

**MODEL 520603-2V150
and 520603-2V151
VOLTAGE MONITOR**

The Cragg Railcharger® Battery Voltage Monitor is a free standing unit that features the ability to monitor two DC voltage sources and has optional temperature and current monitoring ability.

CRAGG RAILCHARGER®
*Instruction Manual for Digital
Voltage Monitor*

RECO

15400 Medina Rd.
Plymouth, MN 55447
(763) 972-2200
(763) 972-2900 Fax
E-mail: mail@rwy.com



Table of Contents

1. WARNINGS, CAUTIONS, AND NOTES	1
2. FEATURES	2
2.1 The standard features of the Voltage Monitor are listed as follows:	2
2.2 Optional Features:	2
3. OPERATION	3
4. FRONT PANEL FEATURES AND COMPONENTS	3
4.1 Digital Display	4
4.2 Push Buttons	6
4.3 LED Status Indicators	6
4.4 External Wiring Connector	6
4.5 Current Sensor	6
4.6 Temperature Sensor	7
5. REMOTE MONITORING	7
5.1 Status Page	7
5.2 History Page	8
5.3 Configuration	8
6. DRAWINGS	10




1. WARNINGS, CAUTIONS, AND NOTES

Please read the entire instruction manual before using the voltage monitor.

Also, read the warnings, cautions, and notes in Table 1. Failure to observe the warnings and cautions can lead to equipment damage or personal injury.

If you have any questions concerning the manufacture, design, function, installation, operation or maintenance, contact Railway Equipment Company before proceeding.

Table 1. Warnings, Cautions, and Notes

Symbol	Description
	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate personal injury. It may also be used to alert against unsafe practices.
NOTE	NOTE indicates explanatory information that applies to the next step in the procedure. It is used to clarify and expand upon the importance of the procedural step when needed.
	If incorrectly wired, monitor can be damaged. Be sure to observe correct polarity on all DC wire connections, check the AC wiring instructions, and connect the ground wire.

2. FEATURES

2.1 The standard features of the Voltage Monitor are listed as follows:

- Two Channel Battery Voltage Monitor with form C Relay Outputs
- Model **520603-2V150** is the standard model and does not include an Ethernet port
- Model **520603-2V151** includes the communications board which provides an Ethernet port for remote monitoring
- 2500 Volt isolation between channels.
- Channel 1 and 2 sensitivity is 100 MV per step.
- For Lead Acid and NiCad Batteries
- Programmable Voltage Parameters
- LED Status Indicators
- Digital Amperage Meter (when optional Current Sensor is used)
- Digital Voltage Meter
- Digital Temperature Meter (when optional Temperature Sensor is used)
- Programmable High and Low Relay Trip Limits for Voltage, Current, and Temperature
- Input Power: 10 - 48VDC 2.5 Watts Constant, Protected by an internal resettable fuse.
- The inputs are protected against reverse polarity.
- Voltage Sense Range Channel 1: 10 - 48VDC
- Output Channel 1: Over or under set points programmable time delay
- Voltage Sense Range Channel 2: 1 - 150VDC
- Current Sense Range Channel 2: -120ADC to +120ADC
- Temperature Sense Range Channel 2: -40 to 300°F, -40 to 150°C
- Output Channel 2: Over or under set points programmable time delay
- The monitor outputs are a form C relay with fuse protection
- All Voltage inputs and Monitor outputs are wired via a removable Wago terminal
- Panel Mount Ready
- Meets or Exceeds AAR/AREMA Specifications
- 2-Year Warranty

2.2 Optional Features:

Current Sensor, +120A to -120A DC – **P/N 520603-32**

Temperature Sensor, 25ft Type T Thermocouple – **P/N 520603-22**

3. OPERATION

The model 520603-2V150 voltage monitor is equipped to monitor up to two DC voltage sources. The unit is powered by the voltage source that it monitors on channel 1. The channel 1 voltage range is 10 to 48 VDC. Because the unit is powered by the voltage it monitors on channel 1, the display will not illuminate until a voltage source is applied across pins one (+) and two (-). The unit power usage is a constant 2.5 Watts. The unit is reverse polarity protected, and the input power is protected by an internal resettable fuse.

Channel 2 has a voltage range of 1 to 150 VDC, but is only available for use if channel 1 is powered. There is 2,500 volts isolation between channels.

The monitor has easy front panel access for set up and wiring. There are form C relay outputs that are over current protected with replaceable blade type automotive fuses.

To get started, power from the source to be monitored (10 to 48 VDC range) should be applied across WAGO pins 1(+) and 2(-) using 18 to 14 gauge wire. This provides power to channel 1.

The display idle screen will show voltage. If the applied voltage is between the high and low voltage parameters, the Channel 1 OK LED will be on, and the channel 1 relay will be powered.

4. FRONT PANEL FEATURES AND COMPONENTS

This section describes the features and components that are on the front panel of the voltage monitor.



Figure 1. Front Panel of Voltage Monitor

4.1 Digital Display

The idle screen displays the input voltage. If only channel 1 has input voltage, only channel 1 will be displayed. If both channels are monitoring voltage sources, both will be displayed. If the optional current or temperature probes are being used, the lower screen will alternate between displaying channel 2 voltage, temperature, and current. With only channel 1 powered, the following screens will be scrolled through when the **MODE** button is depressed:

PASSWORD ___ - The password to adjust parameters is 5. It is entered by pressing the **INCREASE** button until 5 appears in the parameter field.

MAX VCH1

SET __. _ - This displays the high voltage setpoint parameter for channel 1. It can be adjusted from 0 to 50.0 VDC by use of the **INCREASE** or **DECREASE** push buttons. If the input voltage rises above the setpoint, the channel 1 output relay will change state and the channel 1 **CHANNEL OK** LED will go out. Factory default is 50.0 VDC.

LOW VCH1

SET __. _ - Low voltage setpoint for channel 1, adjustable from 0 to 50.0 VDC. If the input voltage falls below the setpoint, the output relay will change state and the **CHANNEL OK** LED will go out. Factory default is 0 VDC.

DELAY CH1

SET ____ - Delay time in seconds before a voltage falling outside the parameters will trigger a fault. This parameter is adjustable from 1 to 600 seconds. Factory default is 10 seconds.

If a voltage input is added on channel 2, in addition to the input on channel 1, the following additional screens to appear as the **MODE** button is used:

MAX VCH2

SET __. _ - High voltage setpoint for channel 2. Voltage range is 0 to 150.0 VDC. Factory default is 150.0 VDC.

LOW VCH2

SET __. _ - Low voltage setpoint for channel 2. Voltage range is 0 to 150.0 VDC. Factory default is 0 VDC.

DELAY CH2

SET ____ - Delay time in seconds for channel 2. Range is 0 to 600 seconds. Factory default is 10 seconds.

There is an optional amp probe available which can be set up to trip the same relay as a voltage fault will trip on Channel 2. The addition of the current probe will cause the following additional screens to appear:

HIGH AMP

SET ____ - Parameter for amp setting above which channel 2 will change relay State. Amp range is -120 to +120 amps. Factory default is +120 amps.

LOW AMP

SET ____ - Amp setting below which channel 2 will trip. Amp range is -120 to +120 amps. Factory default is -120 amps.

There is also an optional temperature probe that can control the channel 2 output. If the probe is used, the temperature can be displayed as Fahrenheit or Celsius. To select either Fahrenheit or Celsius, enter 10 on the **PASSWORD** screen. With 10 as your password, two additional screens will show up as the parameter screens are toggled through. One screen is: **F OR C** _____. The **INCREASE** or **DECREASE** buttons can be used to select which temperature scale will be displayed. The next screen will be **REV. LEV** _____. This screen will display the software revision level installed on the monitor. The addition of the temp probe adds the following screens:

HIGH TEMP

SET ____ - Temperature setting above which channel 2 relay will change state. Available temperature range is -40°F to +300°F (-40°C to 148.9°C). Factory default is +300°F (148.9°C).

LOW TEMP

SET ____ - Temperature setting below which channel 2 relay will change state. Available temperature range is -40°F to +300°F (-40°C to 148.9°C). Factory default is -40°F (-40°C).

The following **Fault Counter Screens** will appear only if the fault count in each is Greater than 0:

CH 1 HI V

COUNT ____ - Number of high voltage incidents on Channel 1. Press **DECREASE** to clear.

CH 1 LO V

COUNT ____ - Low voltage incidents on Channel 1. Press **DECREASE** to clear.

CH 2 HI V

COUNT ____ - High voltage incidents on Channel 2. Press **DECREASE** to clear.

CH 2 LO V

COUNT ____ - Low voltage incidents on Channel 2. Press **DECREASE** to clear.

HI TEMP

COUNT ____ - High temperature incidents on Channel 2. Press **DECREASE** to clear.

LOW TEMP

COUNT ____ - Low temperature incidents on Channel 2. Press **DECREASE** to clear.

HI AMP

COUNT ____ - High amperage incidents on Channel 2. Press **DECREASE** to clear.

LOW AMP

COUNT ____ - Low amperage incidents on Channel 2. Press **DECREASE** to clear.

4.2 Push Buttons

Below the digital display are three control push buttons:

INCREASE – This is used to increase the value of the displayed parameter, if enabled.

DECREASE – This button will decrease the value of the displayed parameter, if enabled.

MODE – This control is used to increment through the available screens.

4.3 LED Status Indicators

Two LEDs are used to indicate Channel OK, one for each input channel.

4.4 External Wiring Connector

Near the bottom of the front panel there is a twelve position socket with a removable connector for external wiring. The connection locations are shown below:

<u>PIN</u>	<u>CONNECTION</u>	<u>VOLTAGE INPUT NUMBER</u>
12	INPUT 10-48 VDC	# 1 +VOLTAGE
11	COM 0V	# 1 -VOLTAGE
10	NORMALLY CLOSED	# 1 OUTPUT RELAY
9	FUSED COMMON	# 1 OUTPUT RELAY
8	NORMALLY OPEN	# 1 OUTPUT RELAY
7	NO CONNECTION	
6	NO CONNECTION	
5	INPUT 1-150 VDC	# 2 + VOLTAGE
4	COM 0V	# 2 – VOLTAGE
3	NORMALLY CLOSED	# 2 OUTPUT RELAY
2	FUSED COMMON	# 2 OUTPUT RELAY
1	NORMALLY OPEN	# 2 OUTPUT RELAY

4.5 Current Sensor

The current sensor connector is located on the right center of the front panel. The sensor is optional, consisting of a plug end wired to a split current coil that can monitor the current level of a circuit monitored by channel 2. By setting the current parameters, the current level can be used to trigger a fault condition on channel 2, either independently, or in conjunction with channel 2 voltage, and/or with the temperature sensor.

4.6 Temperature Sensor

On the top of the monitor case is a temperature sensor jack. The temp sensor is an optional thermocouple that can be placed to monitor battery, equipment, or air temperature. By setting the temp parameters, the temperature level can be used to trigger a fault condition on channel 2, either independently, or in conjunction with channel 2 voltage, and/or with the current sensor.

5. REMOTE MONITORING

With the addition of a communications board, the Voltage Monitor can be remotely monitored via the Ethernet port. This requires the Voltage Monitor to be connected to the internet and a paid subscription from Railway Equipment Company.

5.1 Status Page

The Status page shows the current status of the charger, consisting of Module Indicators, Faults, Fault Counters, Readings and Settings.

Voltage Monitor : Voltage Monitor

Region:
Division:
Subdivision:
Mile Post:
Postal Code: 55421
Latitude: 35° 23' 36" N
Longitude: 97° 28' 36" W
Population Center: Oklahoma City, OK
Expiration Date:

Machine Status (not communicating for 966 days)
Unknown State

Weather Conditions
Station ICAO: KOKC
Few clouds
75.2 °F
Wind: S 15 MPH
Distance to Weather Station: 7.0 miles
Updated: 8/23/2012 8:52 AM CDT
View Forecast

IP Camera Monitor Test [Previous](#) [Return to Dashboard](#) [Next](#)

Status [History](#) [Configuration](#) [Engineering](#) [Usage](#) [Diagnostics](#) [Support](#)

Reading: Thursday, August 23, 2012 9:37:01 AM [Request Update](#) [Refresh](#)

Module Indicators	Faults	Fault Counters	Current Readings	Current Settings
Air Temperature	Ch1 Voltage Low	0	Ambient Temp: 86.1 °F	Machine S/N: 37216
Voltage Ch1	Ch1 Voltage High	1	Circuit Board Temp: 96.1 °F	Firmware Rev: 120120
Voltage Ch2	Ch2 Voltage Low	0	Voltage Ch1: 12.4 V	Comm Firmware Rev: 120112
Current	Ch2 Voltage High	1	Voltage Ch2: 0.0 V	
	Current Low	23	Current: 4.1 A	
	Current High	0		
	Temperature Low	0		
	Temperature High	0		

[Reset All](#) [Reset Module](#)

Figure 2. Status Screen

5.2 History Page

The History page shows any historical data that has been transmitted to our servers. The graph is interactive, which allows you to select specific date ranges, zoom in/out and add/remove data pens.

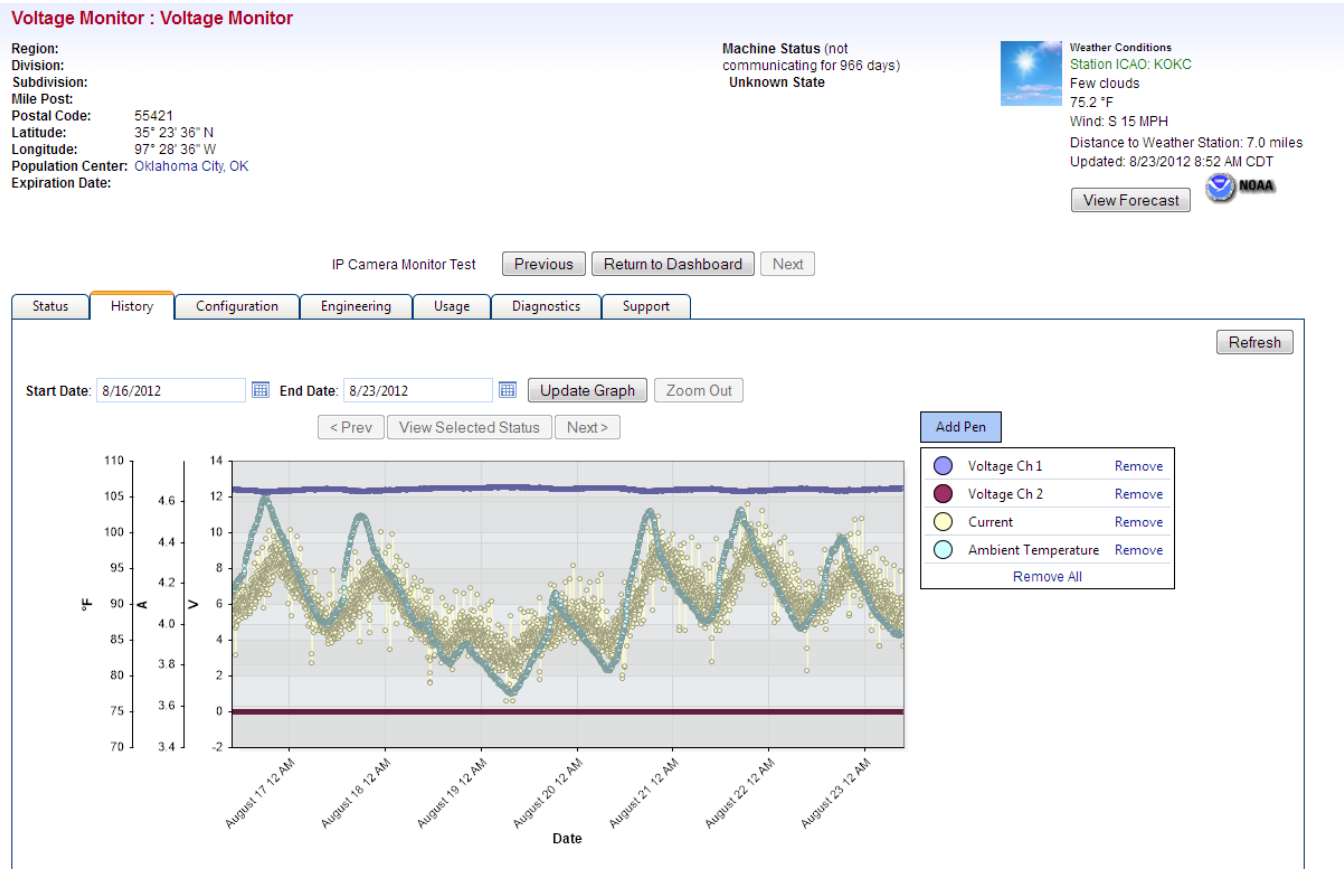


Figure 3. Historical graphing of Voltages, Current and Temperature

5.3 Configuration

The Ethernet port by default is setup to communicate to the remote monitoring servers. If these settings need to be changed, the section below describes how to change these.

PASSWORD

15 - The password to adjust parameters is 15. It is entered by pressing the **INCREASE** button until 15 appears in the parameter field.

Ixxx.xxx

.xxx.xxx – This displays the IP address of the Voltage Monitor. This cannot be changed from this screen.

Sxxx.xxx

.xxx.xxx – This displays the Server IP address that the Voltage Monitor will communicate with. By default this should be set to 208.42.179.9.

DHCP IS

ENABLED – Enable or Disable DHCP. By default this is set to Enabled, which will require the Voltage Monitor to acquire and IP address from a DHCP server.

IP LB

xxx... – Configures the first 3 digits of the IP address. This cannot be changed if DHCP is set to Enabled.

IP HB

. xxx.. – Configures the second 3 digits of the IP address. This cannot be changed if DHCP is set to Enabled.

IP UB

.. xxx. – Configures the third 3 digits of the IP address. This cannot be changed if DHCP is set to Enabled.

IP MB

... xxx – Configures the last 3 digits of the IP address. This cannot be changed if DHCP is set to Enabled.

SUB LB

xxx... – Configures the first 3 digits of the Subnet Mask. This cannot be changed if DHCP is set to Enabled.

SUB HB

. xxx.. – Configures the second 3 digits of the Subnet Mask. This cannot be changed if DHCP is set to Enabled.

SUB UB

.. xxx. – Configures the third 3 digits of the Subnet Mask. This cannot be changed if DHCP is set to Enabled.

SUB MB

... xxx – Configures the last 3 digits of the Subnet Mask. This cannot be changed if DHCP is set to Enabled.

GATE LB

xxx... – Configures the first 3 digits of the Gateway. This cannot be changed if DHCP is set to Enabled.

GATE HB

. xxx.. – Configures the second 3 digits of the Gateway. This cannot be changed if DHCP is set to Enabled.

GATE UB

.. xxx. – Configures the third 3 digits of the Gateway. This cannot be changed if DHCP is set to Enabled.

GATE MB

... xxx – Configures the last 3 digits of the Gateway. This cannot be changed if DHCP is set to Enabled.

PDNS LB

xxx... – Configures the first 3 digits of the Primary DNS. This cannot be changed if DHCP is set to Enabled.

PDNS HB

. xxx.. – Configures the second 3 digits of the Primary DNS. This cannot be changed if DHCP is set to Enabled.

PDNS UB

.. xxx. – Configures the third 3 digits of the Primary DNS. This cannot be changed if DHCP is set to Enabled.

PDNS MB

... xxx – Configures the last 3 digits of the Primary DNS. This cannot be changed if DHCP is set to Enabled.

SDNS LB

xxx... – Configures the first 3 digits of the Secondary DNS. This cannot be changed if DHCP is set to Enabled.

SDNS HB

. xxx.. – Configures the second 3 digits of the Secondary DNS. This cannot be changed if DHCP is set to Enabled.

SDNS UB

.. xxx. – Configures the third 3 digits of the Secondary DNS. This cannot be changed if DHCP is set to Enabled.

SDNS MB

... xxx – Configures the last 3 digits of the Secondary DNS. This cannot be changed if DHCP is set to Enabled.

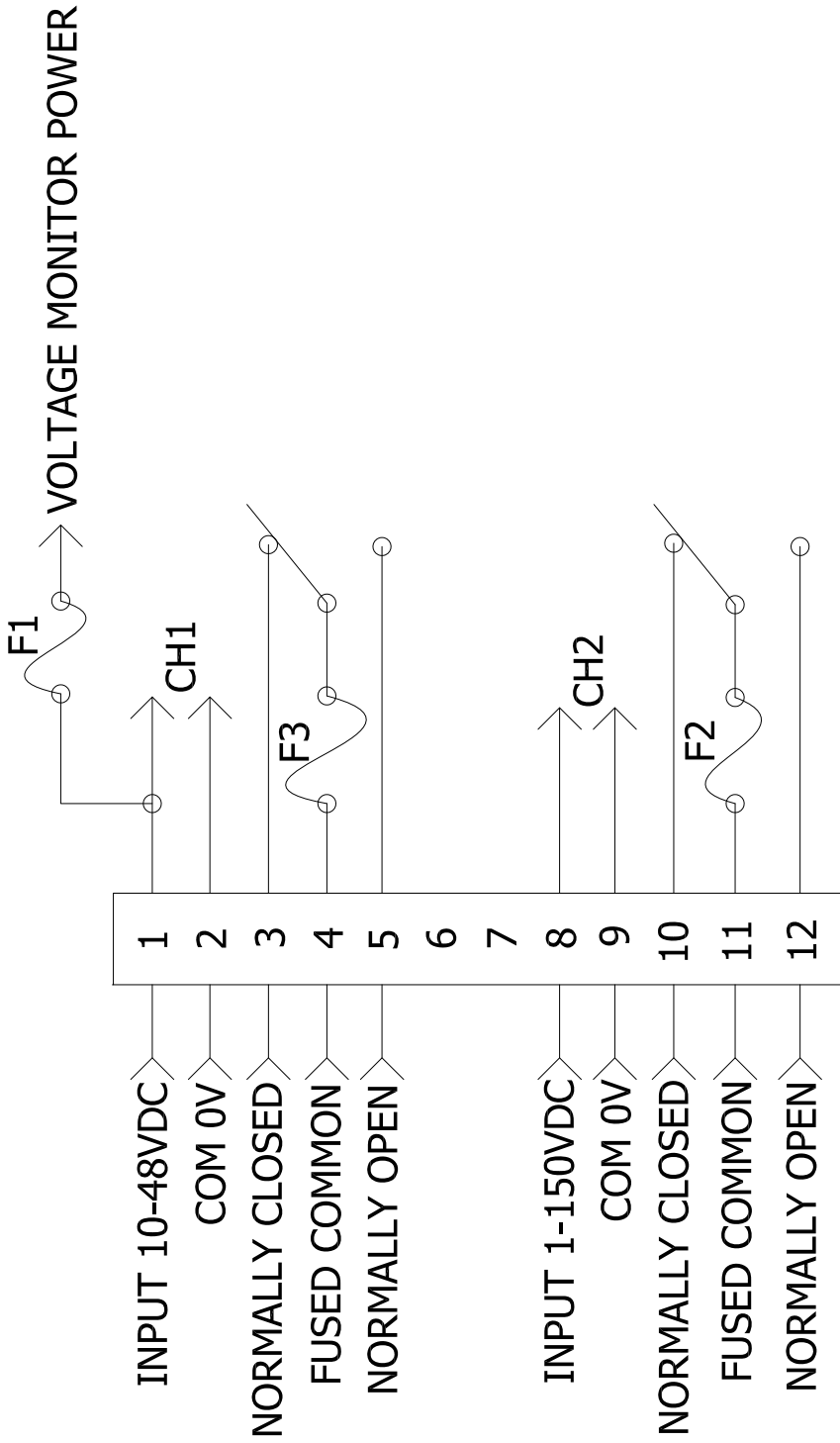
WEB PORT

xxxxx – Configures the port on the Server that the Voltage Monitor communicate with. By Default this is set to 49153.

LOC PORT

xxxxx – Configures the port on the Voltage Monitor that the Server communicates to. By Default this is set to 10089.

6. DRAWINGS



VOLTAGE MONITOR POWER

© RAILWAY EQUIPMENT CO., 2011

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES DIMENSIONS IN PARENTHESES ARE ANGULAR	
DECIMALS	FRACTIONS
.XX # 0.00	FRACCTIONS
.000 NOT SCALE DRAWING	DO NOT SCALE DRAWING
DRAWN: MPAYNE	
DATE: 3/8/12	
DATE: N/A	
SCALE: N/A	
SCALE: N/A	
TITLE: LOW VOLTAGE MONITOR USER CONNECTIONS	
DWG NO: 520603-2V150	REV: 1
SCALE: N/A	DWG SIZE: B
	SHEET 2 OF 2