = 20mA
Battery on discharge	Negative current below 0 ampere.	-60mVdc	2mA
Battery on recharge	Positive current beyond 5.3 amperes	+53mVdc	20.9mA

The 4-20mA analog output behavior follows the equation of a straight line generally called a linear equation written as y=mx+b where "y" is the measured current by the FCCP sensor and "x" being the theorical analog output signal. Thus, the current loop in mA for different measured float current will follow the following formula.

4-20mA ANALOG OUTPUT = ((Measured current in A x 1000) + 1248) / 312

NOTES:

- In floating conditions, the battery current is generally trending in milliamps values. However, the FCCP can read battery current between 0 to 5.3 amperes. During the battery floating condition, the analog output will display the current scaled by the ratio provided in the above table.
- Once the recharge current exceeds 5.3 amperes, the analog output will display a constant +53mV or 20.89mA. (ALM2 High Float Current automatically deactivates when current exceeds 5.3A)
- Upon a battery discharge, the analog output will display a constant –60mV or 2mA.
- Because of filtering, a delay of up to two (2) minutes may be necessary to detect a battery discharge or battery recharge condition.
- Subsequent to a battery discharge or a battery recharge condition, high float current alarms are masked for 6 hours (24 hours for the Ni-Cad model). Low float current alarms are masked for 30 minutes.
- In order to obtain a high-performance filtering process, slow-reacting filters have been implemented. This means FCCPs have slow reaction time. This is why after an abrupt change in string current, or after power-up, the FCCP's stabilization time may be as long as 25 minutes.

5.3 INTERPRETING THE LED DISPLAY

The LED display on the front panel of the FCCP shows the exact status of all conditions the FCCP monitors. By flashing a code of ON and OFF pulses, the STATUS LED signals a warning message corresponding exactly to the state/change of condition detected. The following table outlines the state-change conditions the FCCP detects and the associated LED display.

TABLE 3 - LED behavior in normal mode

CONDITION	STATUS		TIMER / TEMP ALARM	OUT OF RANGE	CURRENT ALARM
	SENSOR 1	SENSOR 2			
FCCP Hardware Failure Alarm	STEADY		OFF	OFF	OFF
High Current Alarm, Sensor A	FLASHES 1X		OFF	OFF	ON
High Current Alarm, Sensor B	N/A	FLASHES 2X	OFF	OFF	ON
Low Current Alarm, Sensor A	FLASHES 3X		OFF	OFF	ON
Low Current Alarm, Sensor B	N/A	FLASHES 4X	OFF	OFF	ON
Maintenance Timer Expired Notification	FLASHES 6X		ON	OFF	OFF
Battery On Discharge, Sensor A	FLASHES 7X		OFF	ON	OFF
Battery On Discharge, Sensor B	N/A	FLASHES 8X	OFF	ON	OFF
Battery On Recharge, Sensor A	FLASHES 9X		OFF	ON	OFF
Battery On Recharge, Sensor B	N/A	FLASHES 10X	OFF	ON	OFF

NOTES:

- If there is more than one alarm condition at any time, the flashing code will go through the complete sequence of alarms. For example, if a battery on discharge condition is detected on both strings the STATUS LED flashing sequence will be 7X, 8X, 7X, 8X etc.
- At any time, simultaneously pressing both the UP (🡅) and the DOWN (🡇) push buttons performs a LAMP TEST

6. INSTALLATION

⚠WARNING
This product is for indoor use only.
This product is classified in Installation Category I.
This product must only be installed by a qualified technician.

Your FCCP is very easy to install. Begin by assembling all tools and hardware necessary for completing this installation:

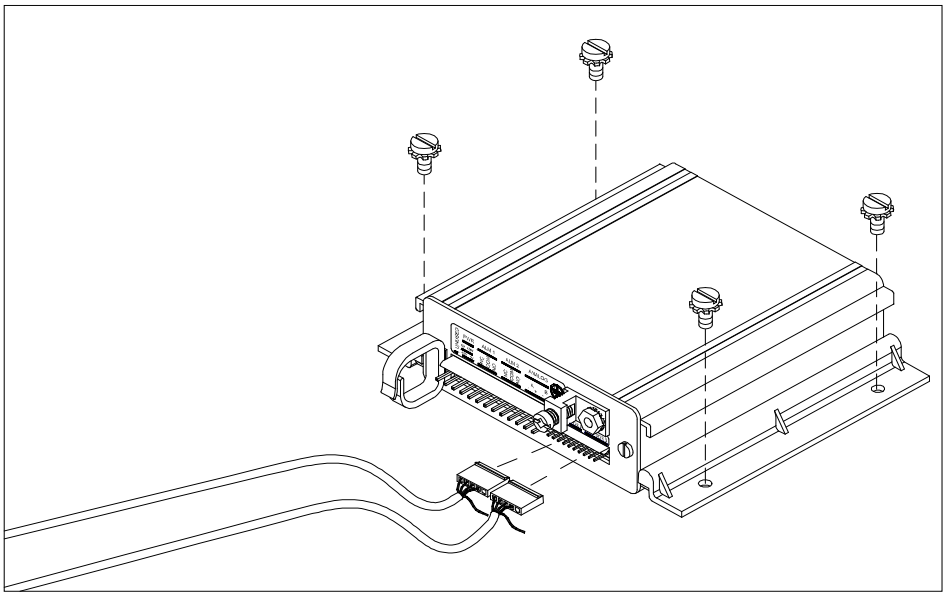
- Wire strippers
- Crimping tool (part #90123-2) for AMP Connectors
- Necessary hardware for unit mounting with the standard brackets if applicable.
- Optional 19" or 23" rack mounting kit
- Two-conductor shielded cable
- Cable ties
- Digital voltmeter (DVM)

Rack mounting of the controller unit is possible using the optional 19" or 23" telecom standard rack bracket.

Part #	Description	Capacity
K-EAR1419	19" rack bracket 1 ¼ inch hole spacing	Holds 2 controllers
K-EAR1423	23" rack bracket 1 ¼ inch hole spacing	Holds 3 controllers

6.1 MOUNTING THE CONTROL UNIT USING STANDARD BRACKETS

Figure 4 – Mounting the FCCP unit

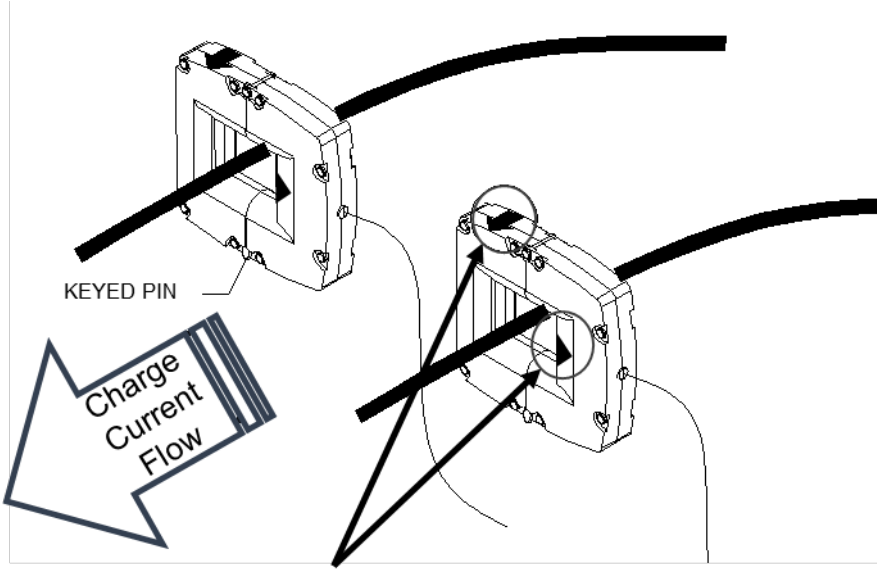


1. Locate the flat surface where the control unit will be mounted. Be sure to take into account accessibility and visibility of the unit's front panel after installation. Allow enough clearance at the rear of the unit for mating portion of the rear connectors.
2. Place the control unit where it will be mounted permanently. Hold firmly. Place a bracket into either slot. The central unit and bracket are small enough to hold with one hand. While aligning the bracket and central unit, mark the positions of the mounting holes.
3. Place the bracket in the other slot of the unit. Mark the positions of the mounting holes as previously done.
4. Use appropriate hardware for your particular application to fasten the brackets of the central unit to the flat surface. Do not tighten the fasteners completely. Leave the hardware loose, allowing the brackets to move enough for removal and replacement of the control unit. Validate that the control unit can be installed and removed from its final installation location.
5. Install the strain relief into the hole located on the left of the back panel sticker and tie cables in it. This will avoid stress on the connectors and wires.
6. If there is unconstrained access to the rear of the unit, you may choose to install the control unit permanently by placing it under the loose brackets and systematically tightening the fasteners in a crisscross pattern (to produce equal stress on the mechanical housing).
7. If access is not available to the rear of the control unit when installed, temporarily leave it and continue with the installation process.

6.2 INSTALLING THE SENSOR (S)

1. Locate the conductor(s) around which the FCCP sensor head(s) will be installed.
2. Open a FCCP sensor head:
   - Without removing it from the sensor, pull out the yellow or white keyed plastic pin until it stops (about one inch / 2.5 cm). If the pin falls out, read the notes below.
   - Open the sensor head by rotating both halves of the sensor on its hinge.

Figure 5 – Opening the sensors



The arrow can be located on the sensors at two locations, the arrow should point in the direction of charging current.

3. Install the sensor heads(s) around the conductor(s). The sensor heads can accommodate cables gauges up one 535 MCM or two 0000 AWG.
4. Close the FCCP sensor head, making sure to have the current carrying conductor inside the sensor head.
5. Push the yellow or white keyed plastic pin back in until its tip comes out of the other side of the sensor head. The pin's head should point towards the centre of the sensor head. If you cannot push the pin back in, read the notes below.
6. Pay attention to polarity (see Figure 5 Routing the cables) The arrow on the sensors should point in the direction of charging current.
   - If the sensor is installed on the positive side of the battery string, the arrow on the sensor must point toward the positive terminal.
   - If the sensor is installed on the negative side of the battery, the arrow must point toward the load.
   - If the sensor is installed within the battery string, the arrow must point toward the positive terminal of the next cell.

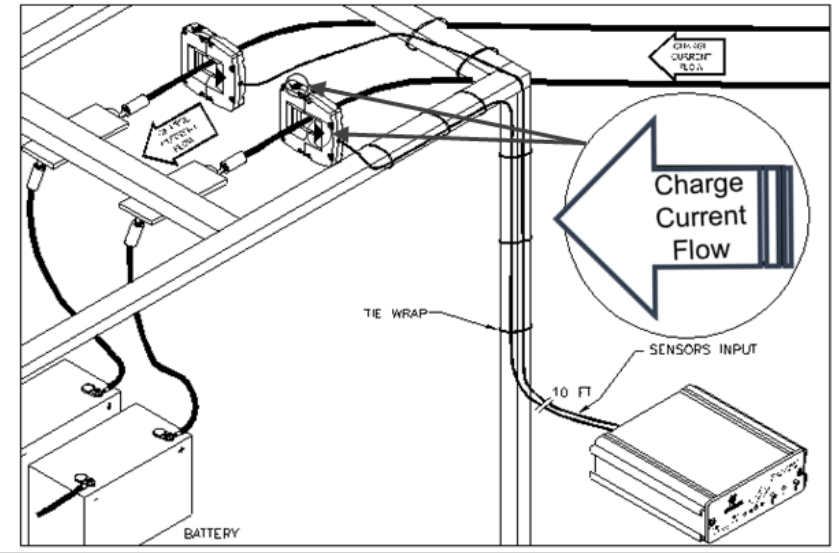
NOTES :

- Be sure there is adequate clearance for the sensor to fit unrestrained around the conductor.
- For the highest accuracy, we recommend installing the sensors at least 12 inches away from each other as well as from high current carrying conductors.
- If the keyed pin comes out of the sensor head, open the sensor head, put the pin back in its hole, and turn it 90 degrees to align the other end with its hole. You can then close the sensor head and completely push the keyed pin inside.

7. FCCP sensors come with 3.07 meters (10 feet) of shielded cable preinstalled from the sensor head to the termination connectors, leaving the ground conductor apart and loose. Route the sensor cable(s) to where the central unit will be mounted. If access to the rear of the control unit is restricted, be sure to leave enough cable length to attach the sensor connector(s) to

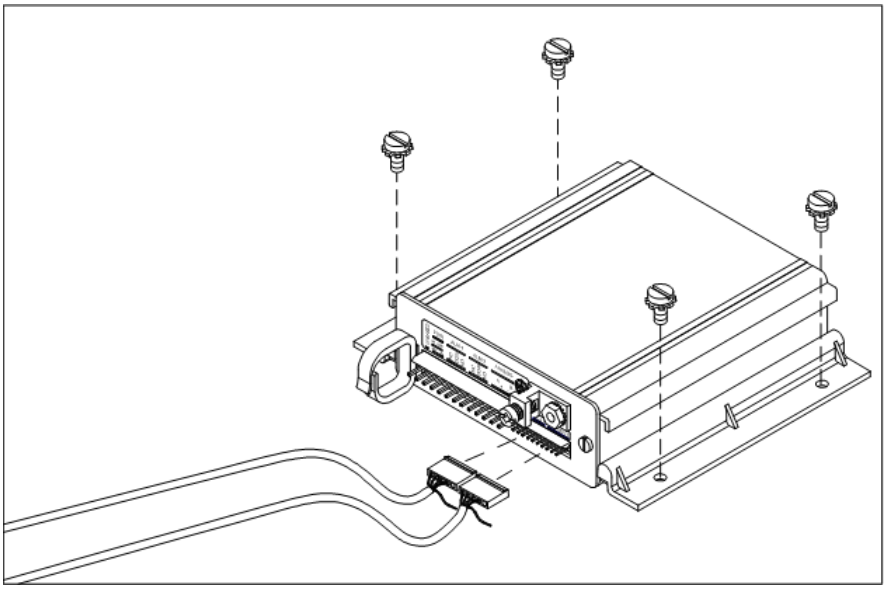
the rear of the control unit and then to slide the complete assembly into its final installation position. Secure using cable ties. Other cable length are available from Multitel.

Figure 6 – Routing the cable



The arrow can be located on the sensors at two locations, the arrow should point in the direction of charging current.

Figure 7 – Inserting the sensor connectors



6.2.1 50' SENSOR CABLE SHORTNING (OPTIONAL)

50' cable sensors are optional and available from Multitel. This section covers the steps used to shorten the 50' cable.

Tools Required:

- Modification Kit (Provided by Multitel)
- Cutter pliers
- Conductor skinner
- Ruler or equivalent
- Crimper Tool AMP (TYCO).
    - PRO CRIMPER II HAND TOOL: 354940-1
    - DIE ASSEMBLY: 58517-2
    - LOCATOR: 189590-1
- Heat Gun ou équivalent
- Soldering Iron
- Multimeter

Proceed as per the following:

1- Cut the cable 3 inches (8cm) longer than the total needed length.

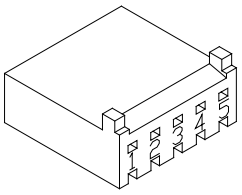
2- Remove 4 inches (10cm) of the outer insulation. Remove the silver shield paper, but keep the un-insulated stranded ground wire. If possible, tin-plate the end of the ground wire to protect against fraying.

3- Slip on the piece of heat shrink tube to the cable, but do not heat it immediately.

4- Cut the two pairs of wire (white/black) and (red/black) at one inche (3cm) long. Do not untwist the pairs of wire.

5- Install the pins with the crimper tool. Once installed, pull the pins slightly to test the mechanical strength. The ground wire does not need pin.

6- Locate the numbers printed onto the insertion face of the connector and install the pins according to the table shown below:



To ensure the two black conductors are not reversed, use a multimeter to verify the continuity between each pair (between 2 and 3) and (between 4 and 5).

	PAIR OF WIRES WHITE/BLACK		**PAIR OF WIRES RED/BLACK**	
	Black Wire	White Wire	Red Wire	Black Wire
Location nº	2	3	4	5

7- Place the heat shrink at mid way between the outer insulation of the cable and the connector.

6.3 WIRING A POWER CABLE TO THE FCCP

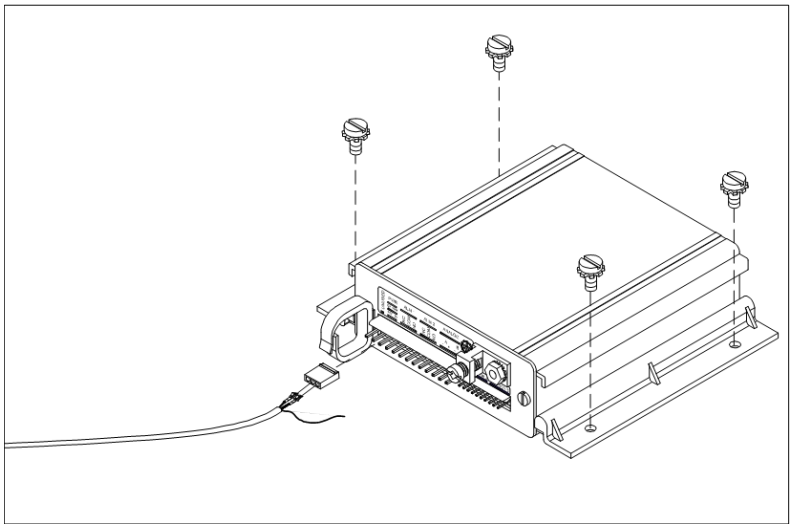
1. Locate the voltage source to power the FCCP control unit. Using a DVM, verify that the voltage difference between the polarities is between 18 and 60 Volts DC. (Use a Class 2 or SELV power supply)
2. Using shielded cable, route from the control unit's mounting location to the located and verified voltage source. If access to the rear of the control unit is restricted, be sure to leave enough cable length to attach the power connector to the rear of the control unit and then to slide the complete assembly into its final installation position. Leave enough cable length to allow connection to the power source.
3. Permanently secure the cable run with cable ties.
4. Install inline fuse holders to the power source end of the shielded cable. The fuses should be as close to the power source as possible. Leave the fuses out of the fuse holder temporarily. Place the fuses somewhere safe where they can be found later.
5. Permanently connect the power source cable to the power source, paying close attention to polarity. Be sure to connect the cable ground to a reliable system ground connection, close to the utilized power source.
6. Turn your attention to the control unit end of the cable. Strip only enough insulation and shield from the cable as necessary to crimp the connector pins and install the connector housing.

NOTE : To maintain the expected FCC emissions, the cable shield needs to come to the base of the connector housing. Therefore, it is critical to only strip away as much insulation as needed to install the connector pins and housing.

7. Using the tool, permanently crimp the pins to the wires exposed at the end of the shielded cable to go to the control unit. Slide the crimped wires into the connector housing, making sure to observe the correct polarity and to leave the ground conductor free.
8. Return to the fuse holders and install the fuses temporarily removed earlier.
9. Plug the connector housing into the control unit and verify that the unit becomes active. **Remove the connector from the control unit and continue the installation.**

NOTE : Designate the power connector as it is easy to misplace the power connector and the analog output connector.

Figure 8 – Inserting the power connector

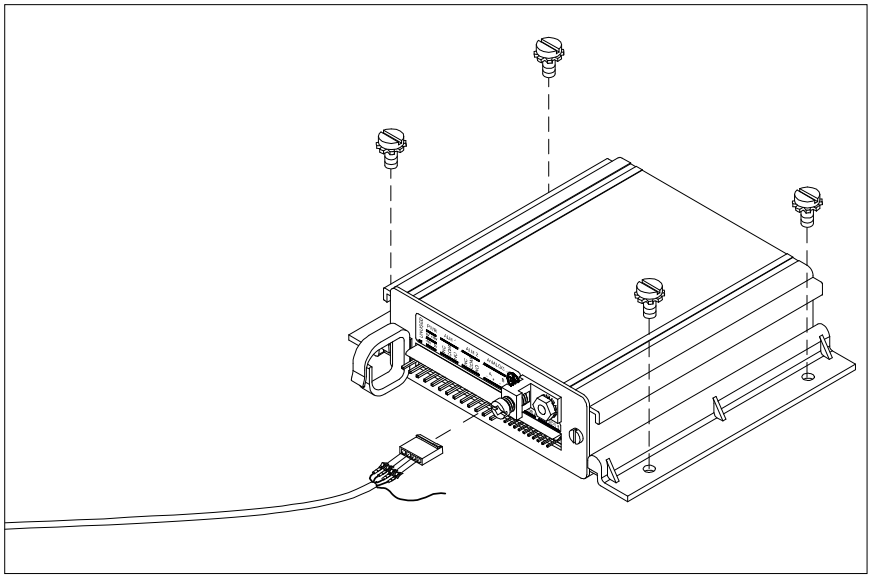


6.4 WIRING THE ANALOG OUTPUTS

Analog output can be use to connect the FCCP to a remote monitoring device such as a building automation system, battery monitoring system, PLCs or DC power plant controls to more easily interpret the float charging current values. Two signal types are possible, function of the FCCP part number selected 0-50mV signal for Telecom and Power Utility Substation application related and 4-20mV for process control devices and building automation systems.

If you are using the analog outputs, the pins corresponding to sensor A are the first two (2) located below the ANALOG label (A). If your FCCP is configured for two (2) sensors, sensor B corresponds to the third and forth pins located below the ANALOG OUTPUT label (B).

Figure 9 – Inserting the analog output connectors



1. For each analog output (sensor A and sensor B), use a single shielded cable to connect the FCCP to the monitoring equipment. Route the cables in the best possible configuration for your particular application. If access to the rear of the control unit is restricted, be sure to leave enough cable length to attach the 50mVdc analog output connector(s) to the rear of the control unit and then to slide the complete assembly into its final installation position. Leave enough cable length to allow connection to the monitoring equipment's inputs.
2. Permanently secure the cable run(s) with cable ties.
3. Make the applicable connections to the monitoring unit's inputs. Be sure to pay special attention to polarity. Refer to the monitoring unit's installation manual for any questions on connections. Connect the shield conductor to a reliable system ground connection, close to the monitoring unit's inputs.
4. Turn your attention to the cable(s) on the FCCP unit's end. Similar to the power connection, keep to a minimum the amount of shielding removed from the cable(s) to install the connector pins and connector housing(s), making sure to observe the correct polarity and to leave the shield conductor free.
5. Crimp the connector pins to the exposed conductors using the tool. Slide the crimped wires into the connector housing, making sure to observe the correct polarity and to leave the shield conductor free.

6.5 WARNING ABOUT THE 50mV ANALOG OUTPUTS ⚠

The 50mV signal type is widely used in dc power systems found in telecom 48Vdc and 125Vdc power utility substations.

1. The 50mV analog outputs **are not isolated from the power supply**.
2. Check thoroughly that the inputs utilized on the monitoring equipment are fully isolated. A digital voltmeter has fully isolated inputs.

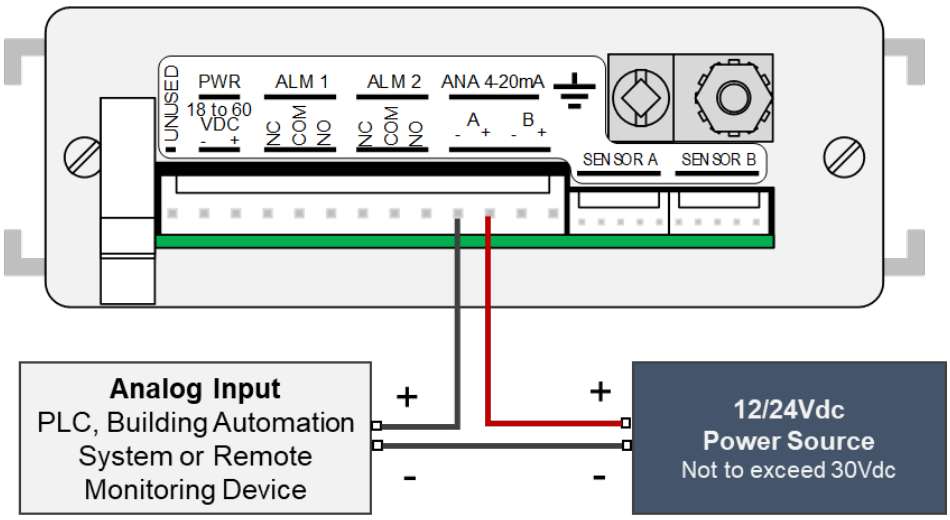
3. Use only a Class 2 power supply to power up the FCCP

6.6 WARNING ABOUT THE 4-20mA LOOP ANALOG OUTPUTS ⚠

The 4-20mA loop signal type is widely used in process control and building automation systems. Even if, the FCCP is a powered device, its 4-20mA current loop is passive and therefore requires an adequate power source for the proper operation of the 4-20mA current loop.

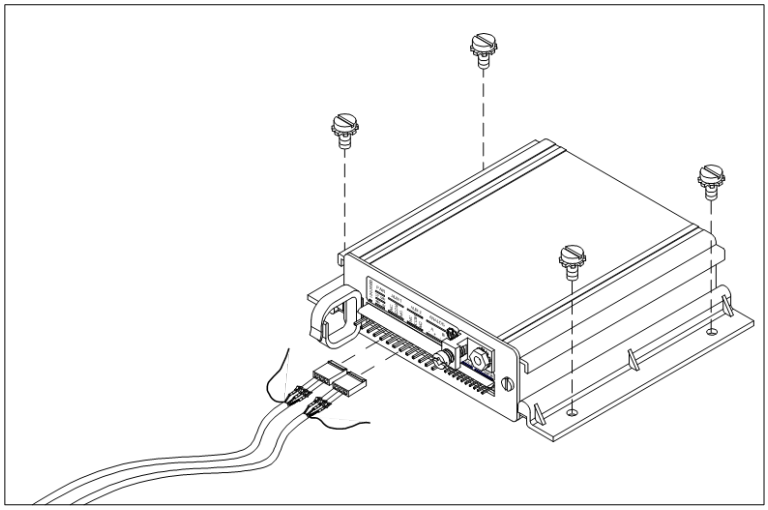
1. The VDC power source should be 12Vdc nominal and it shall not exceed 30Vdc to prevent damaging the 4-20mA circuitry.
2. The 4-20mA analog outputs **are isolated from the power supply up to 500Vdc**.
3. Respect polarity when wiring the 4-20mA current loop for proper operation.

Figure 10 – Wiring the 4-20mA loop signal



6.7 WIRING THE FORM C DRY CONTACT ALARM RELAY OUTPUTS

Figure 11 – Inserting the relay output connectors



If you are using the alarm relay outputs, determine if you will be using the normally closed (NC) or normally open (NO) conditions. The SUMMARY alarm relay output is available on the pins labelled ALM 1. The HIGH CURRENT alarm relay output is available on the pins labelled ALM 2.

1. For each alarm relay output (SUMMARY and HIGH CURRENT) use solid wires (#22 to #26 AWG) to connect the FCCP to the monitoring equipment. Route the cables in the best possible configuration for your particular application. If access to the rear of the control unit is restricted, be sure to leave enough cable length to attach the alarm relay output connector(s) to the rear of the control unit and then to slide the complete assembly into its final installation position. Leave enough cable length to allow connection to the inputs of the monitoring equipment.
2. Permanently secure the cable run(s) with cable ties.
3. Make the applicable connections to the monitoring unit's digital inputs. Refer to the monitoring unit's installation manual for any questions on connections.
4. Turn your attention to the FCCP unit's end of the cable(s).
5. Crimp the connector pins to the exposed conductors using the tool. Install the connector pins in the connector housing(s), paying specific attention to common (COM), normally closed (NC) and normally open (NO) connections. Use the connections applicable for your particular application.

6.8 FINAL STEPS IN INSTALLATION – CALIBRATING THE SENSOR HEADS

1. Except for the power connector, install all FCCP connectors to the control unit. This includes the sensor head connectors. DO NOT INSTALL POWER CONNECTOR.
2. Install "dummy" connectors on any pins that will not be wired. At this time no pin should remain exposed when installation is complete.
3. Remove the sensor heads:
   - Remove the keyed yellow plastic pin(s) from the sensor head(s).
   - Remove the sensor head(s) from the conductor(s) and reinsert the keyed pin(s).

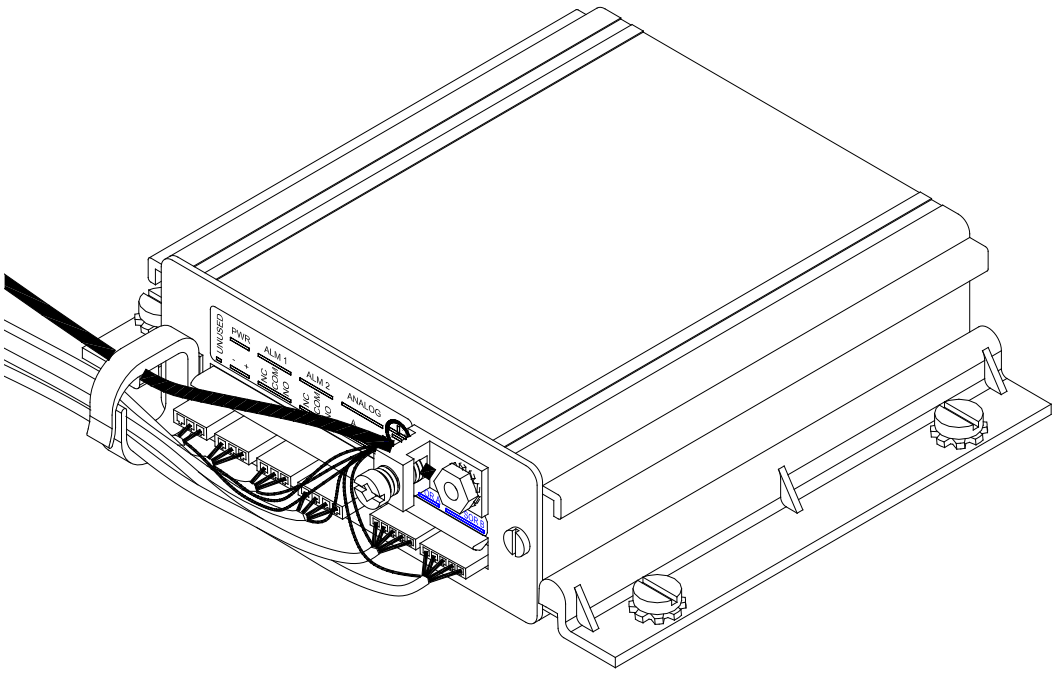
- Position the sensor head(s) in the same orientation, direction and general location, next to the conductor where they will be permanently installed.

4. Simultaneously press the UP (🡅) and DOWN (🡇) buttons on the control unit. Insert the power connector while pressing the UP (🡅) and DOWN (🡇) push buttons on the control unit. Continue to press the push buttons until all the front panel LEDs become activated. Release the UP (🡅) and DOWN (🡇) buttons and wait for the LEDs to become deactivated.
5. Once all front panel LEDs are OFF, remove the power connector. The unit has now been automatically calibrated for best accuracy.
6. Again, reinstall the sensor head(s) in their permanent location around the conductors.
7. Reinstall the power connector on the back of the control unit. Verify that no pin is exposed.

NOTE :
- FCCP sensor calibration may be performed at any time during the product's life. Calibration is recommended when the sensors are moved to another conductor.
- To recalibrate the sensor heads, follow steps 1 to 7.

8. Consolidate all shield conductors together with a reliable ground conductor from the system.
9. Fasten the ground connection lug to the Earth nearest ground termination attached to the back of the FCCP control unit. AT THIS POINT, NO LOOSE WIRE SHOULD REMAIN.
10. Check the monitored states of the outputs to verify operation.
11. Pull all wires into the strain relief slot and tie securely. This will prevent stress to connectors and wires.
12. If not already permanently installed, install the control unit at its final location.

Figure 12 – Installation complete



6.9 ADDITIONAL SENSOR INSTALLATION

There is no specific procedure for the addition of a supplementary sensor on an existing FCCP system.

The guideline to install an additional sensor is to follow the standard installation instructions provided in section 6 of the FCCP User Manuel below.

1. You simply need to temporarily disconnect the power on the FCCP controller device and focus on the instructions which refer to the sensor's installation of section 6.2 of the FCCP User Manuel.

2. Then proceed to the calibration using the instructions provided on section 6.8 of the FCCP User Manuel.

Important
We need to put emphasis on the need to calibrate **both sensors,** the existing and the new one after the installation of the new sensor, since the calibration is done globally for both sensors.

This means "the installer" will need to temporarily remove the existing sensor to keep it beside the monitored conductor like the new sensor as per the instructions given on section 6.8 step 3.

7. PROGRAMMING

For a quick programming guide, please refer to section 1.3.

7.1 USING THE PROGRAMMING MODE

The PROGRAM MODE is selected by pressing the MODE limited-access button. Reaching this button requires the use of a pointed object, such as a voltmeter probe. In PROGRAM MODE, you can modify threshold values, the remaining time on the maintenance timer and activate Threshold Temperature Compensation and Latching Alarms. The three (3) push buttons, the front panel 50-millivolt CALIBRATION TEST POINTS and the LED display are the user interface. In PROGRAM MODE, the LED display enters an alternate function and displays the current parameter being set by the user. The following sections describe how to set each parameter of the FCCP.

7.1.1 First Things First

- Before performing any programming or calibration on the FCCP, validate that there are no active alarms related to the FCCP.
- Before performing any programming or calibration on the FCCP, advise the surveillance centre. While in PROGRAM MODE, the FCCP does not output float current measurements or alarms. Erratic measurements between 0 and 50mVdc may be sent to remote monitoring equipment.
- If no button is pressed for two (2) minutes, while in PROGRAM MODE, the FCCP will default to NORMAL MODE. Any value modified will be saved before automatically defaulting back

to NORMAL MODE. To manually revert to NORMAL MODE, press the MODE limited-access button until no LEDs are activated.

- When setting a parameter, holding an arrow key for two (2) seconds will trigger the FCCP to begin scrolling values in the respective direction, up or down, at a rate of 10 values per second.
- When a value is selected for a parameter setting, allow a delay of three (3) seconds to elapse before saving to insure the display is stable and the setting is as desired. The combination of the filtering within a typical digital voltmeter and the filtering in the FCCP requires time to display an accurate value.
- If powered down, the FCCP stores its data permanently (thresholds, and other user-selected parameters) in its non-volatile EEPROM. This means the data will never be lost, regardless of how long the FCCP stays without power.

TABLE 4 - Program Mode Reference Table

PARAMETERS	MODE BUTTON		LED BEHAVIOUR			
	1 SENSOR	2 SENSORS	STATUS	TIMER / TEMP ALARM	OUT OF RANGE	CURRENT ALARM
Low current threshold sensor A	Press 1X		ON	OFF	OFF	OFF
High current threshold sensor A	Press 2X		ON	OFF	OFF	ON
Low current threshold sensor B	N/A	Press 3X	ON	OFF	ON	OFF
High current threshold sensor B	N/A	Press 4X	ON	OFF	ON	ON
Maintenance timer	Press 5X		ON	ON	OFF	OFF
Temperature compensation threshold	Press 6X		ON	ON	OFF	ON
Alarm latch	Press 7X		ON	ON	ON	OFF
Return to NORMAL MODE	Press 8X		OFF	OFF	OFF	OFF

TABLE 5 - Scale Reference Table

PROGRAM MODE	SCALE (UNITS / MILLIVOLT)
Current thresholds	**5A = 50mV** (10mA = 0,1mV) **0A = 0mV**
Maintenance timer	**OFF = 0mVdc** **100 weeks = 50mV** (1 week = 0,5mV)
Temperature compensation threshold / alarms latch	**ON = 50mV** **OFF = 0mV**

7.2 SETTING HIGH AND LOW CURRENT THRESHOLDS

The lower and upper current thresholds are used by the FCCP when analyzing the float charging current measurement and outputting the appropriate alarm outputs. These thresholds are determined by factors such as the size, construction, chemistry and manufacturing process of a battery as well as the sensitivity to battery failure required. The particular battery manufacturer or battery manufacturer representative should be consulted when selecting appropriate thresholds to be entered into the FCCP.

NOTE :

- When the battery current is beyond 5.3A, the FCCP will not activate the ALM2 high float current alarm further more, if the ALM2 was previously activated and the battery current goes beyond 5.3A, the ALM2 high float current will deactivate.

7.2.1 To Determine your VRLA Float Current

All data coming from the manufacturer overrules the following. These sections are intended only as guidelines and if the maker of your batteries can provide the information, use it.

- If your battery manufacturer can provide you with a float charging current for your installation, skip this section.
- If your manufacturer can provide you with high and low thresholds as well, skip to section 7.2.2.

The float charging current flowing into a battery string depends on basic cell electrochemistry, the applied charging voltage, the average internal cell temperature, and the string average state-of-charge. Therefore, before giving recommendations on threshold adjustments, we need to be able to determine the nominal float charging current for a given battery at a given float voltage and at a given temperature.

Float Current Guideline

Two (2) general guidelines are provided and are applicable to most of the VRLA batteries using lead-calcium (low-antimony) pasted plates with an electrolyte specific gravity in the range of 1.250 to 1.300, both AGM and gel. There are various "nominal" rating systems used for batteries. We decided to use the 8-hour rate to 1.75 volts per cell average end voltage at 25 degrees Celsius as standard. The normal float charging current for the specific battery on which the FCCP is installed should be available from the battery manufacturer. However, if you are unable to obtain this information, the following rules of thumb can be used in calculating the expected float charging current. A mean value with tolerances is given due to manufacturing tolerances and other factors. But again, if specific data is available from the battery manufacturer, you should use that data.

TABLE 6 - Estimated Float Charging Current for AGM-Type, VRLA Batteries

Average Float vpc	Average Temperature of Cells in °C (°F)					
	10 (50)	15 (59)	20 (68)	25 (77)	30 (86)	35 (95)
2.35	1.1	1.6	2.3	**3.2**	4.5	6.4
2.34	1.0	1.4	2.0	**2.8**	3.9	5.6
2.33	0.9	1.2	1.7	**2.4**	3.4	4.9
2.32	0.7	1.1	1.5	**2.1**	3.0	4.2
2.31	0.6	0.9	1.3	**1.8**	2.6	3.7
2.30	**0.6**	**0.8**	**1.1**	**1.6**	**2.3**	**3.2**
2.29	0.5	0.7	1.0	**1.4**	2.0	2.8
2.28	0.4	0.6	0.9	**1.2**	1.7	2.4
2.27	0.4	0.5	0.7	**1.1**	1.5	2.1
2.26	0.3	0.5	0.6	**0.9**	1.3	1.8
2.25	0.3	0.4	0.6	**0.8**	1.1	1.6

TABLE 7 - Estimated Float Charging Current for Gel-Type, VRLA Batteries

Average Float vpc	Average Temperature of Cells in °C (°F)					
	10 (50)	**15 (59)**	**20 (68)**	**25 (77)**	**30 (86)**	**35 (95)**
2.35	0.6	0.8	1.1	**1.6**	2.3	3.2
2.34	0.5	0.7	1.0	**1.4**	2.0	2.8
2.33	0.4	0.6	0.9	**1.2**	1.7	2.4
2.32	0.4	0.5	0.7	**1.1**	1.5	2.1
2.31	0.3	0.5	0.6	**0.9**	1.3	1.8
2.30	**0.3**	**0.4**	**0.6**	**0.8**	**1.1**	**1.6**
2.29	0.2	0.3	0.5	**0.7**	1.0	1.4
2.28	0.2	0.3	0.4	**0.6**	0.9	1.2
2.27	0.2	0.3	0.4	**0.5**	0.7	1.1
2.26	0.2	0.2	0.3	**0.5**	0.6	0.9
2.25	0.1	0.2	0.3	**0.4**	0.6	0.8

NOTE: A tolerance of +/- 33% applies to the value read from the tables above.

An example is given to illustrate the calculation. For an AGM type battery rated 80Ah at an 8-hour rate to 1.75 vpc, the following estimated float current at 2.30 vpc and 25°C can be expected.

Float current = 1.6mA/Ah x 80Ah = 128mA +/- 42mA

7.2.2 To Determine High and Low Thresholds

Now, based on previous rules of thumb, we can determine high threshold multipliers to prevent thermal runaway. **One thing to mention is that thermal runaway is a system design issue, not just a battery issue**. A higher than normal float charging current in a properly installed system with a specific VRLA battery may not be a candidate for thermal runaway. However, this same battery installed improperly may go into thermal runaway at this same current. In other words, the high current alarm from the FCCP will not protect for all installations.

First, starting from the fact that the float charging current doubles for each 10°C rise in temperature and that in the range of 2.25 to 2.35 vpc, an increase of 0.05 volts in per-cell float voltage results in a doubling of float current. Second, it is intended that thresholds temperature compensation feature should be disabled if the battery area is temperature controlled or if a temperature-compensated battery charger is used. Otherwise, the FCCP thresholds temperature compensation feature should be enabled.

Now, based on the previous paragraph, we can recommend the following:

When FCCP Temperature Compensation is ON (enabled):

HCTM = 2.1 times float charging current at 25°C and minimum recommended float voltage

When FCCP Temperature Compensation is OFF (disabled) due to Temp. Comp. Charger:

HCTM = 3 times float charging current at 25°C with float voltage setting at 25°C

When FCCP Temperature Compensation is OFF (disabled) due to Temp. Comp. from air conditioning:

HCTM = 6 times float charging current at 25°C and minimum recommended float voltage

7.2.3 Suggested Ni-Cd Current Thresholds

The suggested thresholds are applicable when the FCCP is used with Saft Ni-Cd batteries. Batteries should be installed indoor and operating in an environmentally controlled site. The thresholds apply to the 80, 125 and 160 Ampere-hour models.

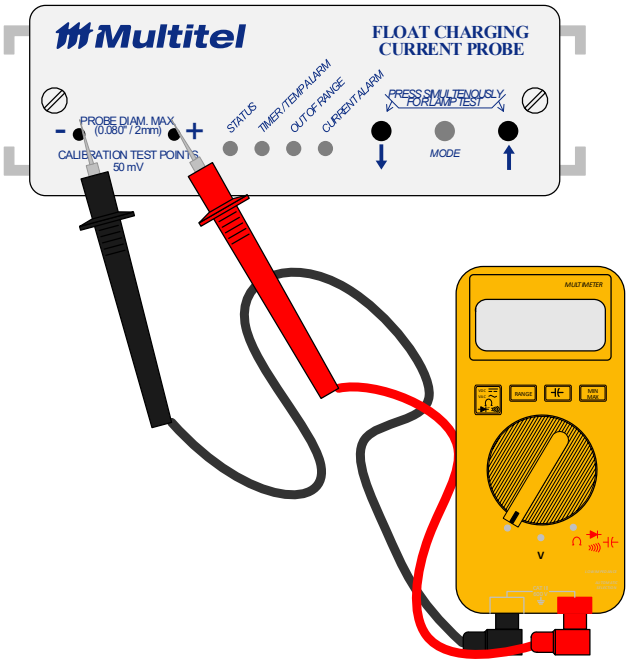
TABLE 8 - Suggested Saft Ni-Cd Thresholds

Battery Models	High threshold		Low Threshold	
Saft NCX 80Ah	416mA	4,2mVdc	0mA	0mVdc
Saft NCX 125Ah	650mA	6,5mVdc	0mA	0mVdc
Saft NXC 160Ah	832mA	8,4mVdc	0mA	0mVdc

7.2.4 To Set High and Low Thresholds on the FCCP

1. From NORMAL MODE, press the MODE limited-access button once to enter the PROGRAM MODE and set the low current threshold.
2. The STATUS LED lights continuously (not flashing). All other LEDs are off.
3. Insert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.

Figure 13 – Inserting the Voltmeter in the Calibration Test Points



4. Set the digital voltmeter to a scale of 0.0001mVdc, a scale that can accurately read tenths of a millivolt (0.1mVdc).
5. The voltmeter displays the lower threshold on a millivolt scale. The actual lower threshold is the voltmeter display multiplied by the 100mA / mVdc setting ratio. For example, an actual lower threshold of 200mA would be displayed as 2 millivolts. An actual lower threshold of 2.5 amperes would be displayed as 25 millivolts.
6. Press the UP (🡅) or DOWN (🡇) push buttons to adjust the setting to the desired threshold that triggers a low current alarm.
7. Press the MODE limited-access button to save the value as the low current threshold and to remain in the PROGRAM MODE, ready to set the high current threshold.
8. The STATUS LED and the CURRENT ALARM LED light continuously (not flashing). All other LEDs are off.
9. Reinsert voltmeter test probes into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to again observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
10. Reset the digital voltmeter to a scale of 0.0001mVdc, a scale that can accurately read tenths of a millivolt (0.1 millivolt).
11. The voltmeter displays the upper threshold on a millivolt scale. The actual upper threshold is the voltmeter display multiplied by the 100mA / mVdc setting ratio. For example, an actual upper threshold of 1.9 amperes would be displayed as 19 millivolts. An actual upper threshold of 3.5 amperes would be displayed as 35 millivolts.
12. Press the UP (🡅) or DOWN (🡇) buttons to adjust the setting to the desired threshold that triggers a high current alarm.

13. Press the MODE limited-access button to save the value as the upper current threshold and to remain in the PROGRAM MODE.

7.3 FCCP WITH TWO SENSORS

If the FCCP you have purchased came with two sensors, you will be prompted for lower and upper current thresholds for the second sensor (sensor B) after the values for the first sensor (sensor A) have been saved. The FCCP will display the STATUS and OUT OF RANGE LEDs as active. If the FCCP you have purchased came with only one sensor, you do not need to set the thresholds for sensor B.

1. After the upper current threshold for the first sensor (sensor A) is changed or verified, press the MODE limited-access button to save the value and to remain in the PROGRAM MODE ready to set the lower threshold for the second sensor (sensor B).
2. The STATUS LED and the OUT OF RANGE LED light continuously (not flashing). All other LEDs are off.
3. Reinsert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Again, observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
4. The voltmeter displays the lower threshold for the second sensor (sensor B) on a millivolt scale. The actual lower threshold for the second sensor (sensor B) is the voltmeter display multiplied by the 100mA / mVDC setting ratio. For example, an actual lower threshold for the second sensor (sensor B) of 200 milliamperes would be displayed as 2 millivolts. An actual lower threshold for the second sensor (sensor B) of 2.5 amperes would be displayed as 25 millivolts.
5. Press the UP (🡅) or DOWN (🡇) push buttons to adjust the setting to the desired threshold that triggers a low current alarm with respect to the second sensor (sensor B).
6. Press the MODE limited-access button to save the value as the low current threshold for the second sensor (sensor B) and to remain in the PROGRAM MODE ready to set the high current threshold for the second sensor (sensor B).
7. The STATUS LED, OUT OF RANGE LED and the CURRENT ALARM LED are activated (not flashing). The remaining LED (TIMER / TEMP ALARM) is off.
8. Reinsert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to again observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
9. The voltmeter displays the upper threshold for the second sensor (sensor B) on a millivolt scale. The actual upper threshold for the second sensor (sensor B) is the voltmeter display multiplied by the 100mA / mVDC setting ratio. For example, an actual upper threshold for the second sensor (sensor B) of 1.9 amperes would be displayed as 19 millivolts. An actual upper threshold for the second sensor (sensor B) of 4.5 amperes would be displayed as 45 millivolts.
10. Press the UP (🡅) or DOWN (🡇) buttons to adjust the setting to the desired threshold that triggers a high current alarm with respect to the second sensor (sensor B).
11. Press the MODE limited-access button to save the value as the upper current threshold for the second sensor (sensor B) and to remain in the PROGRAM MODE ready to set the maintenance timer.

TABLE 9 - Current Scale

BATTERY CONDITIONS	BATTERY CURRENT (A)	ANALOG OUTPUTS	
		50mV (mVDC)	4-20mA (mA)
Battery in discharge mode	- 0.005 and +	-60	2
Battery in float mode	0	0.0	4
	0.5	5	5.6
	1	10	7.2
	1.5	15	8.8
	2	20	10.4
	2.5	25	12
	3	30	13.6
	3.5	35	15.2
	4	40	16.8
	4.5	45	18.4
	5	50	20
Battery in recharge mode	5.3 and +	53	20.9

7.4 SETTING OR USING THE MAINTENANCE TIMER

The maintenance timer allows you to pre-set a period into the FCCP. Similar to a kitchen timer, the FCCP counts down from the pre-set period, indicating the time remaining and signaling when the period has expired. The difference is that a kitchen timer is usually based on minutes, while the FCCP maintenance timer is based on weeks.

1. From NORMAL MODE, press the MODE limited-access button five times to enter the PROGRAM MODE and set the maintenance timer.
2. The STATUS LED and the TIMER / TEMP ALARM LED light continuously (not flashing). All other LEDs are off.
3. Insert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
4. The voltmeter displays the time remaining on the maintenance timer on a millivolt scale. The actual time remaining on the maintenance timer is the voltmeter display multiplied by the two (2) weeks / mVDC setting ratio. For example, an actual time remaining on the maintenance timer of 8 weeks would be displayed as 4 millivolts. An actual time remaining on the maintenance timer of 52 weeks (1 year) would be displayed as 26 millivolts.
5. Press the UP (🡅) or DOWN (🡇) push buttons to adjust the setting to the desired time remaining on the maintenance timer. Set the value to zero to disable the maintenance timer.
6. Press the MODE limited-access button to save the value as the time remaining on the maintenance timer. You will also remain in the PROGRAM MODE ready to toggle the TCC.

NOTE: If the maintenance timer is enabled and there is a power outage, the timer will continue where it had stopped once power is restored.

TABLE 10 - Week Scale Reference Table

1 WEEK = 0,5 mVDC									
WEEK	*mVDC*	*WEEK*	*mVDC*	*WEEK*	*mVDC*	*WEEK*	*mVDC*	*WEEK*	*mVDC*
1	0,5	8	4	15	7,5	30	15	70	35
2	1	9	4,5	16	8	35	17,5	75	37,5
3	1,5	10	5	17	8,5	40	20	80	40
4	2	11	5,5	18	9	45	22,5	85	42,5
5	2,5	12	6	19	9,5	50	25	90	45
6	3	13	6,5	20	10	55	27,5	95	47,5
7	3,5	14	7	25	12,5	60	30	100	50

7.5 TOGGLING THE THRESHOLD TEMPERATURE COMPENSATION (TTC)

For Ni-Cd Batteries, this function must be **DISABLED** at all times.

1. From NORMAL MODE, press the MODE limited-access button six times to enter the PROGRAM MODE and toggle the TTC.
2. The STATUS LED, TIMER / TEMP ALARM LED and the CURRENT ALARM LED light continuously (not flashing). The remaining LED (OUT OF RANGE) is off.
3. Insert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
4. The voltmeter displays the toggled on-off state of the TTC on a millivolt scale. The actual state of the TTC is displayed as 50 millivolts for ON and 0 millivolts for OFF.
5. Press and hold firmly the UP (🡅) or DOWN (🡇) buttons to toggle the setting between states.
6. Press the MODE limited-access button to save the toggle setting for the TTC and to remain in the PROGRAM MODE ready to toggle the latching alarms.

7.6 TOGGLING THE LATCHING ALARMS

1. From NORMAL MODE, press the MODE limited-access button seven times to enter the PROGRAM MODE and toggle the latching alarms.
2. The STATUS LED, TIMER / TEMP ALARM LED and the OUT OF RANGE LED light continuously (not flashing). The remaining LED (CURRENT ALARM) is off.
3. Insert test probes connected to a digital voltmeter into the FCCP's front-accessible CALIBRATION TEST POINTS. Be sure to observe and match the polarity of the CALIBRATION TEST POINTS to the polarity of the digital voltmeter inputs.
4. The voltmeter displays the toggled on-off state of the latching alarms on a millivolt scale. The actual state of the latching alarms is displayed as 50 millivolts for ON and 0 millivolts for OFF.

5. Press and hold firmly the UP (🡅) or DOWN (🡇) push buttons to toggle the setting between states.
6. Press the MODE limited-access button to save the toggle setting for the latching alarms and to return to NORMAL MODE operation.

8. MAINTENANCE

The following chapter contains a maintenance procedure for the sensors and a troubleshooting section.

8.1 CALIBRATION

The FCCP requires little or no maintenance. Once installed, no maintenance is necessary. Nevertheless, **if you change anything in the installation, the sensors need to be recalibrated**. To do so, refer to section *6.8 FINAL STEPS IN INSTALLATION – CALIBRATING THE SENSOR HEADS*

8.2 TROUBLESHOOTING

If the information in this section cannot help you with troubleshooting your problem, refer to chapter 9 - Contacting Multitel.

My FCCP is not showing the right current value.	A very powerful digital filter removes the AC signal in a very efficient manner. On the other hand, it introduces a 25-minute stabilisation time when the current varies or the device is reset.
	It is important to perform the calibration as described in the manual: during calibration, the sensors must be placed exactly in the same position as they will be once installed (same place, same orientation).
	Make sure that the arrow on the sensor points in the right direction.
The FCCP does not trigger the alarm when it crosses the threshold.	In order to avoid false alarms, a 6-hour (24-hour for the Ni-Cd model) delay is required before triggering a high float current alarm. A 30-minute delay is required before triggering a low float current alarm.
The FCCP reads a battery discharge while charging up.	If the sensor is installed backwards, the FCCP will measure a battery discharge. Verify the sensor orientation.
During batteries discharge, the FCCP does not turn the BOD / BOR LED on.	With a high discharge current (over 150 amperes), the sensor's magnetic circuit saturates and slows down the digital filter's response. Detection can take up to 15 minutes. Because of the six-hour delay before an alarm is triggered, these fifteen minutes should not be a problem.

After turning my instrument back on, errors that were in memory are now erased.	It is absolutely normal. The FCCP was designed to be supplied without interruption. Alarm occurrences are kept in the RAM memory, thence lost as soon as the device is turned off. The maintenance timer and parameters (current threshold, latching alarm option and temperature compensation option) are maintained in the EEPROM.
When my instrument is turned off, I have an alarm contact that activates.	The "summary" alarm (labelled ALM 01) is designed to trigger an alarm when the unit is off or defective.
When do I need the temperature compensation function?	If rectifiers already have temperature compensation or if batteries are installed in a controlled environment, the FCCP's temperature compensation should be deactivated.

9. CONTACTING MULTITEL

Our customer service and Technical Support technicians are always eager to answer any question you might have about the FCCP.

Simply telephone us, write to us or visit our Internet site where you will find FAQ's for the FCCP.

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