

FCCP BOX

User Manual

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CONTROL SHEET

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BACKGROUND

For various reasons, some electric utility substations have been designed with a station DC supply without redundancy, implying it is composed of a single battery string and single battery charger.

For NERC's TPL-001-5 standard, those stations with a DC supply associated with protective functions required for Normal Clearing are considered a single point of failure that must be mitigated by adding an additional charger and an additional battery string, unless they are both monitored and reported to a Control Center for both low voltage and open circuit.

This exception is based on Footnote 13c of the TPL-001-5 standard:

13c. A single station DC supply associated with protective functions required for Normal Clearing (an exception is a single station DC supply that is both monitored and reported at a Control Center for both low voltage and open circuit).

DESCRIPTION

The FCCP Box (Multitel SKU #M-56/FCCPBOX) is a product assembly that combines the Multitel Float Charging Current Probe (see [FCCP user manual](#)) with a panel meter made by Autonics (MT4W-DV-11). The FCCP enables for battery open circuit detection while the panel meter enables detection of a low battery voltage condition. The FCCP Box also provides dry-contact alarms that must be wired to the local Remote Telemetry Unit or to the SCADA system to report both alarm conditions to the Control Center for TPL-001-5 compliance. Alarm threshold values have been factory programmed and can be adjusted in the field according to station DC supply specificities.

LOW VOLTAGE DETECTION

The FCCP Box input power requires a typical 125Vdc (acceptable range 67.2Vdc to 154Vdc) to operate which can also be used to monitor the battery low voltage. It includes an embedded DC-DC stepdown converter to provide the appropriate input power voltage to the panel meter. Note that the FCCP Box can simultaneously monitor the voltage provided by the same battery system with a separate input.

The station DC battery voltage is pre-wired to the back of the panel meter, and the low voltage threshold value is set to 120Vdc at the factory by default. Thus, when the battery voltage goes below the threshold value, the FCCP Box will trigger a low voltage alarm.

OPEN CIRCUIT DETECTION

The FCCP Box is equipped with one (1) non-intrusive split core current transducer which is placed around the battery cable between the battery and the battery charger. With the FCCP split core transducer in place, the FCCP can monitor the float charging current within a range of 0 to 5.3A. When the float charging current goes below 10mA, the FCCP Box will trigger the open circuit alarm (XYZ).

Note: a second current transducer option is available.

The lowest user configurable alarm threshold for the open string detection is 10mA, and the low voltage alarm is configurable based on the nominal DC voltage for the specific location where it is installed. The FCCP Box also offers a third alarm for Battery Thermal Runaway detection which is triggered when abnormal high float charging current is detected, and the threshold value is factory set to 4A. Note that potential thermal runaway conditions can be observed via the feature of high float current monitoring, but it is not a requirement of TPL-001-5.

Example of an Application Diagram



SPECIFICATIONS

Input Power (Range)	125 Vdc (67.2Vdc to 154Vdc)
Consumption	13.8 Watts Maximum
Operating Temperature	-10° C to 50° C (-14° F to 122° F)
Storage Temperature	-20° C to 60° C (-4° F to 140° F)
Overall Dimensions (LxWxD)	25.5cm (10in) x 25.5cm (10in) x 15.24 (6in)
Weight	6.8kg (15lb)
Current measurement range	0 to 5.3A
Uncertainty	+/-0.5%
Voltage Range	0 to 154Vdc
Voltage accuracy	+/-0.1%
Response time	Current (30 minutes) Voltage (immediate)
Open circuit/High current alarm contact	Form C
Low voltage alarm contact	Form A
Current transducer cable	10ft (50ft optional)
Current transducer dimension	11.3cm x 11.9cm (4.45in x 4.68in)
Current transducer hole diameter	3.7cm x 4.67cm (1.46in x 1.84in)

FCCP BOX MAIN COMPONENTS

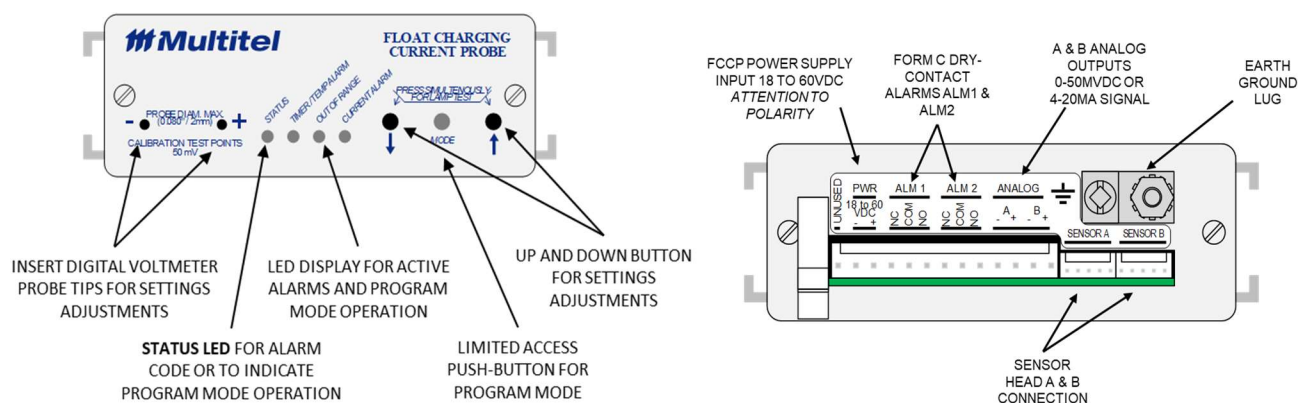
The FCCP Module

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

False alarms are difficult to deal with and are typically very costly. The 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.

For a more comprehensive guide on the FCCP module, please see the [FCCP user manual](#).

FCCP Front and Back Panels



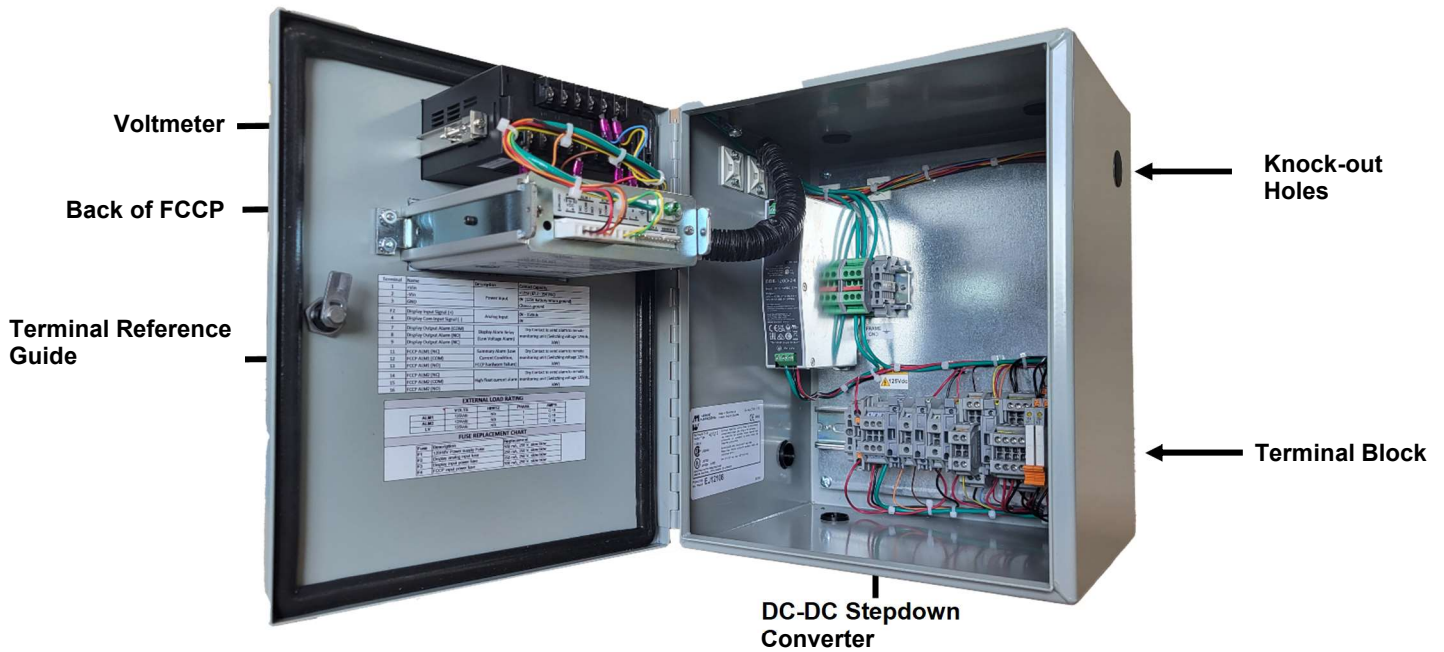
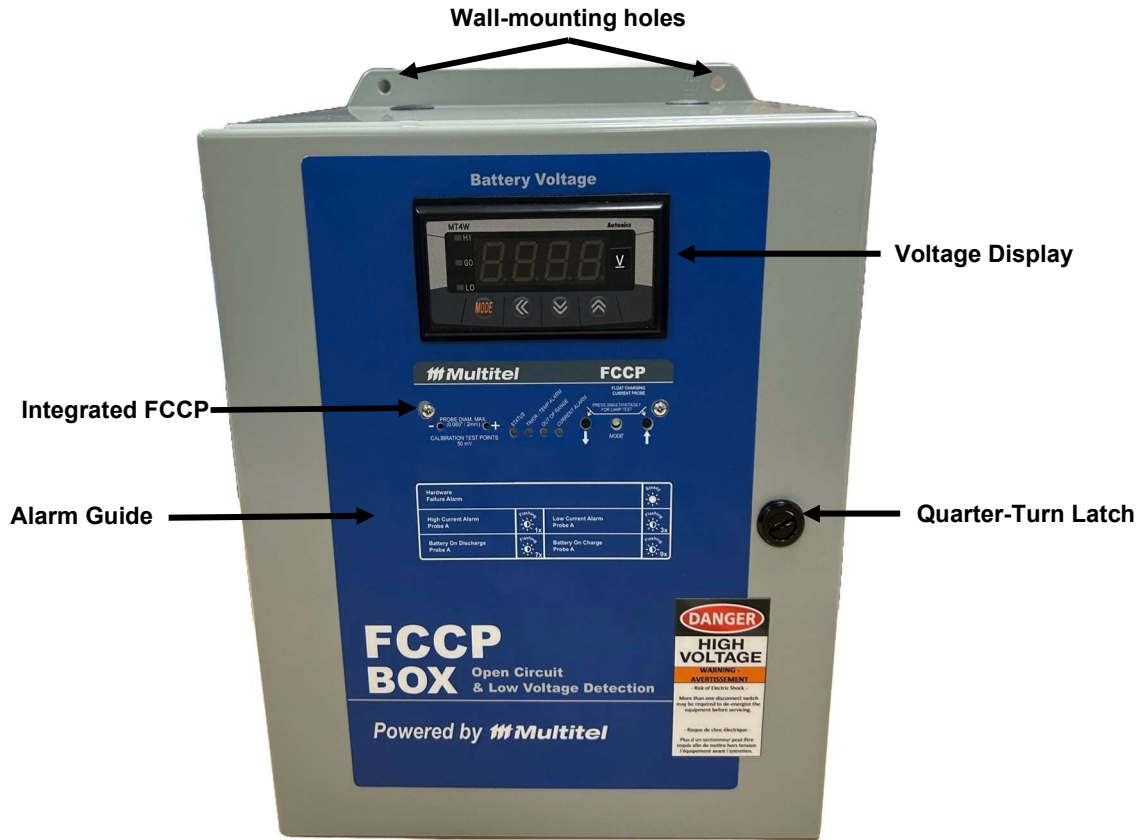
Panel Meter MT4W-DV-11

© MT4W Series



1. **HI**: High output indication of preset
2. **GO**: GO output indication of preset
3. **LO**: Low output indication of preset
4. **MODE** key: mode key
5. **Navigation keys**: moves digit, enters parameter mode, **Navigation keys**: changes sv
6. **unit label part**

Enclosure (Front and Inside)



STEP-BY-STEP INSTALLATION

Required Tools and Material

To install and setup the FCCP Box, you will need the following suggested tools and material:

- Ground cable;
- For NEC-compliant: Size 14 AWG (22 mm);
- For EN/IEC 60950-compliant: Size 18 AWG (12 mm);
- Stranded wire, 20 AWG minimum (to wire FCCP Box power supply and voltage analog input);
- In-line fuse holders (if connected directly to the battery string) or use the available disconnect circuit at your string distribution panel;
- ½ amp fuse compatible with the fuse holder you are using;
- Wire stripper, cutters;
- 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);
- Four (4) metal screws which are suitable for the installation surface (usually wall mounted) with the appropriate screwdriver or wrench. FCCP Box mounting holes are ¼ of an inch and the enclosure is approximately 15 lb; and
- Blade screwdriver #4 (3mm).

Preparing The Installation

The FCCP Box should be installed in accordance with National Electrical Code ANSI/NFPA # 70 and by qualified personnel. Installation should be as close as possible to the monitored equipment to reduce cabling and installation time.

1. Mounting and Grounding

The FCCP Box is designed to be installed on a flat wall surface without the need for an additional bracket. Fixing holes are available outside the FCCP Box. Note that the split core current transducer provided with the FCCP Box is provided with a 10-foot cable and, therefore, the FCCP Box should be installed within reach of the battery cable. Note that an optional 50-foot cable can be purchased separately.

- Find a safe and secure location with enough space to install the FCCP Box such as on plywood or another flat wall surface.
- Level the FCCP Box and use the four (4) metal screws and anchors provided to secure the FCCP Box in place.

Once the FCCP Box is installed on the wall, the chassis ground must be connected to a reliable ground source. The ground cable should be run inside the FCCP Box through the knockout holes available around the box. Use fittings (not provided) for cable protection. The ground wire should be wired in accordance with local electrical codes to terminal #3 (GND) -- see figure #1. The terminal #3 is pre-wired to the FCCP Box enclosure.

- For NEC-compliant grounding, a size 14 AWG (22 mm) or larger copper wire and an appropriate user-supplied ring terminal with an inner diameter of 1/4 inch (5 to 7 millimeters) are used for the installation.
- For EN/IEC 60950-compliant grounding, a size 18 AWG (12 mm) or larger copper wire and an appropriate user-supplied ring terminal are used for the installation.

Follow these steps to install the ground connection:

1. Strip one end of the ground wire. The stripping length for the terminal connection is 9mm (11/32 inches).
2. Attach the ground to the terminal #3 (GND); terminal tightening torque is between 0.5 and 0.6 Nm.

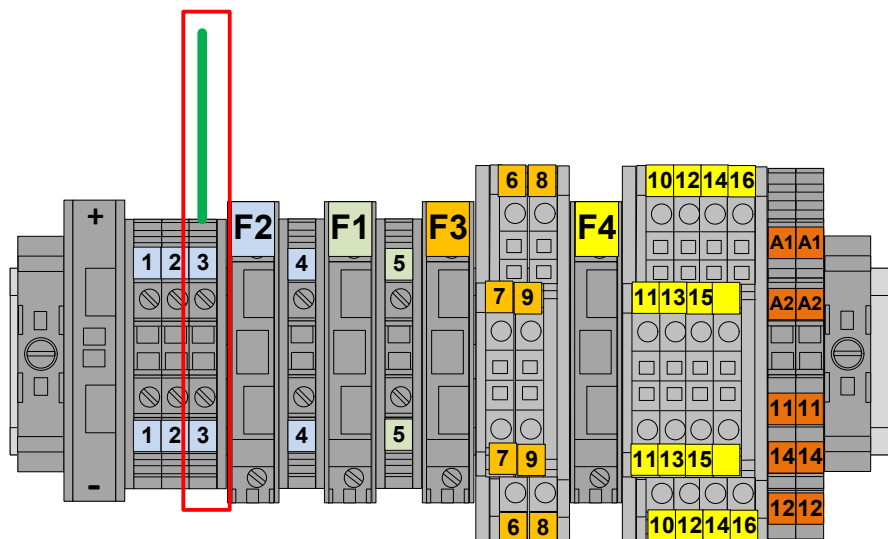


Figure 1 FCCP Box Terminal - Ground

2. Wiring Power Input and Battery Voltage Signal



! 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.**
****The PWR terminals must be supplied from an SELV source in accordance with IEC 1010-1 appendix H.**
****Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**
**** All electrical work should be done by qualified personnel or a licensed electrician, and in accordance with the local electric code. High voltage may cause injuries or death.**

The FCCP Box is powered by a 125Vdc power source normally provided by a distribution fuse or circuit breaker. The protection device should not exceed 2A. It is recommended to use wire size of 24 AWG to 12 AWG for termination inside the FCCP Box.

The battery voltage signal should be picked up between the battery charger and the battery distribution. It is recommended that a protection device be installed at the connection point. The FCCP Box provides a readily-accessible disconnect device: One (1) for power input and One (1) for battery voltage signal.

1. Open all (4) fuse holders and insert one (1) fuse in each holder. Required fuses are included in the box. The fuse value to be used is shown in the box inner panel. Each fuse holder should be left open during the wiring.
2. Using an appropriate wire-stripping toll, strip each cable to 9mm (11/32 inches).
3. Attach each cable to the appropriate terminal as follows:

Battery String Voltage	(+) 125Vdc	Terminal #1
	0 Volts	Terminal #2
Input Power	(+) 125Vdc	Terminal #F2
	0 Volts	Terminal #4

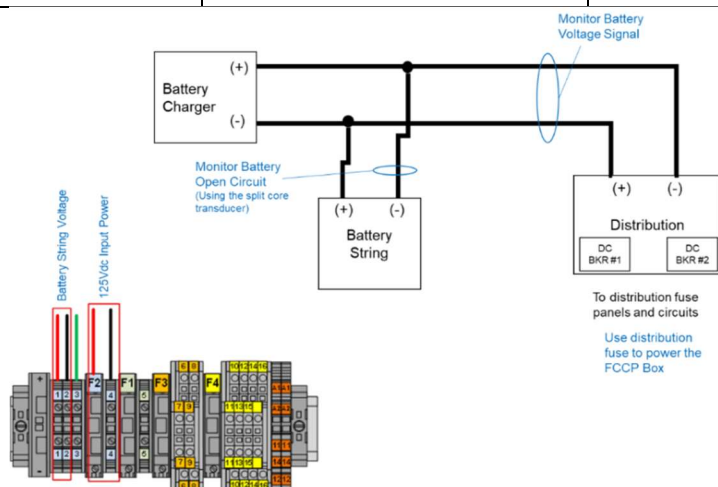


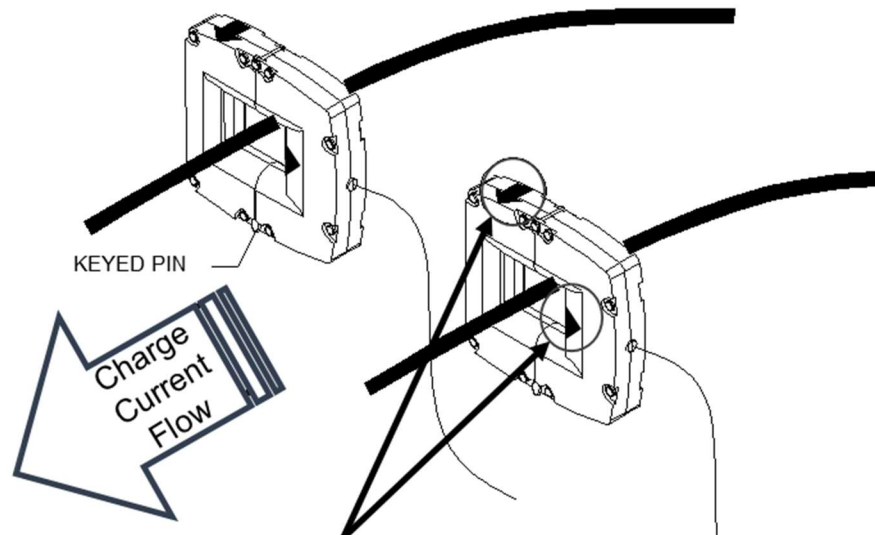
Figure 2: FCCP Box Terminal – Power Input and Voltage Sound

4. When the connections are completed, you can power up the system by closing each fuse holder, leaving F4 open.
 - a. F1, to power the 24Vdc DC Converter;
 - b. F3, to power the panel meter; and
 - c. F2, to the panel meter voltage reading.

3. Current Transducer Installation

The current transducer is a split core design and can be placed around the battery cable big enough to fit a single 535MCM cable or 2x 4/0 cables. The current transducer cable is pre-terminated with a 4-pin connector which will need to be fitted in a knockout and plugged at the back of the FCCP Panel. Locate the negative battery cable(s) around which the current transducer will be installed.

1. Open the current transducer by twisting the pin and pulling without removing it from the transducer.
2. Pull the yellow or white keyed plastic pin until it stops (about one inch or 2.5 cm).
3. Open the current transducer by rotating both halves of the sensor on its hinge.



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

Figure 3: Opening the sensors

4. Pay careful attention to the polarity. The arrow on the current transducer should point in the direction of the charging current, thus towards the 0V of the battery string.
5. Install the current transducer around the battery cable(s). The current transducer can accommodate cable gauges up one 535 MCM or two 0000 AWG.
6. Close the current transducer with the battery cable inside.
7. Lock the current transducer by pushing on the plastic pin.
8. Route the current transducer cable inside the FCCP Box and terminate the pre-wired connector at the back panel of the FCCP, to the "SENSOR A" position. See Figure 4.

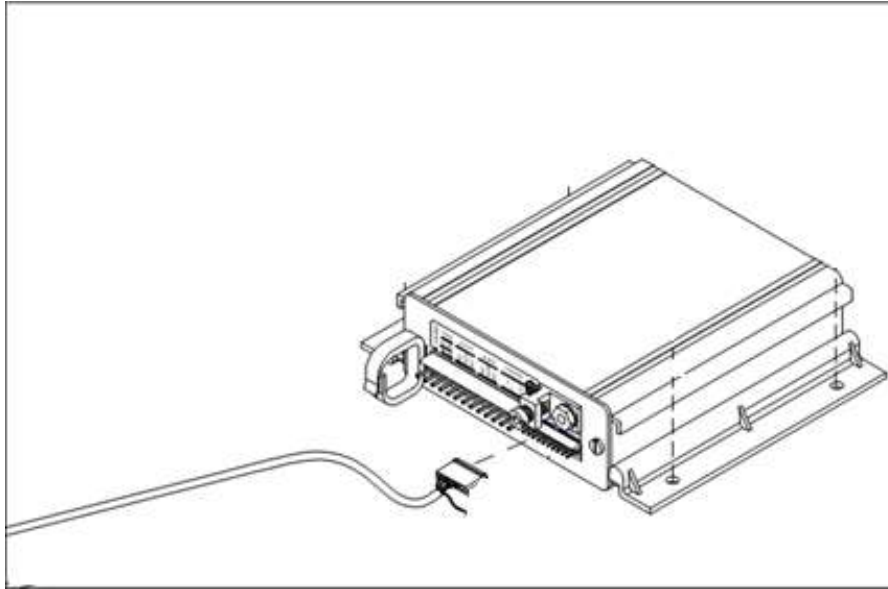


Figure 4: Inserting the Current Transducer Cable

4. Calibrating the FCCP

1. Open the F4 fuse holder to remove power to the FCCP.
2. 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.
3. Simultaneously press the UP (↑) and DOWN (↓) buttons on the control unit. Power up the FCCP by closing the F4 fuse holder while pressing the UP (↑) and DOWN (↓) push buttons on the control unit. Continue to press the push buttons until all the front panel LEDs turn on. Release the UP (↑) and DOWN (↓) buttons, and wait for the LEDs to turn off.
4. Once all front panel LEDs are off, open the F4 fuse holder. The unit has now been automatically calibrated for best accuracy.
5. Reinstall the current transducer to its permanent location around the battery cable and secure the current transducer using cable ties.
6. Reclose F4 fuse holder to power the FCCP back On.

FCCP Calibration 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.
-

5. Wiring Alarm Signal

The FCCP Box provides both low voltage and open circuit alarms. These alarm signals should be connected to the local RTU or SCADA system digital inputs for TPL-001-5 compliance. The thermal runaway alarm is not required for this NERC regulation.

Low Voltage Alarm	Low Voltage Alarm (COM)	Terminal #7
	Low Voltage Alarm (NO)	Terminal #8
Open Circuit Alarm FCCP ALM#1	Open Circuit Alarm (COM)	Terminal #12
	Open Circuit Alarm (NC)	Terminal #11
	Open Circuit Alarm (NO)	Terminal #13
Thermal Runaway Alarm FCCP ALM#2	Thermal Runaway Alarm (COM)	Terminal #15
	Thermal Runaway Alarm (NC)	Terminal #14
	Thermal Runaway Alarm (NO)	Terminal #16

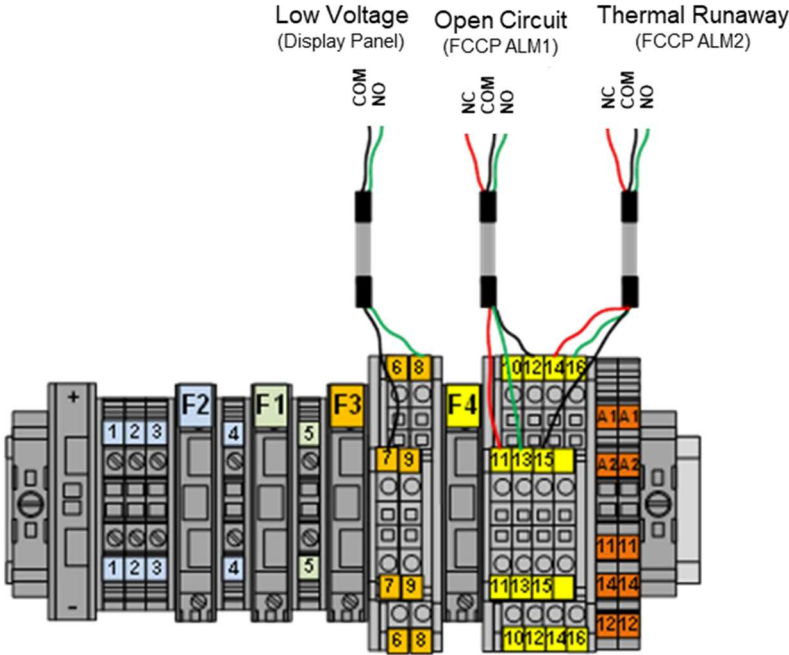


Figure 5: FCCP Box Terminal - Alarms

ALARM PROGRAMMING

Factory Alarm Threshold Settings

Alarm name	Factory setting	Possible Range	Disabled
Low Voltage Alarm (Display Panel)	120	X to Y	
Open Circuit Alarm (FCCP ALM1)	10mA	10mA to Y	0A
Thermal Runaway (FCCP ALM2)	4A	0.01A to 5A	0A

To setup the Alarm Programming, you will need a DVM (digital voltmeter) capable of reading down to 0.1mVdc.

Open Circuit (ALM1) and Thermal Runaway (ALM2) Alarm

To adjust the Open Circuit Alarm threshold value, follow these steps:

1. Use a DVM capable of reading mV down to 0.1mV. Insert the DVM test probe in the calibration test point located on the FCCP front panel (see Figure 6 below).
2. Turn on the DVM and set it to mV scale. Each 0.1mV increment = 10mA, thus 50mV = 5A.
3. Use a pointed object to press the MODE button once to enter the FCCP programming mode. The 4x LEDs will light as “Press 1x row” indicated in the table on the next page.
4. The DVM will show the factory threshold value 0.2Mv
5. Use the UP (↑) or DOWN (↓) push buttons to adjust the Open Circuit Alarm Threshold to the desired value.
6. Press the MODE button once more. The 4x LED will light as “Press 2x row” in the table. The DVM will display 40mV value.
7. Use the UP (↑) or DOWN (↓) push buttons to adjust the Thermal Runaway Alarm (High Threshold) to the desired value.
8. Press the MODE button six (6) times consecutively to exit the programming mode. Note that all the LEDs should turn off.

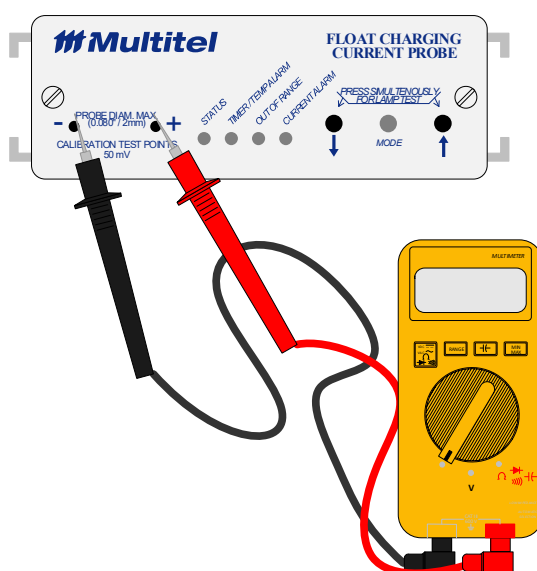


Figure 6: Open Circuit Value with DVM

PARAMETERS	MODE BUTTON		LED BEHAVIOUR			
	1 SENSOR	2 SENSORS	STATUS	TIMER / TEMP ALARM	OUT OF RANGE	CURRENT ALARM
Open-Circuit threshold sensor A	Press 1X		ON	OFF	OFF	OFF
Thermal Runaway/High threshold sensor A	Press 2X		ON	OFF	OFF	ON
Open-Circuit threshold sensor B (if applicable)	N/A	Press 3X	ON	OFF	ON	OFF
Return to NORMAL MODE	Press 8X		OFF	OFF	OFF	OFF

FCCP PROGRAMMING MODE NOTES

The programming mode allows you to configure a second current transducer (optional), a maintenance timer, an alarm latching and a temperature compensation threshold. Please refer to the FCCP user manual for more details.

Note that the FCCP will automatically exit the programming mode after a 15-minute delay.

Change the Panel Meter Low Voltage Threshold Alarm (L. Set)

The Low Voltage Alarm is factory set to 120V. To adjust the value, use the following step-by-step procedure:

- Press Mode Key **MODE** until you see L.Set menu on the panel meter display.
- Use the Control Keys **◀** **⏴** **⏵** to change Low Voltage Threshold value.

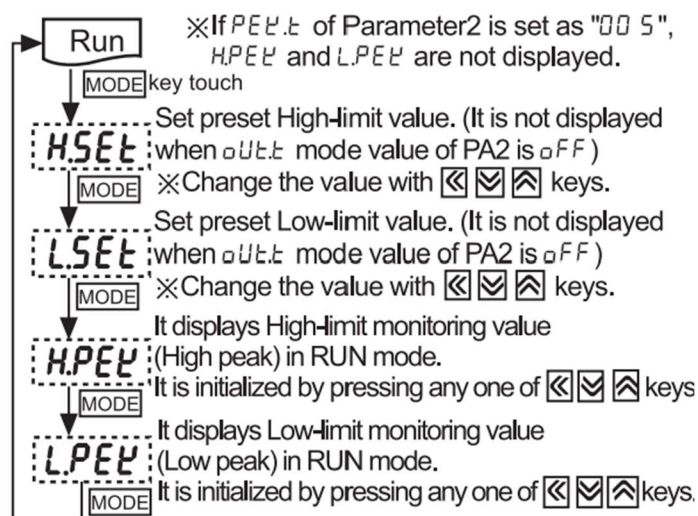


Figure 7: Low Voltage Threshold Alarm Procedure

Change the Hysteresis Value (HYS)

The hysteresis is the difference between the value when the alarm turns on to off (clear). The hysteresis is currently setup to 1V. To adjust the value, use the following step-by-step procedure:

- Hold the Mode Key **MODE** until you see PA 2 menu on the digital display panel.
- Press Mode Key **MODE** until you see HYS.
- Use the Control Keys **◀** **▼** **▲** to change HYS value.
- Hold the Mode key **MODE** to exit the configuration menu.

PA 2 (Parameter 2)	oUt.t	Out type	Set operation mode of preset output	Selectable <i>oFF</i> / <i>L5t</i> / <i>H5t</i> / <i>LH5t</i> / <i>HH5t</i> / <i>LL5t</i> / <i>Ld5t</i>
	HYS	Hysteresis	Set hysteresis value	Set range : 1 to 10% F.S.
	StA.t	Startup compensation time	Set startup compensation time.	Set range : 00 to 99.9sec.
	PEL.t	Peak time	Set monitoring delay time for peak value(sec)	Set range : 00sec to 30sec
	dIS.t	Display time	Set sampling time(sec.)	0.1 to 5.0 sec.(Variable by 0.1sec.)
	ZEro	Zero Key	Set usage of front side zero adjustment key	<i>nO</i> : Not use front side zero adjustment key <i>YES</i> : Use front side zero adjustment key
	EuIn	Event Input	Set external terminal(6, 7) function	<i>HoLd</i> : Use external terminal as Hold terminal <i>ZEro</i> : Use external terminal as zero point adjustment terminal
	FS-H	Full scale High	Set the upper value output point or PV output	Min. set range: Min. 10% F.S.
	FS-L	Full scale Low	Set the lower value output point or PV output	Max. set range: Max. <i>FS-H</i> 10%
	AdrS	Address	Set communication address	Set range:01 to 99
	bPS	Bit per second	Set baudrate(bps)	Selectable <i>1200</i> / <i>2400</i> / <i>4800</i> / <i>9600</i>
	LoC	Lock	Set lock function	Selectable <i>oFF</i> / <i>LoC1</i> / <i>LoC2</i> / <i>LoC3</i>

Open Circuit Alarm Relay Behavior

The FCCP ALM1 is used to provide the Open Circuit Alarm. In reality, the ALM1 is considered a summary alarm which can be triggered from various sources such as:

- A low current condition;
- A maintenance timer expired notification; or
- An FCCP hardware failure condition.

In order to generate a hardware failure, the ALM1 relay is energized by the CPU when input power is on. Thus, please refer to the subsequent table to clarify the FCCP relay alarm behavior.

FCCP Relay Output Behavior (ALM1 and ALM2)

The information herein provided is true when the FCCP is powered 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 or FCCP hardware failure condition	Energized	De-energized
High current condition	Energized	Energized

During normal operation, the ALM1 relay will be energized and will maintain a short circuit between Terminal 12 (ALM1 Com) and Terminal 13 (ALM1 NC). When the system is powered down or if a low current condition occurs, the relay will be de-energized and will return to the NC position. A short-circuit will appear between terminal 12 (ALM1 Com) and Terminal 12 (ALM1 NO).

OPERATION VERIFICATION

- Note: it is recommended to wait at least 25 minutes after installation, programming and calibration before testing. This initial time is used to calibrate the FCCP's algorithm to stabilize the device within its surroundings.
- **Testing:** Once the FCCP Box is physically installed and its alarm programming and calibration are completed, simulate a low current alarm by either temporarily removing the current transducer or by opening the battery charging circuit (verify with your company which procedure is the best practice and most suitable).
- Test the low voltage alarm by either temporarily removing the fuse F2 or by shutting down the charging circuit (again, verify with your company which procedure is the best practice and most suitable).
- Ensure that all alarms tested are remotely reporting and clearing properly to your control center.

CONTACTING MULTITEL

Multitel's customer service and technical support technicians are always eager to answer any questions you might have about the FCCP Box.

You can call or write to us, or visit our website where you can find further information on the FCCP Box, the FCCP ([user manual](#)) and other remote Multitel solutions.



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