

# D650 Universal/Remote Display

User Manual



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## MANUAL SETS

## **50 SERIES MANUAL SET**

- ML0035 M650 Family User Manual
- ML0036 50 Series DNP3 Protocol
- ML0037 50 Series Modbus Protocol
- ML0038 M350 Family User Manual
- ML0039 M651 Family User Manual
- ML0040 M653 Family User Manual
- ML0047 D650 Universal/Remote Display Manual

#### **70 SERIES MANUAL SET**

- ML0021 M87X User Manual
- ML0022 70 Series UCA<sup>®</sup> Object Model
- ML0024 M87X Modbus Plus Module & Protocol
- ML0025 70 Series Modbus Protocol
- ML0026 70 Series DNP3 Protocol
- ML0027 M870D Remote Display Manual
- ML0032 M57X User Manual
- ML0033 M570Dx Remote Display Manual
- ML0034 70 Series IEC 61850 Protocol Manual
- ML0041 878 DIOD User Manual
- ML0047 D650 Universal/Remote Display Manual

#### **POWERPLEX II MANUAL SET**

- ML0043 60 Series IEC 61850 Protocol Manual
- ML0044B PowerPlex II User Manual
- ML0045 PowerPlex II DNP3 Protocol
- ML0046 PowerPlex II Modbus Protocol
- ML0047 D650 Universal/Remote Display Manual
- ML0048 EtherNet/IP Protocol Manual

## VERSION HISTORY (ABRIDGED)

- V1.00 2016-03-08 D650 Initial Release
- V2.00 2018-06-29 D650 Client Protocol
- V2.12 2019-08-15 D650 Client Protocol Flex Scaling
- V2.14 2020-04-20 Supports 32-bit integer, multiple counters, two-row displays
- V2.20 2021-01-08 Enhanced configuration of Universal Display

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## CERTIFICATION

Bitronics LLC certifies that the calibration of our products is based on measurements using equipment whose calibration is traceable to the United States National Institute of Standards Technology (NIST).





## INSTALLATION AND MAINTENANCE

Bitronics LLC products are designed for ease of installation and maintenance. As with any product of this nature, installation and maintenance can present electrical hazards and should be performed only by properly trained and qualified personnel. If the equipment is used in a manner not specified by Bitronics LLC, the protection provided by the equipment may be impaired.

In order to maintain UL recognition, the following Conditions of Acceptability shall apply:

a) After installation, all hazardous live parts shall be protected from contact by personnel or enclosed in a suitable enclosure.

## WARRANTY AND ASSISTANCE

This product is warranted against defects in materials and workmanship for a period of onehundred-and-twenty (120) months from the date of their original shipment from the factory. Products repaired at the factory are likewise warranted for eighteen (18) months from the date the repaired product is shipped, or for the remainder of the product's original warranty, whichever is greater. Obligation under this warranty is limited to repairing or replacing, at our designated facility, any part or parts that our examination shows to be defective. Warranties only apply to products subject to normal use and service. There are no warranties, obligations, liabilities for consequential damages, or other liabilities on the part of Bitronics LLC except this warranty covering the repair of defective materials. The warranties of merchantability and fitness for a particular purpose are expressly excluded.

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# SAFETY SECTION

This Safety Section should be read before commencing any work on the equipment.

### Health and safety

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

## Explanation of symbols and labels

The meaning of symbols and labels that may be used on the equipment or in the product documentation is given below.



Installing, Commissioning and Servicing

Equipment connections



Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energizing the equipment, it must be grounded (earthed) using the protective ground (earth) terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment ground (earth) may cause a safety hazard.

The recommended minimum ground (earth) wire size is 2.5 mm<sup>2</sup> (#12 AWG), unless otherwise stated in the technical data section of the product documentation.

Before energizing the equipment, the following should be checked:

- 1. Voltage rating and polarity
- 2. CT circuit rating and integrity of connections
- 3. Protective fuse rating
- 4. Integrity of ground (earth) connection (*where applicable*)
- 5. Equipment operating conditions

The equipment should be operated within the specified electrical and environmental limits.



Current transformer circuits

Do not open the secondary circuit of a live CT since the high voltage produced may be lethal to personnel and could damage insulation.



Insulation and dielectric strength testing

Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.



Do not attempt to perform installation, maintenance, service or removal of this device without taking the necessary safety precautions to avoid shock hazards. De-energize all live circuit connections before work begins.



Fiber optic communication

Where fiber optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.



# WARNING: EMISSIONS - CLASS A DEVICE (EN55011)

This is a Class A industrial device. Operation of this device in a residential area may cause harmful interference, which may require the user to take adequate measures.



# **DECOMMISSIONING AND DISPOSAL**

#### 1. Decommissioning

The auxiliary supply circuit in the equipment may include capacitors across the supply or to ground (earth). To avoid electric shock or energy hazards, after completely isolating the supplies to the meter (both poles of any dc supply), the capacitors should be safely discharged via the external terminals before decommissioning.

2. Disposal

It is recommended that incineration and disposal to watercourses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation may apply to the disposal of lithium batteries.

# **1.0 DESCRIPTION & SPECIFICATIONS**

## 1.1 Introduction

There are two versions of the D650 Display. The D650 Universal Display (D650MX) connects to other equipment via Modbus or DNP3 Serial or TCP/IP to display values from that equipment using over 50 predefined screens of common three-phase power system measurements, and up to 30 user configurable screens. The D650BX Detached Display is targeted to replace the Model M870D Detached Display. The Model D650BX connects to 70 Series IEDs or PPX II devices through one of their serial communications ports. The Model D650BX is designed to provide a convenient way to view measurements made by 70 Series or PowerPlex II IEDs. A maximum of 64 (when used with 70 Series) or 10 (when used with PowerPlex II) user-configurable measurement screens can be displayed. The instrument can be set to display a single screen continually or automatically scroll through all available screens. Additionally, the user may manually step through all available screens. All the screens can be scrolled.

Three individual D650 Displays may be mounted horizontally on a 19" panel, if desired.

# 1.2 Features

- 1. Modbus or DNP3 Serial or TCP/IP Client Protocol (D650MX)
- 2. Flex scaling and measurement assignment in D650MX Universal
- 3. Configurable RS-232/RS-485 serial port
- 4. Wide-range universal power supply
- 5. Rugged aluminum 4" round industry standard case.
- 6. 3-line at once, easy-to-read, long-life LED displays
- 7. Ultimate precision with five digits per line
- 8. Instant recognition of the displayed function from the alphanumeric display in engineering units
- 9. Easy setup and scrolling from front display with "Touch-Sense" buttons
- 10. Configurable Display ID addresses and baud rate settings
- 11. Web-based configuration via Ethernet service port for D650MX, limited setup for D650BX.
- 12. PC based Configuration utilizing 70 Series software tools when using with Mx7x devices.

# 1.3 Specifications

1.3.1 Power Supply Input (Auxiliary) Voltage	
Input Terminals	L1(+) and L2(-); Safety ground stud
Installation Category (Auxiliary power supply)	CAT II. Refer to definitions below.
Nominal	48-250V dc, 69-240V ac (50/60Hz)
Operating Range	36-300V dc, 55-275V ac (45-65Hz)
Burden	8W max, 24VA max

1.3.2 Display	
Display	3 lines of 5 digits, Red LED, 0.56" High
Display Interface	4 buttons
Distance (max)	50 ft. (15m) RS232, 4000 ft. (1200m) RS485
Addressability (Display ID)	Configurable Display Addresses 1 15 (D650BX)

1.3.3 Communication Ports – Serial &	Ethernet
Serial port (Display; Modbus RTU,	RS-232, RS-485 (4-wire), full duplex, Software configurable port.
DNP3 – D650MX)	Baud rate: Configurable, 9600, 19200, 38400, 57600, 115200 bps, D650BX Display's baud rate settings must match the port baud rate settings on 70 Series (M87x, M57x) or PowerPlex II (PPX II)
	Parity: Configurable; factory default setting is None.
	Fixed Serial Communication Parameters: 8 bits & 1 stop bit.
Ethernet	Single port; copper 10/100 Base-TX (standard) RJ45.

1.3.4 Environmental	
Operating Temperature	-40C to 70C
Relative Humidity	0-95% non-condensing
Pollution Degree	Pollution Degree 2. Refer to definitions below.
Enclosure Protection (to IEC60529: 2001)	Front Panel: IP 20, Rear: IP 20 When equipment is mounted in an appropriately rated protective enclosure to NEMA or IP protection classifications, as required for the installation. Ratings are applicable for enclosure category 2 (see definitions)
Altitude	Up to and including 2000m above sea level
Intended Use	Indoor use; Indoor/Outdoor use when mounted in an appropriately rated protective enclosure to NEMA or IP protection classifications, as required for the installation. Class 1 equipment to IEC61140: 2001

1.3.5 Physica	al	
Connections	Protective	10-32 Studs for connection with protective earth ground. Recommended Torque: 12 In-Lbs, 1.36 N-m
$\wedge$	Conductor	Cable temperature rating: 85C minimum
∠ • ``	Voltage (AUX	Precautions must be taken to prevent shorting of lugs at the terminal block.
	PWR only)	A minimum distance of 1/8" (3mm) is recommended between uninsulated lugs to maintain insulation requirements. Recommended Torque: 9 In-Lbs. 1.02 N-m
		Cable temperature rating: 85C minimum.
(located on		Note: On the Model D650 Display the terminals VA, VB, VC, VN on the terminal block are
back panel)		disconnected and do not function as inputs).
	Serial Port	6 position removable terminal block, accepts 26-14AWG solid or 26-12 AWG stranded wire.
	(Display)	Recommended Torque / In-lbs, 0./9 N-m.
		Cable temperature rating: 85C minimum.
	Ethernet	RJ45, 8 position modular jack, Category 5 for copper connection; 100m (328 ft.) UTP (unshielded twisted pair) cable
Weight	1 8 lbs ( 8 kr	
(typical)		
Size	Industry star	ndard 4" round case, 7.0 inches long

Definitions:

**Enclosure Category 2:** Enclosures where no pressure difference relative to the surrounding air is present.

**Installation Category II (Overvoltage Category II)** or CAT II: Equipment is intended for connection to the fixed installation of a building. The power supply to the electronic equipment is separated from other circuits, usually by a dedicated transformer for the mains power supply.

**Measurement/Installation Category III (Overvoltage Category III) or CAT III:** Distribution Level, fixed installation, with smaller transient overvoltages than those at the primary supply level, overhead lines, cable systems, etc.

**Pollution:** Any degree of foreign matter, solid, liquid, or gaseous that can result in a reduction of electric strength or surface resistivity of the insulation.

**Pollution Degree 2:** Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.

## **1.4 Standards and Certifications**

UL/CSA Recognized, File Number E164178 UL61010-1, Edition 3, Issue Date 2012/05/11 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements UL61010-2-30, Edition 1 – Issue Date 2012/05/11 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2: Particular Requirements for Testing and Measuring Circuits

CSA C22.2 No. 61010-1-12-CAN/CSA, Edition 3, Issue Date 2012/05/01

CAN/CSA Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

CSA C22.2 No. 61010-2-30-12-CAN/CSA, Edition 1 - Issue Date 2012/05/01

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular Requirements for Testing and Measuring Circuits

If applicable, the CE mark must be prominently marked on the case label.

European Community Directive on EMC (EMCD) 2014/30/EU, superseding 2004/108/EC and Directive 91/263/EC [TTE/SES]. European Community Directive on Low Voltage (LVD) 2014/35/EU, superseding 2006/95/EC

Product and Generic Standards

The following product and generic standards were used to establish conformity:

Low Voltage (Product Safety)

IEC 61010-1, Edition 3, Issue Date 2010

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

IEC 61010-2-30, Edition 1 – Issue Date 2010

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular Requirements for Testing and Measuring Circuits

**EMC:** EN 61326-1: 2013 (Supersedes EN61326-1: 2006), EN 61000-6-2: 2005 + AC: 2005 (supersedes EN 61000-6-2:2005), EN 61000-6-4: 2007 + A1:2011 (IEC date 2010)

Radiated Emissions Electric Field Strength EN 55011: 2009 + A1: 2010 EN 55011: 2016 EN 61000-6-4: 2007 + A1:2011 (IEC date 2010 Group 1, Class A Frequency: 30 - 1000 MHz

AC Powerline Conducted Emissions EN 55011: 2009 + A1: 2010 EN 55011: 2016 EN 61000-6-4: 2007 + A1:2011 (IEC date 2010 Group 1, Class A Frequency: 150 kHz – 30 MHz

Conducted Emissions, Telecommunication port (Ethernet port) EN 55022: 2010 + AC: 2011 EN 55032: 2012 + AC: 2013 EN 55032: 2015 + AC: 2016-07 Group 1, Class A Frequency: 150 kHz – 30 MHz

Electrostatic Discharge (ESD) EN61000-4-2: 2009 Discharge voltage: ± 8 KV Air; ± 4 KV Contact & Additionally meets ± 6 KV Contact

Immunity to Radiated Electromagnetic Energy (Radio Frequency) EN 61000-4-3: 2006 + A1: 2008 + A2:2010, Class III Frequency: 80 – 1000 MHz, Amplitude: 10.0 V/m, Modulation: 80% AM @ 1 kHz Frequency: 1400 – 2000 MHz, Amplitude: 3.0 V/m, Modulation: 80% AM @ 1 kHz Frequency: 2000 – 2700 MHz, Amplitude: 1.0 V/m, Modulation: 80% AM @ 1 kHz Digital Radio Telephones: Erequency: 900 MHz & 1890 MHz, Amplitude: 10.0 V/m, 3.0 V/m

Frequency: 900 MHz & 1890 MHz, Amplitude: 10.0 V/m, 3.0 V/m, Modulation: 80% AM @1kHz

Electrical Fast Transient / Burst Immunity EN 61000-4-4: 2012 (supersedes EN 61000-4-4: 2004 + A1:2010) Burst Frequency: 5 kHz Amplitude, AC Power Port: ± 4 KV (Severity Level 4), exceeds ± 2 KV requirement Amplitude, Signal Port: ± 1 KV, Additionally meets ± 2 KV (Severity Level 3) Amplitude, Telecom ports (Ethernet): ± 1 KV

Current/Voltage Surge Immunity EN 61000-4-5: 2014 (supersedes EN 61000-4-5: 2006) Open Circuit Voltage: 1.2 / 50  $\mu$ s Short Circuit Current: 8 / 20  $\mu$ s Amplitude, AC Power Port: ± 2 KV common mode, ± 1 KV differential mode

Immunity to Conducted Disturbances Induced by Radio Frequency Fields EN 61000-4-6: 2014 (supersedes EN 61000-4-6: 2009) Level: 3 Frequency: 150 kHz – 80 MHz Amplitude: 10 V rms Modulation: 80% AM @ 1 kHz

Power Frequency Magnetic Fields EN 61000-4-8: 2010 Amplitude: 30A/m Frequency: 50 and 60 Hz

AC Supply Voltage Dips and Short Interruptions EN 61000-4-11: 2004

Surge Withstand Capability Test For Protective Relays and Relay Systems ANSI/IEEE C37.90.1: 2002 (2.5 kV oscillatory wave and 4 kV EFT)

# 2.0 PHYSICAL CONSTRUCTION & MOUNTING

The D650 meters are packaged in rugged aluminum cases specifically designed to meet the harsh conditions found in utility and industrial applications.

The Front panel view is shown in Figure 1. The mechanical dimensions are shown in Figure 2.



Figure 1 – D650 Front View





Figure 2 - Mounting and Overall Dimensions D650

#### 2.1 Installation



WARNING - INSTALLATION AND MAINTENANCE SHOULD ONLY BE PERFORMED BY PROPERLY TRAINED OR QUALIFIED PERSONNEL.

#### 2.2 Initial Inspection

Bitronics instruments are carefully checked and "burned in" at the factory before shipment. Damage can occur however, so please check the instrument for shipping damage as it is unpacked. Notify Bitronics LLC immediately if any damage has occurred, and save any damaged shipping containers.

#### 2.3 Protective Ground/Earth Connections

The device must be connected to Protected Earth Ground. The minimum Protective Ground wire size is 2.5 mm<sup>2</sup> (#12 AWG). Bitronics LLC recommends that all grounding be performed in accordance with ANSI/IEEE C57.13.3-1983.



#### 2.4 Overcurrent Protection

To maintain the safety features of this product, a 3 Ampere time delay (T) fuse must be connected in series with the ungrounded/non-earthed (hot) side of the supply input prior to installation. The fuse must carry a voltage rating appropriate for the power system on which it is to be used. A 3 Ampere slow blow UL Listed fuse in an appropriate fuse holder should be used in order to maintain any UL product approval.



#### 2.5 Supply/Mains Disconnect

Equipment shall be provided with a Supply/Mains Disconnect that can be actuated by the operator and simultaneously open both sides of the mains input line. The Disconnect should be UL Recognized in order to maintain any UL product approval. **The Disconnect should be acceptable for the application and adequately rated for the equipment.** 

#### 2.6 Instrument Mounting

The instrument may be mounted into a standard 4" round panel opening as shown in Figure 2. The unit will mount through the 4-inch round panel opening from the front. Align the four #10-32 studs attached to the flange with their appropriate mounting holes, as shown by the panel hole pattern. Use four #10-32 nuts with lock washers applied onto the studs from the back side of the panel. *Make sure that any paint or other coatings on the panel do not prevent electrical contact.* 

**WARNING – DO NOT** over tighten the nuts on the mounting studs, **HAND** tighten with a standard nut driver, 12 inch-pounds (1.36 N-m) is recommended, **MAXIMUM** torque is 15 inch-pounds (1.69 N-m).

Several instruments may be mounted on a 19" Rack panel if desired. Three of the D650 displays will fit side by side on a standard 5.25" high panel. Figure 2 indicates the dimensions of the panel hole cutout. Leave adequate space surrounding the instrument when determining mounting arrangements.

#### 2.7 Cleaning

Cleaning the exterior of the instrument shall be limited to the wiping of the instrument using a soft damp cloth applicator with cleaning agents that are not alcohol based, and are non-flammable and non-explosive.

# 3.0 BACK PANEL & WIRING

The rear view of the D650 is shown in Figure 3 with the Serial (Display) port shown (removable terminal block at the top. Refer to Section 3.4 in this user manual when wiring the serial communication port for your display.



Figure 3 – Rear View D650

(Note: Back panel shown by Figure 3 contains hole plugs used on the earliest production parts, however a variation of the back panel is incorporated on later production parts where holes and their associated markings have been removed.)

## 3.1 Auxiliary Power

The D650 display is powered by connections to L1(+) and L2(-). A Blue LED Power (PWR) indicator is provided on the rear panel to indicate that the unit is powered ON. It is located on the right side of the rear panel. Refer to section 1.3.1 for specifications.

## 3.2 Ethernet

The D650 Ethernet port meets or exceeds all requirements of ANSI/IEEE Std 802.3 (IEC 8802-3:2000) and additionally meets the requirements of part 8-1 TCP/IP T-profile for physical layer 1 (Ethernet copper interface). The D650 display is offered with a standard Ethernet 10/100 Megabit (Mb) RJ45 (copper) interface (10BASE-T and 100BASE-TX) which automatically selects the most appropriate operating conditions via auto-negotiation. This interface is capable of operating either as half-duplex (compatible with all Ethernet infrastructure) or full-duplex interfaces (which allow a potential doubling of network traffic). Note that the meters come with the port setup as a service port. On the D650MX, the Ethernet port also supports Modbus and DNP3 TCP/IP Client Protocol.

# 3.2.1 Indicators – Ethernet (ACT) & Serial LEDs

There are 2 LEDs on the rear panel to indicate activity is occurring on the communication ports. These LEDs are useful in determining that there is activity occurring on the ports. The "ACT" LED will flash to indicate there is activity on the Ethernet port. It will also indicate that a link has been established. The Serial LED flashes to indicate there is activity occurring for the serial port.

A troubleshooting guide is found in Appendix A1, which may be useful in establishing Ethernet connections.

## 3.2.2 Network settings

The D650 Display comes preconfigured for interconnection to an HTML web server with default settings for IP address, SUBNET mask, and ROUTER (GATEWAY) address.

Network Default (Preconfig	ured) Settings	
IP Address	Subnet mask	Router (Gateway) Address
192.168.0.171	255.255.255.0	192.168.0.1

It is very important that the network have no duplicate IP addresses, so an IP address conflict is NOT created for your network. It is recommended to perform your initial setup for network addresses using the front buttons on the meter, unless it is known that the default (preconfigured) IP address is not already an assigned address on your network. Changing the stored Configuration of these network addresses may be accomplished by using one of the following methods

Enter Network addresses using the meter's front buttons:

Refer to the section in this manual on "Navigating the D650's setup menu from the Front panel" for further instruction regarding the button sequence you will use to scroll through the menu structure. This will provide a handy menu tree.

Activate the setup mode using the front buttons on the meter by pressing the Up + Toggle (Exit) buttons simultaneously. Scroll to menu selection "<sup>1.1</sup> Network", in order to change the Network settings. Enter an IP address that you know is an unassigned address for your network. You can ping the IP address to make sure it is not already in use on your network. You may also want to check with your network administrator to make sure the IP address you plan on using is available to use on your network. After entering the Network addresses, exit out of the menu, and when prompted to save the new configuration settings, press the button directly under the SAVE prompt identified as "Y" (Yes). Reboot the meter for the configuration changes to take effect.

Enter the IP Address for the meter through a standard web browser:

Before entering an IP address with this method, make sure the current IP address and the new IP address to be assigned to the meter will not cause IP address conflicts on your local network. To connect to the web server, enter the meter's current IP Address in your web browser's address bar. When the web server screen appears, click on the "Settings" tab. Please refer to screen captures below for "Settings" and "Network" pages. Type the new Network settings (IP address, Subnet mask,

Gateway) in the appropriate fields and click the "**Apply**" button to send the new network settings to the meter. Reboot the meter for the configuration change to take effect.

The D650 uses the following port numbers for each type of protocol:

Protocol	Port Number
HTML	80 (TCP)
Modbus Client	502 (TCP) configurable
DNP3 Client	20000 (TCP/UDP) configurable

Determining the IP Address if unknown:

Although the IP address can be obtained via the display, Bitronics has created a utility program to request the IP address for a specific MAC address on an Ethernet network. This program can be used with the D650 as well. Please contact customer service to obtain the program.

The program uses the <u>Inverse Address Recognition Protocol</u> to perform the lookup and thus is called inarp. The InARP protocol definition can be found at <u>www.apps.ietf.org/rfc/rfc2390.html</u>. The inarp utility can also scan an Ethernet network for a range of MAC addresses, printing the IP address for any devices which respond.

The general form of inarp is defined below, followed by some usage examples.

inarp usage:

```
inarp [-i <if_ipaddr>] [-n <cnt>] [-p <ms>] [-v] <mac-spec>
```

```
where
  <if_ipaddr> := interface ip address (default is 1st Ethernet interface)
      <cnt> := count of addresses to poll (default 1)
      <ms> := period between polls (100ms)
  <mac-spec> := <6ByteMac> | <[3-5]ByteMac> | <macRangeName>
  <6ByteMac> := xx:xx:xx:xx:xx - <cnt> can specify a range to scan
  <5ByteMac> := xx:xx:xx:xx - default <cnt> is 256
...
  <3ByteMac> := xx:xx:xx - default <cnt> is 16,777,216
<macRangeName> := "50series"
      50Series MAC base (00:d0:4F:03), default <cnt> is 65,536
```

-v := request verbose information

CTRL-C stops a scan.

The inarp utility requires the WinPcap and Packet libraries which are bundled in the WinPcap "Installer for Windows." This can be downloaded from www.winpcap.org.

Installation requires Administrator privileges.

Examples:

to poll the 1st IPv4 interface, inarp -v 50series CTRL-C stops the scan

to poll the IPv4 interface associated with 192.168.1.1, use inarp -v -i 192.168.1.1 50series

or to poll a specific mac, use inarp -v -i 192.168.1.1 00:D0:4F:03:00:15

The inarp utility is Copyright (c) 2011 by Bitronics, LLC. All rights reserved. Portions of inarp are Copyright (c) 1999 - 2005 NetGroup, Politecnico di Torino (Italy), and Copyright (c) 2005 - 2010 CACE Technologies, Davis (California)

### 3.2.3 Firmware upgrades and saving and loading configuration files – Ethernet service port

New versions of firmware may be released by Bitronics from time to time, either to add new functionality or to correct errors in code that may have escaped detection prior to commercial release. Consult the factory for detailed information pertaining to the availability of firmware upgrades. In cases such as this, it is desirable to support a mechanism for new firmware to be installed remotely. The ability to upgrade Firmware is done over the Ethernet port. The M650/D650 family utilizes a page in the Web Server interface to upload and install new firmware. Note, this only updates the firmware for the D650 display, not the device it is connected to.

Before loading new firmware, you should restore the meter to the factory defaults. On the Load/Store settings page, select Restore All Defaults to bring the meter back to default settings. To upload the new firmware, first obtain a copy of the firmware image. The firmware image is a binary file, less than 1 MB in length, that can be attached to email, distributed on a CD, or downloaded from an FTP site as circumstances dictate. Place a copy of the firmware image on your computer then access the upload page from the Firmware Upload link on the Configuration Settings page.

This will take you to the Firmware Upload page, which looks like the screen capture in Figure 4.

Home S	ettings Contact		
Settings / Firm	nware Upload		
Update D	evice Firmware		
Save to IED Select a firmy	vare image file.		

# Figure 4 – Bitronics D650 Firmware Upload Page

Once the Firmware Upload page is visible, use the Browse button to locate the firmware image on your computer. Next, use the Submit button to initiate the file transfer and installation process. The instrument must be rebooted to make the new firmware active. At the completion of the file transfer and installation process, the instrument will prompt you to reset the instrument remotely by displaying the dialog box below after the firmware has been successfully installed.

Pending changes will not take effect until after IED is reset.	Reset
--	-------

It is strongly recommended that you clear your web browser's cache (delete the temporary internet files) after updating the firmware so that the new content will be loaded into your browser. Please refer to your browser's help file on how to clear the cache. A useful keyboard shortcut common to Internet Explorer, Firefox and Chrome is CONTROL + SHIFT + DELETE, which will take you directly to the relevant dialog panel. Carefully select the items to be cleared. Be sure to check the boxes that clear "temporary internet files", "cache" or "website data" and uncheck any boxes that preserve data.

## 3.3 Serial Port

The D650 display is equipped with a serial port. The Model D650BX utilizes the serial port to connect with the following Bitronics models in serial display protocol: M57x, M87x, or PowerPlex II. The port is software (user) configurable for RS-232 or RS-485. Baud rate is fixed at 19.2kbps for the PowerPlex II and supports rates up to 38.4k Display protocol when used with the Mx7x. The RS-232 drivers support full and half duplex modes. See Figures 5 & 6 for signal assignments applicable to RS232 and RS485. See section 1.3.3 for specifications. The Model D650MX can operate in serial display protocol if that option is selected on the web page in which case it will act like the D650BX. The D650MX can utilize the serial port if configured for Modbus/DNP3 to connect to other devices as a SCADA Master to display values from those devices. In SCADA mode, 9600, 19200, 38400, 57600, 115200 bps are supported

Set-up of the D650 Serial Port can be accomplished by using a web browser connected to the Ethernet port, or via the front display buttons (Setup menu - <sup>1.2</sup> Serial Port). The default configuration for the serial ports is:

Serial P	ort Default Setting				
Port	Protocol	Parity	Baud	IED Addres	Physical Media
Serial	Display	None	9600	1	RS-232

Serial cable requirements for RS485 connections:

Tie RS-485 cable shields (pin 15) to earth ground at one point in system.

The recommended torque ratings for the terminal block wire fasteners are listed in the Physical Specifications table (section 1.3.5).

Transient Voltage Suppressor (TVS) clamp devices are used on the serial port as the method of protection. The serial port is clamped to a voltage of 16.7-18.5V nominal, 24.46V max. The clamps are rated for a peak pulse current of 24.6 Amps max.

#### 3.4 Interconnections to D650 Serial Port

#### 3.4.1 Communication Connections - Serial Port RS232 Mode for M57x to D650

D650 RS-232 Cable Connections to M57x

#### D650 Rear Port to M57x RJ11 (P1)



\*6 conductor RJ11 flat cable - RTS & CTS are not required for D650 display operation. Otherwise, 4 conductor RJ11 flat cable will suffice for display operation.

#### D650 Rear Port to M57x Serial Ports

	M57x			DISPL/	٩Y
SER	IAL POF	RTS		REAF	2
	P2, P3			POR	Γ
RXD	21, 27		<u>_</u>	TXD	19
TXD	22, 28		<del></del>	RXD	18
RTS	20, 26		1	RTS	17
CTS	19, 25		-li	CTS	16
SHLD	18, 24		i <u>L</u>	SHLD	15
GND	17, 23		++	GND	14

The rear port of the D650 Display and the port of the M57x must be set to RS-232, matching Baud rates and parity, and Display protocol.

The cable should be Belden 9842 or equivalent, unless otherwise specified. The maximum cable length for RS-232 is 50 ft (15m).

RDSCables-232\_D650\_M57x\_R1.cdr 1/7/16

#### Figure 5A – RS-232 Cable Wiring Diagram – M57x to D650

#### 3.4.2 Communication Connections - Serial Port RS232 Mode for M87x to D650

D650 RS-232 Cable Connections to M87x

### D650 Rear Port to M87x DB9M

DB9 FEN	1ALE		DISPL	٩Y
connecte	ed to		REAF	2
M87x	P1		POR	Г
RXD	2 —	++	TXD	19
TXD	3 —	÷÷	RXD	18
GND	5	1	RTS	17
DTR	4	¦i –	CTS	16
DSR	6	i <u>–</u>	SHLD	15
DCD	1 - <b>- L</b>	<u>+</u>	GND	14
RTS	7 —	<b>_</b> .		
CTS	8 —			
RI	9			

#### D650 Rear Port to M87x Ports

M87x H	05	ST		DISPL	٩Y
SERIAL P	OR	RTS		REAF	2
P2, P3,	P2	1		POR	Γ
RXD	2		<del> </del>	TXD	19
TXD	1	-	÷+	RXD	18
RTS	3		11	RTS	17
CTS	4		¦i –	CTS	16
SHLD	5		i <u>L</u>	SHLD	15
GND	6		+	GND	14

The rear port of the D650 Display and the Host port of the M87x must be set to RS-232, matching Baud rates and parity, and Display protocol.

The cable should be Belden 9842 or equivalent. The maximum cable length for RS-232 is 50 ft (15m).

RDSCables-232 D650 M87x R1.cdr, 1/7/16

### Figure 5B – RS-232 Cable Wiring Diagram – M87x to D650

D650 RS-232 Cable Connections to PowerPlex II (PPX II)



- 1. The rear port of the D650 Display and the Display P1 (Host) port of the PPXII must be set to RS-232, matching Baud rates, parity, and Display protocol.
- 2. The maximum cable length for RS-232 is 50 ft. (15m).

RDSCables-232\_D650\_PPXII.cdr, 8 Jan 2016

#### Figure 5C – RS-232 Cable Wiring Diagram – PowerPlex II to D650

#### 3.4.4 Communication Connections - Serial Port RS485 Mode for M57x to D650



#### 3.4.5 Communication Connections - Serial Port RS485 Mode for M87x to D650



M87x RS-485 Cable Connections to D650

The rear port of the D650 and the Host port of the M87x must be set to RS-485, matching Baud rates and parity, and Display protocol.

The cable should be Belden 9842 or equivalent. The maximum cable length for RS-485 is 4000 ft (1200m).

RDSCables-485\_D650\_M87x\_R1.cdr, 1/7/16

Figure 6B - Typical RS-485 Cable Wiring - M87x to D650

#### 3.4.6 Communication Connections - Serial Port RS485 Mode for PPX II to D650

#### PPX II RS-485 Cable Connections to D650

PPX II Port to D650 Display's Rear Port (4-Wire, Full Duplex) Zmodem, Display Protocols



The rear port of the D650 and the serial port of the PPX II must be set to RS-485, matching Baud rates and parity, and Display protocol.

The cable should be Belden 9842 or equivalent. The maximum cable length for RS-485 is 4000 ft (1200m).

RDSCables-485\_D650\_PPX II\_R1.cdr. 1117/16

#### Figure 6C - Typical RS-485 Cable Wiring – PPX II to D650

## 3.5 Setup Mode – D650 Display Settings

The D650 has four configurable parameters that must be set to match the device to which it is connected. The configurable parameters consist of the "ID of Display" (1-15) for serial display protocol only, Serial Mode/Physical Media (RS232 or RS485), Baud rate and Parity configuration settings. Please refer to the "Display" and "Serial Port" screen captures in Section 5.5 to see where to set these parameters via the web interface. To setup using the front display, press the up arrow key and the Toggle (Exit) key simultaneously to enter the display setup mode. The alphanumeric display will describe the selected parameter, while the digit display will show the value. Use the up and down arrow keys to scroll through the available values for that parameter. When the desired value is displayed, press Home (Enter) button to confirm the setting. The left arrow button is used to go to the next configurable parameter. When 'Exit' appears in the alphanumeric display, press the Toggle (Exit) button to return to normal operation. The instrument will automatically return to normal operation if no keys have been pressed in five minutes. This timeout prevents the instrument from inadvertently being left in setup mode.

Parameter	Available Values (Programmed/Configured)
ID of Display	1 – 15 (Serial display protocol only)
Serial Mode	232, 485
Physical Media)	
Baud	9600,19200, 38400 Baud
Parity	None, Even, Odd, Always 1 (Mark), Always 0 (Space)
Version	Displays current version information. This value cannot be modified.
Exit	Allows exiting setup mode.

## Table 1 – Configurable Parameters

WARNING - THE METER ADDRESS, COMMUNICATION MODE, AND BAUD RATE PARAMETERS ARE STORED IN NON-VOLATILE MEMORY. THIS MEMORY STORAGE HAS A 1,000,000 CYCLE ENDURANCE RATING. (PARAMETERS CAN BE CHANGED 1,000,000 TIMES).

# 3.6 Interdependency – Meter Configuration controls D650 Display Screens with Serial Display Protocol

The screens that are displayed in the D650's scrolling mode when set in serial display protocol are generated by the meter (M57x, M87x, or PPX II). The meter is responsible for sending its programmed screen data to the D650 Detached Display. The Detached Display screens can be programmed (ENABLED/DISABLED) by the user by configuring the meter. The programming and configuration settings for the displayed measurement screens reside with the meter. The configuration of the individual screens as well as screen content is dependent upon what model is connected to the D650's serial port. See the following subsections for more details on programming and configuring the D650 based on whether the Detached Display is connected to a M57x/M87x or a PPX II.

## 3.6.1 Setup the Measurements for Display Screens - 70 Series Configurator (M57x or M87x)

Measurements that are shown on the D650 Display Front panel can be set up using the Windows® based 70 Series Configurator. There are two folders in the Communication section, which must be configured before the D650 can successfully establish communication with the meter. The folder as shown by Figure 7 is used to setup the Port Assignments. Set the protocol of the port to which the Remote Display is connected to "Zmodem/Display/Log". Set the Serial Mode Physical Media, Parity,

and Baud settings as required so that these settings are the same as the settings entered for the D650. The "RxD to TxD Display" parameter can be set to zero and the Run Display box must be checked. In this example, Port 4 is set to run the display.

	🍠 Port Assignments							
-	COM Ports							
Instrument Transformer				COM1 (P	1) IED			
Measurements	Protocol	Media	Parity	Baud	Address	Delay	🔽 Enable Logging	
- Medsarenens	ZModem/Display/Log	▼ RS232 ▼	None 🔻	9600 👻	1	0	Run Display(s)	
Apparent Power (VA)								
- Plicker				COM2 (P	2)			
Harmonics	Protocol	Media	Parity	Baud	Address	Delay	Enable Logging	
Sommunication				Dadu		-		
	Modbus	▼ RS232 ▼	Even •	19200 -	1	U	C Run Display(s)	
Port Assignments				COM3 (P3	3)			
Sunchronization	Destand	Madia	Dist		IED Address	RxD to TxD Delay	Enable Longing	
UCA Time Sync	Protocol		Panty	Baud	,			
₩ IRIG-B	DNP	▼ RS232 ▼	Even 🔻	9600 🔻	1	0	E Run Display(s)	
SNTP				COM4 (P	4)			
- DNP					IED Address	RxD to TxD		
🕂 Triggers and Alarms	Protocol	iviedia	Parity	Baud	Address	Delay	Enable Logging	
* Recorder Triggers	ZModem/Display/Log	▼ RS232 ▼	None 🔻	9600 🔻	1	0	Run Display(s)	
GSSE (Virtual I/O)								
Automatic Notification se			All COM p	orts will be opened usin	ig 8 Data Bits, 1 Stop I	Bit.		
- Timers -			Users of re	minai programs snourc	I Set I low Control to IN	bile		

Figure 7 – Configurator Communication/Port Assignments Folder

The Detached Display Folder must now be set up to show the proper measurements. Figure 8 shows the layout of this folder.

- Hentity	📮 Detached Display								
-			Mx7	70D		En	gineering	g Units	
						K	M E G	G I G	
Measurements			Measurements	to Display	Number of Decimal Digits	0	Ā	A	Secondary Units
Demands	Measurement 1		RMS Volts A 1		2	-			
- P Flicker	Measurement 2		RMS Volts B 1		2	-	1000		
Harmonics	Measurement 3		RMS Volts C 1		2	-			
Z Communication						<b>V</b>			
- Detached Display						V Ho	me Scre	en	
- 🦻 Port Assignments		kVHi I-	-N	Scroll Rate	3,000 ms	🔽 En	able Scr	reen	
🕀 🔊 Protocols	Alphanumeric Display	NUME T	-1	Refresh Rate	1,000 ms	En	able Re	set	
Synchronization						Sta	art in Auto	o Scroll m	iode
UCA Time Sync	Measurement Type Filter	Measurement Filter	Sereen To Dianlay	Dert	ID of Display		D	-foult Corr	
- 💸 IRIG-B	measurement ryper mer	medaurement i mer	Screen to Display	Fol	Display		De	elault Scre	ens
	🔽 Instantaneous	Amps	Screen 1 🔻	4 🔻	1 -	Cust	om		
DNP     Triggers and Alarms	Demands	Volte							
* Recorder Triggers	Demanda	V OILS							
GSSE (Virtual I/O)	Harmonics	V Power							
- Automatic Notification se				After CT/V1	ratios are change	d it may be	desired	to reform	at
- * Timers -	Ratios	Miscellaneous		the pl	acement of the dec	cimal point	in the di	splay.	

# Figure 8 – Configurator Communication/Detached Display Folder

Note: The Detached Display folder will configure either Mx70D or D650 type displays

Screens are defined by choosing measurements from a drop down list and then specifying the resolution (Number of Decimal Digits), scale factor (Kilo, Mega, Giga), whether scale factor is attributed with the secondary of the Voltage Transformer (VT) or Potential Transformer (PT), and text information for the screen (Measurements to Display). Up to 64 screens can be defined for each display. Multiple displays can be attached to a single 70 Series IED, but the total number of available screens is limited to 64. Each screen can be assigned to a particular 70 Series IED serial port (Port) and remote display address (ID of Display settings). The screen definitions are stored in the 70 Series IED and not in the Remote Display.

Demand and Energy values may be reset from the front panel if this option is selected in the 70 Series configuration software. If this option is chosen, the displayed values will be reset when the Combination of Home (Enter) and Toggle (Exit) buttons on the front panel are depressed simultaneously.

Please refer to the online help in the 70 Series Configurator for additional information. Note: The Display ID of the D650 must match the "ID of Display" value entered in the folder shown by Figure 8. In RS485 Mode, multiple displays may be connected over a single port. Each display would be assigned a different "ID of Display" value associated with its own separate set of Enabled screens.

For M57x and M87x, programming of the Detached Display screens is accomplished by using Bitronics Configurator software. Any changes to display screens originating in 70 Series meters may only be performed by changing the configuration entered under the Detached Display menu tab.

The 70 Series Configurator software is used to program which screens are sent serially to the D650 Detached Display. There are 22 screens with pre-assigned Measurements as the default screens for the Detached Display. The measurements may be changed or additional screens configured in order to display any of the 70 Series Measurements available in the measurement database. When the Enable Screen check box is checked, that Measurement screen is sent to the display. The Home Screen check box, when checked, determines which screen appears as the D650's Home screen. Click on the 70 Series Configurator software Help button to obtain

helpful information with respect to the Detached Display Configuration screen.

# 3.6.2 Setup the Measurements for Display Screens – Web Browser (PPX II)

**For PPX II**, programming of the Detached Display screens is accomplished through the PPX II web browser interface. When the D650 Detached Display serial port is connected to the PowerPlex II (PPX II) display port, it is necessary that the web browser interface associated with the PPX II be utilized to configure any display screens that will be sent to the Detached Display. The Screens that will be sent to the display must be configured on the PPX II web page. From the PPX II web page, click on the Enable Screen checkbox for any measurement screen you wish to send serially to the D650 Detached Display. The "Screen Enable" selection should appear automatically under the Settings tab on the web page, once the D650 serial port connection is established between the D650 and the PPX II. It may take several seconds for the web page to refresh when the D650 Detached Display is connected to Display Port P1 (RJ11) of the PPX II. From the web page, select the Settings tab then click on Screen Enable in the menu list. See the PowerPlex II User manual for information on the Screen Enable page and settings on Custom Display Screens.

Refer to Appendix A2 or the PowerPlex II User Manual, which covers PowerPlex Settings for Screen Enable and Custom Display Screens.

## NOTE:

The following are NOT supported from the D650BX or D650MX when set for serial display protocol Detached Display front buttons: 1.) Configuration changes to M57x, M87x, 2) Changes to PowerPlex II settings, 3) Screen Enable/Disable .

### 3.7 Setup Mode – D650MX Client Protocol

Setup for the D650MX Universal is done via the web pages of the device. This involves setup on the Input page, Serial Port or Network Page, Protocol Page, and Enable Screen Page. More information on the pages are available in section 5.5. There is the option for using the Scaling setup page to provide greater flexibility in interfacing directly to other IEDs such as relays. More information on this can also be found in section 5.5 and in the Appendix A5 showing examples of using flex scaling.

## 4.0 OPERATION

#### 4.1 Display (See Appendix Sections A3 & A4 – Standard Formats & Display Screens)

The D650 can display all the standard and configurable screens that are available on M57x, M87x or PPX II. To make all quantities available, the display scrolls from quantity to quantity approximately every 5 seconds. The quantities are refreshed once a second. If the D650 is used with a 70 Series IED the scroll and refresh rates are settable from the 70 Series Configurator using the Detached Display folder. The Alphanumeric display at the bottom of the instrument indicates to the user what quantity is being displayed. The Alphanumeric display also provides the user with primary engineering units (Watts, kWatts, MWatts, etc.). The associated IED's Configurable screen settings allow the user to enable or disable each of the display screens, in order to view only a selected subset of all the measurements the meter is capable of displaying.

70 Series (M57x, M87x): See section 3.6.1 on setup using the 70 Series Configurator Software for programming and enabling screens for the D650 Detached Display.

PowerPlex II (PPX II): Refer to the PowerPlex II manual for setting screens in the web browser for PPX II that will be sent serially over the Display port to the D650 display.

#### 4.1.1 D650 Display Resolution for Negative quantities

For all the Watt, VAR and/or PF displays the "SIGN" of the quantity is indicated by the center segment of the left most digit, which will be illuminated to produce a "-" for negative quantities. Positive quantities will have no polarity indication. This restricts the display to 4 digits of resolution in the Watt and/or VAR display, however this is a restriction for the display only.

#### 4.1.2 Overview – Buttons Functions: Display Mode vs. Setup Mode



1. Pressing any button when the display is scrolling will end the scroll.

#### Figure 9 – Button functions for Display Mode


1. Setup mode is initiated upon pressing combination of Up Arrow and Exit

Figure 10 – Button functions in Set-up Mode

### 4.1.3 Keypad Functions for Display Mode

Measurement screens may be stepped through manually by pushing the up and down arrow keys. Pushing the Toggle (Exit) key turns the scroll function off and on. When the scroll function is activated, the measurement screens will automatically step through the user-defined screens. Auto scroll state (ON/OFF) is stored in non-volatile memory. Pressing the Home (Enter) key will bring up the home screen. The factory default home screen will be Amps A, B, C.

**Home screen (D650 used as PowerPlex II Display)**: When D650 display is connected to a PowerPlex II the Home Screen may be designated or enabled in either of the following ways:

- 1. From the D650 front panel the user would press a Combination of "Home (Enter)" and "Toggle (Exit)" keys when on the screen desired as the Home Screen.
- 2. From the web browser interface by clicking on the appropriate "Enable Home Screen" setting box from the "Enable Screen" settings tab located on the PowerPlex II web page.

**Home screen (D650 used as 70 Series Display)**: When the D650 display is connected to a M57x or M87x the Home Screen cannot be designated or enabled through the D650 front panel. The Home Screen must be configured through the 70 Series Configurator Software. Refer to section 3.6.1.

**Home screen for D650MX:** Selection of the Home Screen can be set on the Screen Enable page. The Default HOME screen is:

Amps A,B,C.

### 4.1.3.1 Demand Resets (Serial Display Protocol Only)

The demand values are reset in 4 groups: current, voltage, power and energy. This can be accomplished via the front display. Refer to Table 2 for the button combinations, which depends on the type of instrument to which the display is attached. Refer to the appropriate measurement instrument's manual about resetting groups of measurements such as current, voltage, power and energy.

### Table 2 –Button Functions (Display Mode vs Setup Mode)

Button	Display Mode Functior ( D650 Display) With following meter d M57x, M87x	n ependency PPX II	Setup Mode Function (D650 Display)
Up Arrow	Next measurement/value	Next measurement/value	Next menu item
Down Arrow	Previous measurement/value	Previous measurement/value	Previous menu item or Y (Yes) when prompted
Home (Enter)	Scroll to designated home screen	Jump to designated home screen	Enter selected submenu (or configuration item), or Increments the highlighted digit when entering number, or IP address, or N (No) when prompted
Toggle (Exit)	Toggle Auto Scroll On/Off	Toggle Auto Scroll On/Off	Exits current menu selection and moves up to next higher menu level. Returns to display mode on exit from main setup menu
Combination Up and Exit keys	Enter Setup Mode (Configuration setting is done in the setup menu)	Enter Setup Mode (Configuration setting is done in the setup menu)	
Combination Up and Down Keys		Resets Demand Values for the Group	
Combination Home (Enter) and Toggle (Exit) keys	Resets Demand Values for the Group (if Enabled)	Designate the displayed screen as "Home Screen"	

### 4.1.4 Display Error/Informational Messages

Error messages from self-test are shown on the display. Table 3 summarizes the errors and the messages displayed:

### Table 3 - SELF TEST RESULT SUMMARY FOR D650 DISPLAY

(Refer to the appropriate user manual for the corresponding model connected to the D650 display)

Fault	Fault Indication	Refer to appropriate Model's User Manual	Effects of Fault	Corrective Action
Display Oveflow	Display flashes 9999	$\checkmark$	Measured quantity is too large to be displayed. Communication option output may still be accurate, if overload does not exceed meter input ratings.	Correct fault external to instrument.
Input gain calibration checksum error	G CAL	$\checkmark$	Calibration constants for the input gain are in error. The display and the communication option output are reduced in accuracy to approximately +/-3%.	Return meter to factory for repair
Input phase calibration checksum error	P CAL	$\checkmark$	Calibration constants for the phase are in error. The display and the communication option output are reduced in accuracy to approximately +/-3%.	Return meter to factory for repair
Analog outputs calibration checksum error	A CAL	√ (M57x/M87x)	Calibration constants for the analog outputs are in error. The analog output option is reduced in accuracy to approximately +/-3%.	Return meter to factory for repair
Input Over- Range	CLIP	$\checkmark$	Peak input quantity exceeds the range of the instrument. Both display and communication option output accuracy reduced by an amount depending upon the degree of over-range.	Verify input signals are within range. If within range, return to factory for repair.
Protocol Configuration Error (Available in Future)	P CFG		Instrument protocol configuration may be corrupted and inaccurate. This may cause communication errors.	Reset configuration.
Firmware Download in Progress	FLASH	PPX II	Will be displayed during PowerPlex II (PPX II) download and will disappear shortly after user reboots meter	Reboot PPX II meter when prompted.
	FLASH d650	D650	Will be displayed during D650 download and will disappear shortly after user reboots display	Reboot D650 Display when prompted.

Message	Explanation	Action
No Comm	No valid messages are being received by the display.	Check cable connections and setup parameters on the Remote Display and corresponding IED model (M57x, M87x, PPX II).

### 5.0 FUNCTIONAL DESCRIPTION

### 5.1 Configuration

**D650:** Setup of the D650BX Display is most easily performed using the web interface via the Ethernet service port. Basic configuration can also be handled from the front display panel by entering setup mode using the keypad. Refer to Table 2 in Section 4.1.3 that indicates the key combination (Combination Up and Exit keys) that is used to "Enter Setup Mode". The D650MX configuration is done primarily through the web interface. All the Client Protocol selections (protocol, screen enable, custom screens, etc.) are done via the web pages. Note that the D650MX Universal can be configured to operate as a D650BX by selecting "Serial display protocol" from the drop down on the Input page.

**70 Series:** The screens displayed by the D650 are determined by the settings programmed into a M57x or M87x using the 70 Series Configurator software. The 70 Series configurator is used to program screen content and enable the screens that will be sent to the D650 Display.

**PPX II:** The screens displayed by the D650 are determined by the Screen Enable settings programmed into the PowerPlex II using the Web browser interface. The PPX II Screen Enable and Custom Display Screen web pages found under the Settings tab are used to program screen content and enable the screens that will be sent to the D650 Display.

### 5.2 HTML Web Server

The D650 incorporates an internal web-based configuration utility.

### 5.3 Passwords

Passwords can be set up through the web interface in the 50 Series for use in controlling access to configuration and other functions available through the Ethernet port or the front panel display. Passwords may be comprised of the 95 printable ASCII characters as defined by <u>http://en.wikipedia.org/wiki/ASCII#ASCII printable characters</u> which includes 0-9, a-z, A-Z, and special characters. Passwords may have maximum length of 20 characters and a minimum of 1 character. Passwords prompts are disabled by leaving the new password field blank and clicking the 'Change Password' button. The default from the factory is to have no password set.

The password is used to authenticate a session when prompted. The session authentication will last until the user clicks the 'Log Out' link on the upper right corner of the Web Interface or after five minutes elapses. Authentication will be required when attempting the following actions:

- Applying changes to any settings on the Web Interface Settings tab
- Uploading new firmware on the Firmware Upload page
- Changing the password on the Password Security page
- Rebooting the IED

The Password Security page includes the Front Panel Configuration Lock, which may be used to prevent access to the following actions:

- Setup Mode on the Front Panel (see section 5.4)
- Demand Resets from the Front Panel (section 4.1.3.1).
- Home Screen selection from the Front Panel (section 4.1.3)

If these options are attempted while the lock is enabled, the message 'Locked' will be briefly displayed on the front panel alphanumeric display for D650.

**Change Password** 

New Password Retype New Password	
Change Password Note: Submit a blank pas	sword to disable password protection.

Front Panel Configuration Lock

Unlocked Locked	© ●		
Apply			

### 5.4 Navigating the D650's setup menu from the front panel





How to Enter an Integer:





Increment highlighted digit by 1.

Highlight Previous/Next digit.

Exit to menu

How to Enter a Floating Point Number:





Increment highlighted digit by 1.



Shifts decimal point one place to right. Decimal moves to left-most digit when right-most digit is passed.



Highlight Next digit. Highlights left-most digit when rightmost digit is passed.



Exit to menu

How to Enter an IP address:





Increment highlighted digit by 1.

Highlight Previous/Next digit. Numbers scroll left and right to follow highlighted digit.



Exit to Network menu

### 5.5 Performing set-up through the web page interface – D650 Detached Display



This section will assume you are able to use the factory default IP address of 192.168.0.171 to connect to the web page using an HTML web server. If this is not the case, you may need to refer to section 3.2.2 (Network settings) and the previous section (Section 5.4: Navigating the D650's setup menu from the Front panel) to change your network configuration settings.

If connecting a D650 Display service port to an Ethernet network, a different IP address must be assigned to each of the separate network devices to avoid generating an IP address conflict on the network.

Enter the D650's IP address into your internet browser to connect with the D650 web page interface. Internet browsers supported are Firefox, Internet Explorer, Safari and Google Chrome. The Home page screen should appear as shown below.

Home page (D650MX shown):



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From the home screen you can select from the following tabs:

<u>Settings</u> – This page allows the user to change the configuration settings. Making D650 configuration changes requires the unit to be rebooted. Configuration settings for the D650 are stored in flash memory.

<u>Contact</u> – This page indicates how to contact Bitronics

NOTE: Some screen shots shown below may not exactly match the appearance of those from your actual meter.

### Settings page:

The setting page divides functions into Input, Output, and Utilities. Click on one of the settings categories under each to be taken to the next page. Note that for the D650BX many of the settings pages are not applicable and won't appear.



Settings Page Selections:

From the Settings page screen you can select one of the following selections:

<u>Input</u> – This page allows the user to select between Modbus/DNP3 Client, or Serial display protocol. It also allows for manual setting of CT and PT ratios if not set previously in the outstation device.

<u>Protocol</u> – This is to select the Client Protocol to be used in the D650M3 and to select the registers or points.

<u>Network</u> – This page allows the user to change the network configuration settings for IP address, gateway and router address.

<u>Serial Port</u> – This page allows user configuration for the serial port settings.

<u>Custom Scaling</u> – This page is used to set flexible scaling and assign measurement types

<u>Custom Screens</u> – This page applies to the D650MX only and allows the user to create custom screens.

<u>Screen Enable</u> – This page applies to the D650MX only and allows the user to select those screens that will be displayed from the device it is connected to.

<u>Identity</u>– This page allows the user to enter information that is necessary to identify the meter. It gives an identity to a particular D650. Each D650 should have different information entered for its identity.

Load/Store Settings – This page allows you to save and retrieve settings for the D650 Display.

<u>Password Security</u> – This page allows the user to set a password and to enable or disable access to front display configuration (D650)

<u>Firmware Upload</u> – This page allows the user an interface to browse for or type in the location on their PC of new firmware for purposes of uploading to the unit.

Screen shots showing the selections to be made for each of the above selections follow on the next few pages. Default values are shown where applicable.

D650 configuration changes require the unit to be rebooted. Configuration settings for the D650 are stored in flash memory.

### Input:

<b>∲</b> Bitro	onics
Home Settings S	Status Contact
Settings / Input	
Display Input Cont	figuration
Display Input	Modbus/DNP -
Input Configuration	3 Element 🔹
VT Ratio	
Primary	1.0000 Manual Set
Secondary	1 -
CT Ratio	
Primary	1.0000 Manual Set
Secondary	1 -
Note: Ratios sent over prot	tocols override manually set ratios.
Apply	
Restore Defaults	
	Convrinti @ 2018 Bitronice 11 C All rights reserved

	nics
XRINX	
Home Settings	Status Contact
Settings / Input	
Display Input Con	figuration
Display Input	Modbus/DNP •
Input Configuration	3 Element 👻
VT Ratio	
Primary	1.000 From DNP
Secondary	1
CT Ratio	
Primary	1.000 From DNP
Secondary Note: Ratios sent over pro	1 focols override manually set ratios
Apply	
Арріу	
Destare Defaulte	
Restore Delauits	
Restore Delauits	
Restore Defaults	
Restore Defaults	Copyright © 2018 Bitronics, LLC. All rights reserved.
	Copyright @ 2018 Bitronics, LLC. All rights reserved.
	Copyright @ 2018 Bitronics, LLC. All rights reserved.
ARitro	Copyright @ 2018 Bitronics, LLC. All rights reserved.
Bitro	Copyright © 2018 Bitronics, LLC. All rights reserved.
Bitro	Copyright @ 2018 Bitronics, LLC. All rights reserved.
Bitro Home Settings	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Con	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Con	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Con Display Input Input Configuration	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Display Input Input Configuration	Copyright © 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Con Display Input Input Configuration	Copyright @ 2018 Bitronics, LLC. All rights reserved.
Home Settings Settings / Input Display Input Con Display Input Input Configuration Apply Restore Defaults	Copyright @ 2018 Bitronics, LLC. All rights reserved.

Note that the D650MX will use the CT and PT ratios set up in the device, it will ignore those on the Input page unless no ratios are set in the device it is interfacing with (Manual setting). Selecting "Serial display protocol" instead of Modbus/DNP3 disables the Client protocol functions and makes the D650MX operate like the D650BX.

### Protocol (D650MX):

rotocol I Configuration Modbus DNP3 rotocol Scaling Count C	Home Settings	Status	Contact				
I Configuration       Modbus DNP3       Diversion            • Modbus DNP3        Home       Status       Contact            • Optimal Resolution • Primary Units         count         1.000 ▼         DNP3 Protocol Scaling         Scaling         Optimal Resolution         Primary Units         DNP3 Session         TCP ▼         Edit Points         DNP Session         Type         TCP ▼         Edit Points         Source         DNP Session         Type         TCP ▼         Edit Points         Source         I27         Destination         Iunto III         Destination         Iunto III         Destination         Iunto III         Destination         Iunto III	Settings / Protocol						
Modbus   DNP3   Home   Settings   Status   Contact   Settings   Primary Units   Protocol   Count   1.000 ~   count   1.000 ~   count   1.000 ~   Settings   Status   Contact   Settings   Protocol   Count   1.000 ~   Settings   BILF12 ~   View Registers   Volts per count   0.001 ~   0.001 ~   0.001 ~   0.001 ~   Settings   BILF12 ~   View Registers   Volts per count   0.001 ~   0.100 ~   DNP Session   Type   TCP ~   Edit Points I   Sol2   Destination	Protocol Configu	ration		ØBitro	oni	CS	
DNP3       Home       Settings       Status       Contact         Protocol Scaling       Optimal Resolution       Protocol Configuration       Modbus         count       1.000 •       Protocol       Modbus         count       1.000 •       Protocol Scaling       Modbus         count       1.000 •       DNP3       DNP3         ression       TCP •       Modbus       DNP3         feess       1       Amps per count       0.001 •         Set       BiLF12 •       View Registers       Volts per count       0.001 •         frame Timeout       4000 milliseconds       Watts per count       0.100 •       Index to the section of the section	Protocol	0	Modbus	A DICI	$\sim$	<u> </u>	
Settings / Protocol         Optimal Resolution         Primary Units       Protocol Configuration         count       1.000 *       Modbus         count       0.000 *       DNP3         count       0.000 *       Optimal Resolution       Modbus         icount       0.000 *       DNP3 Protocol Scaling       Optimal Resolution         icount       TCP *       Amps per count       0.001 *         Set       BiLF12 * View Registers       Voits per count       0.001 *         Set       BiLF12 * View Registers       Voits per count       0.001 *         Voits per count       0.100 *       DNP Session       TCP *       Edit Points L         vddress       192.168.0.172       Type       TCP *       Edit Points L         Source       127       Japtation       Japtation       Japtation		0	DNP3	Home Settings	Status	Contact	
Optimal Resolution     Primary Units     Protocol Configuration     Protocol Configuration     Protocol     Modbus     DNP3	Modbus Protocol Sca	lina		Settings / Protocol			
Primary Units       Protocol Configuration         count       1.000 •         count       1.000 •         icount       0.001 •         icount       0.000 •         icount       0.000 •         icount       0.100 •         icount	Scaling	() ()	Optimal Resolution				
count       1.000 •       Protocol       Modbus         count       1.000 •       DNP3       DNP3         iession       TCP •       DNP3 Protocol Scaling       Optimal Resolution         iession       TCP •       Modbus       Ontimal Resolution         set       BiLF12 • View Registers       Voits per count       0.001 •         Set       BiLF12 • View Registers       Voits per count       0.100 •         strame Timeout       4000 milliseconds       Watts per count       0.100 •         vddress       192.168.0.172       Type       TCP • Edit Points L         502       Source       127       1         daptation       Destination       1       1		0	Primary Units	Protocol Configuration			
count     1.000 •     Protocol     Modbus       icount     1.000 •     DNP3     DNP3       icount     1.000 •     DNP3 Protocol Scaling     Optimal Resolution       icount     TCP •     Scaling     Optimal Resolution       itess     1     Amps per count     0.001 •       Set     BiLF12 •     View Registers     Voits per count     0.001 •       iframe Timeout     4000 milliseconds     Watts per count     0.100 •       viddress     192.168.0.172     Type     TCP •     Edit Points I       isource     127     Joes ID Mediano     1	Amps per count		1.000 -				
count 1.000 -   bession TCP -   tress 1   Set BiLF12 - View Registers   Voits per count 0.001 -   Frame Timeout 4000 milliseconds   Watts per count 0.100 -   DNP Session DNP Session   DNP Session TCP - Edit Points I   502 Source   taptation Destination	Volts per count		1.000 -	Protocol	0	Modbus	
DNP3 Protocol Scaling Scaling     Optimal Resolution Primary Units       tress     1     Amps per count     0.001 *       Set     BiLF12 * View Registers     Voits per count     1.000 *       Frame Timeout     4000 milliseconds     Watts per count     0.100 *       Mddress     192.168.0.172     Type     TCP * Edit Points I       502     Source     127       daptation     Destination     1	Watts per count		1.000 -		۲	DNP3	
TCP •     Scaling     Optimal Resolution       dress     1     Amps per count     0.001 •       Set     BiLF12 • View Registers     Volts per count     1.000 •       Frame Timeout     4000 milliseconds     Watts per count     0.100 •       DNP Session     0.100 •     •       Source     127     502     Source       daptation     Destination     1				DNP3 Protocol Scaling			
Image: Primary Units       Image: Dress     Image: Primary Units       Set     BiLF12 * View Registers     Volts per count       Image: Primary Units       Set     BiLF12 * View Registers       Volts per count     0.001 *       Image: Primary Units       Set     BiLF12 * View Registers       Volts per count     0.000 *       Image: DNP Session       DNP Session       Image: DNP Session	Modbus Session			Scaling	۲	Optimal Res	
Image: Set     Image: Set     Image: Set     Image: Set     0.001 *       Set     BiLF12 * View Registers     Voits per count     1.000 *       Frame Timeout     4000 milliseconds     Watts per count     0.100 *       DNP Session     DNP Session     Type     TCP * Edit Points I       502     Source     127       Japtation     Destination     1	Туре		TCP •		0	Primary	Units
Set     BiLF12 < View Registers     Volts per count     1.000 *       Frame Timeout     4000     milliseconds     Watts per count     0.100 *       Address     192.168.0.172     Type     TCP * Edit Points L       502     Source     127       Japtation     Destination     1	Slave Address		1	Amps per count		0.001	w
Frame Timeout     4000     milliseconds     Watts per count     0.100       DNP Session       Address     192.168.0.172     Type     TCP     Edit Points I       502     Source     127       Japtation     Destination     1	Register Set		BiLF12 View Registers	Volts per count		1.000	Ŧ
Address 192.168.0.172 DNP Session Type TCP  Edit Points I 502 Source 127 Destination 1	Receive Frame Timeo	out	4000 milliseconds	Watts per count		0.100	Ŧ
Address 192.168.0.172 Type TCP Edit Points L 502 Source 127 Destination 1	TCP/IP			DNP Session			
502 Source 127 Destination 1	Slave IP Address		192.168.0.172	Туре		TCP .	Edit Points L
daptation 1	IED Port		502	Source		127	]
daptation				Destination		1	
Slave IP Address 192.168.0.172	Legacy Adaptation		Slave IP Address	192.168.0.172		0.172	
ng Regs to Read 125 IED Port 20000	Max Holding Regs to	Read	125	IED Port		20000	
ng Regs to Write 125	Max Holding Regs to	Write	125	new r on		20000	
ng Regs to Read 125 Slave IP Address 192.164 IED Port 20000	IED Port Legacy Adaptation Max Holding Regs to Max Holding Regs to	Read	502 125 125	Source Destination Slave IP Address IED Port		127 1 192.168 20000	3.

### Modbus

DNP3

First select between Modbus or DNP3. You will then select Optimal Resolution (default) or Primary Units. In the Session section, under Type, there will be 2 different selections for Modbus and 2 for DNP3. Under Modbus the options are TCP or RTU. For DNP3 the selections are Serial or TCP. There is only one session per each D650. Under DNP3, clicking on the Advanced button reveals more advanced functions that may or may not need to be changed. Clicking on the Basic button hides the advanced functions. A detailed description of the setup parameters for Modbus and DNP3 can be found in the Appendix of the respective protocol manuals.

There are both fixed and configurable register/point lists. Please refer to the appropriate protocol manual for more information regarding how to view or edit the register/point list. For Modbus, the drop down for the Register Set is Bitronics Legacy Fixed (BiLF) 12-bit or 16-bit, or Total User Configurable (TUC).

There is a Filter feature available for choosing from the Available and Selected columns when editing the Modbus Register Configuration or DNP3 Points Configuration as shown below.

# Bitronics

Contact

Home Settings

#### Settings / Protocol

Modbus Register Configuration

Available	Selected	
RMS Volts A RMS Volts B RMS Volts C Demand RMS Volts A Demand RMS Volts C Max Demand RMS Volts C Max Demand RMS Volts C Min Demand RMS Volts C Min Demand RMS Volts B Min Demand RMS Volts B Min Demand RMS Volts C RMS Volts AB RMS Volts BC RMS Volts CA	40002 RMS Amps A 40003 RMS Amps B 40004 RMS Amps C 40018 RMS Amps Residual 40045 Demand RMS Amps A 40046 Demand RMS Amps B 40047 Demand RMS Amps C 40048 Max Demand RMS Amps A 40049 Max Demand RMS Amps B 40050 Max Demand RMS Amps Residual 40052 Max Demand RMS Amps Residual 40101 Reset Demand Amps	∧ V
Select All >> Filter: Volts	Filter: Amps X	
Reserved >>	Clear Use BiLF16 List	

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

Cancel Next >

Network:

## Bitronics

192.168.0.1

Contact

 Home
 Settings
 Status

 Settings / Network
 Network
 Network

 Network Configuration
 Hostname
 192.168.0.171

 How Address
 192.168.0.171
 Subnet Mask

Address Apply

Router

Restore Defaults

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### Serial Port:

Settings / Serial Port	tus Conta	ct		
Serial Port Configura	ation			
Serial Port Mode	RS232	•		
Baud Rate	9600	•		
Parity	NONE	•		
TX Output Control min RX-to-RTS Delay	0	milliseconds		
RTS-to-TX Delay	0	milliseconds		
RTS holdup after TX	0	milliseconds		
RS232 Hardware Fl	ow Contro	I		
RTS - Modern or Ext RS232/4 RTR - Null Modern	85 Converter	0		
Serial Port Diagnostics				

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### Scaling:

A custom, linear two-point scaling method can be used to associate the display with any device. The user associates the value of two polled points "on the wire" with two values desired to be displayed (e.g 3200 and 21200 polled "on the wire" are associated with 0.0 and 100.0 displayed). The selected points do not have to be minimum and maximum.

Custom scaling files can be edited offline using JSON (JavaScript Object Notation) or a text editor. Custom scaling files can be saved and moved to other D650 Universal Displays.

Once the custom scaling values are defined, they are assigned to Measurements using the names for the polled values. Phase and Modifier are referenced to the point LEDs on the right of the three display lines and the display will be controlled by these selections.

Once these Measurements are assigned, the user can go to Protocol settings and edit the list to have the Measurements polled. Provision exists to be able to insert blank lines to position polled values in points/register list.

Please refer to the Appendix A5 for a more detailed overview on how to setup the Custom/Flex Scaling.

<b>∲</b> Bitr	onics				
Home Settings	Status Contact				
Settings / Scaling					
<u>ootanigo</u> / ootaniig					
Scalings					
Name	Point 1		Point 2		
Hame	Poll	Display	Poll	Display	Insert Row
MWatts	-32767	- 100	32767	100	Delete Row
Freq MHz	-1000	59.000	1000	5 1000	Delete Row
Frequency	4500	45.00	6500	65.00	Delete Row
Primary kV	0	0.00	14400	14.40	Delete Row
Cent-to-F	0	0.56	1000	0.51 5	Delete Row
Magaziramanta					
Name	Scaling	Phase	Modifier	Insert Dow	
Watte Line 27	MWatte T			Delete Rew	
				Delete Row	
Trequency-Line27				Delete Row	
		none V		Delete Row	
TopOil_X1B_Sub12	Cent-to-F V	none 🔻	max 🔻	Delete Row	
TopOil_X1C_Sub12	MWatts •	none 🔻	max 🔻	Delete Row	
Save Scaling File	Open	Scaling File			
Apply					
Restore Defaults					

### Screen Enable:

### Bitronics

Contact

Home Settings Status

Settings / Screen Enable

Display Screen Enable

	Enabled	Screen	Populated
Amps A, B, C			1
Amps Residual	1	0	1
Volts AN, BN, CN	V	0	1
Volts AB, BC, CA	V	0	1
Watts A, B, C		O	1
VARs A, B, C		0	1
Total Watts - Total VARs	1	0	~
VAs A, B, C	$\overline{\mathbf{v}}$	0	1
Power Factor A, B, C	1	0	5
Total VAs - 30 Power Factor		0	1
Frequency		0	1
kWatt-Hours Normal(+)		0	4
kWatt-Hours Reverse(-)		0	1
kVAR-Hours Lagging(+)		0	1
kVAR-Hours Leading(-)		0	1
kVA-Hours		0	1
kWatt-Hours Net		0	1
Total Watts - 30 PF - Frequency	1	O	1
Demand Amps A.B.C		O	1
Max Demand Amps A,B,C		0	1
Demand Amps Residual		O	1
Average Volts AN, BN, CN	4	0	1
Max Average Volts AN, BN, CN		0	1
Min Average Volts AN, BN, CN		0	1
Average Volts AB, BC, CA		0	1
Max Average Volts AB, BC, CA		0	1
Min Average Volts AB, BC, CA		0	1
Total Watts Max · Avg · Min		0	5
Total VARs Max - Avg - Min		0	1
Total VAs Max - Avg - Min		0	1
Fund Amps A, B, C	8	0	
Fund Amps Residual		0	
Fund Volts AN, BN, CN		0	
Fund Volts AB, BC, CA		O	
TDD Amps A.B,C		0	
THD Volts AN, BN, CN		0	
THD Volts AB, BC, CA		0	
K-Factor Amps A,B,C	10	0	
Displacement Power Factor A,B,C	-	0	
Displacement Power Factor Total		0	
Fund Demand Amps A,B,C		O	
Max Fund Demand Amps A.B.C		0	
Averane Watte & B. C	1921	0	1.21
May Average Watts & B. C	(12)	0	
Min Average Wate & P. C.		0	~
Average VARe & B.C.		0	
Hav Average VAR's A, D, C		0	4
Min Average WRS A. D. C		0	~
Mill Average VARS A. B. C		0	1
Mar Average Vis A. P. C	1991	0	~
Max Average Vis A, B, C		0	~
Recorden Volte AN DRI Chi	1991	0	~
Secondary Volta AP, DN, CN		0	1
Volte Suv	122	0	~
		Ø	V
Clear All Check Populated Check	All		
Apply			
Restore Defaults			

The Screen Enable web page shown above only applies to the D650MX Universal Display. As explained in Section 3.6 above, the D650BX screens are setup via the 70 Series

Configurator or PPX II web page (see Appendix 2). Note in the view above, that a checkmark appears for those items that are available from the device that the D650MX is interfacing with. Clicking on the Check Populated will enable the screens for all the items available on the outstation device.

### Custom Display Screen Settings: Two Sections - Build/Edit and Summary

The Custom Display Screen Configuration page only applies to the D650MX Universal Display. It contains two sections: the Build/Edit panel and the Summary panel. One custom display screen is built at a time in the Build/Edit panel and is then added to the Summary panel, which presents a list of all the custom screens that have been built. The Build/Edit panel is presented if there are no custom screens stored on the IED when the page is loaded; otherwise, the Summary panel is presented. Only one panel is visible at a time.

### Build/Edit panel

Select a measurement to be displayed on each display line from the dropdown lists and enter an alphanumeric label that describes the display screen.

Special character buttons insert the characters shown on the buttons into the "Label" field. The "k/M/G" (kilo/Mega/Giga) button inserts an underscore character into the "Label" field, which is automatically replaced with the appropriate unit prefix when displayed on the IED's front panel. The dot character is used to separate parts of a single label into multiple labels that apply to the different display lines. It is necessary to place dots between underscore that apply to different display lines.

The MIN, MAX, AVG, line and phase LEDs are automatically lit by the IED, based on the selected measurements.

Home Set	tings Status (	Contact			
Settings / Custo	om Display Screens				
Custom Di	splay Screen Co	onfiguration			
	Measurement				
Line 1	NONE	•			
Line 2	NONE	•			
Line 3.	NONE	•			
	Label	Special Cha	racters		
Alphanumeric		•	↑ ↓ k/M/G		

Click the "Next >" button to view the summary panel.

Summary panel

Screens are saved to IED once the "Apply" button has been clicked. A row (screen) from the summary table can be selected for viewing, editing or deleting by clicking its radio button.

The order of the screens can be changed by selecting a screen from the list and clicking on the up or down arrows.

<b>∲</b> Bitr	ronics			
Home Data	Resets Settings Conta	act		
Settings / Custom Displ	ay Screens			
Label 1 _V:AWA 2 _V:AWB 3 _V:AWC 4 kVARhW 5 _V DmdAD	Measurement 1 RMS Volts A RMS Volts B RMS Volts C KVAR-Hrs Lag Max Demand BMS Volts A	Measurement 2 RMS Amps A RMS Amps B RMS Amps C KVAR-Hrs Lag Demand PMS Volts A	Measurement 3 RMS Watts A RMS Watts B RMS Watts C RMS Watts Total Nin Demand BMS Volte A	Enabled V V V
0 6 _V DmdBΦ 0 7 _V DmdCΦ ∧ V	Max Demand RMS Volts A Max Demand RMS Volts C	Demand RMS Volts B Demand RMS Volts C	Min Demand RMS Volts B Min Demand RMS Volts C	2
Edit Add De	elete			

### **Identity:**

Home Set	tings Status	Contact		
Settings / Identi	tv			
Searings / Identi	c)			
Identity				
Name	D650_name			
Description	D650_desc			
Owner	D650_owner			
Location	D650_locat			

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### Load/Store Device Settings:

Homo Cotting				
Home Setting	S Status Contact			
<u>Settings</u> / Load/Sto	re Settings			
Load/Store D	evice Settings			
Save to IED Select a configurati	on file.			
Save to Compute Store IED configura	Load network settings from file er tion to computer.	9		
Save to Compute Store IED configura	Load network settings from file er tion to computer. Get File	e		
Save to Comput Store IED configura Restore Factory Restore all device	Load network settings from file tion to computer. Get File Defaults settings to factory defaults.	e		
Save to Comput Store IED configura Restore Factory Restore all device	Load network settings from file  r tion to computer.  Get File  Defaults settings to factory defaults.  Restore All Defaults	9		

### Password Security Settings:

The Password can be entered using the web browser interface for the D650 Display. Applying a Password provides a layer of security by enabling a Configuration Lock on the D650 Display front panel during Setup Mode. The Front Panel Configuration Lock disables the ability to change configuration settings and reset Demand values from the front panel buttons of the display. However, Display Mode operation to obtain informational readouts and scroll through screens is not affected. Note that the Configuration Lock must be unlocked in both the D650 and the PowerPlex II configurations in order to use the key combinations for reset demand values and set home screen.

## Bitronics

Home Settings Status

Settings / Password Security

Change Password

New Password	
Retype New Password	
Change Password	
Note: Submit a blank pas	sword to disable password protection.

Contact

Front Panel Configuration Lock

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### Firmware Upload:

Home Settings Status Contact Settings / Firmware Upload	e Settings Status Contact ngs / Firmware Upload date Device Firmware e to IED ct a firmware image file.	<b>Ø</b> Bitr	onics		
Settings / Firmware Upload	aas / Firmware Upload date Device Firmware e to IED ct a firmware image file.	Home Settings	Status Contact		
Update Device Firmware	date Device Firmware e to IED ct a firmware image file.	Settings / Firmware Up	load		
Save to IED	ct a firmware image file.	Save to IED	Firmware		

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### **Status Page:**

### Contact Page:

ØBitronics
Home Settings Contact
Bitronics, LLC
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http://www.novatechweb.com/bitronics

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### 6.0 DISPLAYABLE MEASUREMENTS

### 6.1 List of Display Capable Measurements from M57x

Please note that not all measurements are available in every M57x model (second set of current measurements and corresponding power, energy, etc. only in M572)

Available Measurements	
Accrued Digital IO Module #0-6, Input 1-16	K-factor Amps A (1 and 2)
Accrued Digital IO Module #0-6, Output 1-4	K-factor Amps B (1 and 2)
Accrued DR1/DR2 Active, Completed, Started	K-factor Amps C (1 and 2)
Accrued Pulse KWH, KVARH Positive (Bus 1 and 2)	K-factor Amps Residual (1 and 2)
Accrued Pulse KWH, KVARH Negative (Bus 1 and 2)	Log Interval
Accrued Virtual IO, Inputs 1-32, Outputs 1-32	Meter Type
Accrued WR1/WR2 Active, Completed, Started	Misc. Packed Bits
Amps A, B, C, Residual (Feeder 1 and 2)	Network Time Sync
Any Recorder Active	Peak Fault Current Amps A, B, C, Residual, Bus (1 and 2)
Any Recorder Memory Full	Phase Angle Amps A Harmonic (1…63 for 1 and 2)
Any Recorder Stored	Phase Angle Amps B Harmonic (1…63 for 1 and 2)
Any Recorder Triggered	Phase Angle Amps C Harmonic (163 for 1 and 2)
Avg. 3-phase Amps (1 and 2)	Phase Angle Volts A Bus1-Bus2
Avg. 3-phase Volts (1 and 2)	Phase Angle Volts A Harmonic (163)
Best Clock	Phase Angle Volts AB Harmonic (163)
Class 0 Response Setup	Phase Angle Volts B Bus1-Bus2
CT Scale Factor	Phase Angle Volts B Harmonic (163)
CT Scale Factor Divisor	Phase Angle Volts BC Harmonic (163)
Demand (Max.) Amps A, B, C, Residual (1 and 2)	Phase Angle Volts C Bus1-Bus2
Demand (Max.) Fund. Amps A, B, C, Residual (1 and 2)	Phase Angle Volts C Harmonic (163)
Demand (Max.) TDD Amps A, B, C, Residual (1 and 2)	Phase Angle Volts CA Harmonic (163)
Demand (Max.) THD Volts Bus1 AN, BN, CN, AB, BC, CA	Phase Angle Volts to Amps A (1 and 2)
Demand (Max.) THD Volts Bus2 AN, BN, CN, AB, BC, CA	Phase Angle Volts to Amps B (1 and 2)
Demand (Max.) VARs A, B, C, Total (1 and 2)	Phase Angle Volts to Amps C (1 and 2)
Demand (Max.) VAs A, B, C, Total (1 and 2)	Power Factor A, B, C, Total (Bus 1 and 2)
Demand (Max.) Volts Bus1 AN, BN, CN, NG, AB, BC, CA	Power Factor Total Arithmetic (Bus 1 and 2)
Demand (Max.) Volts Bus2 AN, BN, CN, NG, AB, BC, CA	Power Factor Total Equivalent L-L (Bus 1 and 2)

Available Measurements	
Demand (Max.) Watts A, B, C, Total (1and 2)	Power Factor Total Equivalent L-N (Bus 1 and 2)
Demand (Min.) THD Volts Bus1 AN, BN, CN, AB, BC, CA	Power Factor Total Geometric (Bus 1 and 2)
Demand (Min.) THD Volts Bus2 AN, BN, CN, AB, BC, CA	Protocol Version
Demand (Min.) VARs A, B, C, Total (1 and 2)	PT Scale Factor
Demand (Min.) VAs A, B, C, Total (1 and 2)	PT Scale Factor Divisor
Demand (Min.) Volts Bus1, AN, BN, CN, NG, AB, BC, CA	Pulse Status- Negative VArHrs (1 and 2)
Demand (Min.) Volts Bus2, AN, BN, CN, NG, AB, BC, CA	Pulse Status- Negative WHrs (1 and 2)
Demand (Min.) Watts A, B, C, Total (1 and 2)	Pulse Status- Positive VarHrs (1 and 2)
Demand Amps A, B, C, Residual	Pulse Status-Positive WHrs (1 and 2)
Demand Fundamental Amps A, B, C, Residual	Pulse VAR-Hrs Normal (1 and 2)
Demand TDD Amps A, B, C, Residual	Pulse VAR-Hrs Reverse (1 and 2)
Demand THD Volts Bus1 AN, BN, CN, AB, BC, CA	Pulse Watt-Hrs Normal (1 and 2)
Demand THD Volts Bus2 AN, BN, CN, AB, BC, CA	Pulse Watt-Hrs Reverse (1 and 2)
Demand VARs A, B, C, Total	Reactance A, B, C (1 and 2)
Demand VAs A, B, C, Total	Resistance A, B, C, (1 and 2)
Demand Volts Bus1 AN, BN, CN, NG, AB, BC, CA	Slip Freq. Volts A Bus1-Bus2
Demand Volts Bus2 AN, BN, CN, AB, BC, CA	Slip Freq. Volts B Bus1-Bus2
Demand Watts A, B, C, Total	Slip Freq. Volts C Bus1-Bus2
Digital IO#0 Debounce Time	SNTP Time Sync
Digital IO#0 Input Point 1-4	Symmetrical comp. of Bus 1 voltage (mag. and angle)
Digital IO#0 Output Point 1-4	Symmetrical comp. of Bus 2 voltage (mag. and angle)
Digital IO Module #0-6 Status Output Point 1-4	Symmetrical comp. of current (mag. and angle, 1 & 2)
Displacement Power Factor A, B, C (1 and 2)	System Frequency
Displacement Power Factor Total (1 and 2)	Tag Register
Displacement Power Factor Total Arithmetic (1 and 2)	TDD Amps A, B, C, Residual (1 and 2)
Displacement Power Factor Total Equivalent L-L (1 & 2)	TDD Denominator A, B, C, (1 and 2)
Displacement Power Factor Total Equivalent L-N (1 & 2)	TDD, Even, Amps A, B, C, Residual (1 and 2)
Displacement Power Factor Total Geometric (1 & 2)	TDD, Odd, Amps A, B, C, Residual (1 and 2)
DNP Time Sync	Temperature
DR 1 Active	THD Volts Bus1 AN, BN, CN, AB, BC, CA
DR1 Memory Full	THD Volts Bus2 AN, BN, CN, AB, BC, CA
DR1 Record Count	THD, Even, Volts Bus1 AN, BN, CN, AB, BC, CA
DR1 Stored	THD, Even, Volts Bus2 AN, BN, CN, AB, BC, CA

Available Measurements	
DR1 Triggered	THD, Odd, Volts Bus1 AN, BN, CN, AB, BC, CA
DR2 Active	THD, Odd, Volts Bus2 AN, BN, CN, AB, BC, CA
DR2 Memory Full	Time Sync Error (usec, msec, sec)
DR2 Record Count	Trigger Derivative 1-120
DR2 Stored	Unbalance Volts (1 and 2)
DR2 Triggered	Unbalance Amps (1 and 2)
DSP Version	User Gain Amps A, B, C, Residual (1 and 2)
Factory Version Hardware	User Gain Volts Bus1 A, B, C, N
Factory Version Software	User Gain Volts Bus2 A, B, C, N
Fault Completed (Bus 1, Bus 2)	User Gain Volts Bus2 Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
Fault Count (Bus 1, Bus 2)	User Phase Correction Amps A, B, C, Residual (1 and 2)
Fault Distance AN, BN, CN, AB, BC, CA (Bus 1, Bus 2)	User Phase Correction Volts Bus1 AN, BN, CN, NG, AB, BC, CA
Fault Target (A, B, C, Bus 1 and Bus 2)	User Phase Correction Volts Bus2 AN, BN, CN, NG, AB, BC, CA
Fault Type (Bus 1, Bus 2)	User Phase Correction Volts Bus2 Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
Flicker Short (PST VAN, VBN, VCN Bus 1 and 2)	VA/PF Calc. Type (1 and 2)
Flicker Long (PLT VAN, VBN, VCN Bus 1 and 2)	VA-Hrs (1 and 2)
Frequency Amps A, B, C, Residual (1 and 2)	VAR-Hrs Lag (1 and 2)
Frequency Volts Bus1 A, B, C	VAR-Hrs Lead (1 and 2)
Frequency Volts Bus2 A, B, C	VARs A, B, C, Total (1 and 2)
Fund. Amps A, B, C, Residual (1 and 2)	VAs A, B, C, Total (1 and 2)
Fund. VAs Tot. Arith (1 and 2).	VAs Tot. Arith. (1 and 2)
Fund. VAs Tot. Equiv. L-L (1 and 2)	VAs Tot. Equiv. L-L (1 and 2)
Fund. VAs Tot. Equiv. L-N (1 and 2)	VAs Tot. Equiv. L-N (1 and 2)
Fund. VAs Tot. Geom. (1 and 2)	VAs Tot. Geom. (1 and 2)
Fund. VAs Total (1 and 2)	Virtual Input Point 1-32
Fund. Volts Bus1 AN, BN, CN, AB, BC, CA	Virtual Output Point 1-32
Fund. Volts Bus2 AN, BN, CN, AB, BC, CA	Volts Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
Harmonic, Individual, Amps A, B, C, (163 for 1 & 2)	Volts Bus1 AN, BN, CN, NG, AB, BC, CA
Harmonic, Individual, Bus1, Volts A (163)	Volts Bus2 AN, BN, CN, NG, AB, BC, CA
Harmonic, Individual, Bus1, Volts AB (163)	Watt-Hrs Normal (1 and 2)
Harmonic, Individual, Bus1, Volts B (163)	Watt-Hrs Reverse (1 and 2)
Harmonic, Individual, Bus1, Volts BC (163)	Watts A, B, C, Total (1 and 2)
Harmonic, Individual, Bus1, Volts C (163)	Waveform Status
Harmonic, Individual, Bus1, Volts CA (163)	WV1/WV2 Active
Harmonic, Individual, Bus2, Volts A (163)	WV1/WV2 Memory Full
Harmonic, Individual, Bus2, Volts AB (163)	WV1/WV2 Record Count
Harmonic, Individual, Bus2, Volts B (163)	WV1/WV2 Stored
Harmonic, Individual, Bus2, Volts BC (163)	WV1/WV2 Triggered
Harmonic, Individual, Bus2, Volts C (163)	Xfmr Ratio Amps A, B, C, Residual (1 and 2)

Available Measurements	
Harmonic, Individual, Bus2, Volts CA (163)	Xfmr Ratio Future Use
Health	Xfmr Ratio Volts Bus1 A, B, C, N
Heartbeat	Xfmr Ratio Volts Bus2 A, B, C, N
Impedance A, B, C (1 and 2)	Xfmr Ratio Volts Bus2 Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
IrigB Time Sync	

### 6.2 List of Display Capable Measurements from M87x

Please note that not all measurements are available in every M87x model (i.e. neutral current in M871 only, second set of current measurements and corresponding power, energy, etc. only in M872)

Available Measurements	
Accrued Digital IO Module #0-6, Input 1-16	K-factor Amps B (1 and 2)
Accrued Digital IO Module #0-6, Output 1-4	K-factor Amps C (1 and 2)
Accrued DR1/DR2 Active, Completed, Started	K-factor Amps N
Accrued Pulse KWH, KVARH Positive (Bus 1 and	K-factor Amps Residual (1 and 2)
2)	
Accrued Pulse KWH, KVARH Negative (Bus 1 and	Log Interval
2)	
Accrued Virtual IO, Inputs 1-32, Outputs 1-32	Meter Type
Accrued WR1/WR2 Active, Completed, Started	Misc. Packed Bits
Amps A, B, C, N, Residual (Feeder 1 and 2)	Network Time Sync
Any Recorder Active	Peak Fault Current Amps A, B, C, Residual,
	Bus (1 and 2)
Any Recorder Memory Full	Phase Angle Amps A Harmonic (163 for 1
	and 2)
Any Recorder Stored	Phase Angle Amps B Harmonic (163 for 1
	and 2)
Any Recorder Triggered	Phase Angle Amps C Harmonic (163 for 1
	and 2)
Avg. 3-phase Amps (1 and 2)	Phase Angle Amps N Harmonic (163)
Avg. 3-phase Volts (1 and 2)	Phase Angle Volts A Bus1-Bus2
Best Clock	Phase Angle Volts A Harmonic (163)
Class 0 Response Setup	Phase Angle Volts AB Harmonic (163)
CT Scale Factor	Phase Angle Volts B Bus1-Bus2
CT Scale Factor Divisor	Phase Angle Volts B Harmonic (163)
Demand (Max.) Amps A, B, C, N, Residual (1 and	Phase Angle Volts BC Harmonic (163)
2) Demond (Mayr) Fund Amma A. D. C. N. Desid (1	Dhasa Angle Valta C Dust Dus 2
Demand (Max.) Fund. Amps A, B, C, N, Resid. (1 and 2)	Phase Angle Volis C Bus I-Busz
Demand (Max.) TDD Amps A. B. C. N. Resid. (1	Phase Angle Volts C Harmonic (1 63)
and 2)	
Demand (Max.) THD Volts Bus1 AN, BN, CN, AB,	Phase Angle Volts CA Harmonic (163)
BC, CA	
Demand (Max.) THD Volts Bus2 AN, BN, CN, AB,	Phase Angle Volts to Amps A (1 and 2)
BC, CA	<b>5 1 ( )</b>
Demand (Max.) VARs A, B, C, Total (1 and 2)	Phase Angle Volts to Amps B (1 and 2)
Demand (Max.) VAs A, B, C, Total (1 and 2)	Phase Angle Volts to Amps C (1 and 2)
Demand (Max.) Volts Bus1 AN, BN, CN, NG, AB.	Power Factor A, B, C, Total (Bus 1 and 2)
BC, CA	
Demand (Max.) Volts Bus2 AN, BN, CN, NG, AB.	Power Factor Total Arithmetic (Bus 1 and 2)
BC, CA	(
Demand (Max.) Watts A, B, C, Total (1and 2)	Power Factor Total Equivalent L-L (Bus 1 and
	2)

Available Measurements	
Demand (Min.) THD Volts Bus1 AN, BN, CN, AB,	Power Factor Total Equivalent L-N (Bus 1 and
BC, CA	2)
Demand (Min.) THD Volts Bus2 AN, BN, CN, AB,	Power Factor Total Geometric (Bus 1 and 2)
BC, CA	<b>B</b>
Demand (Min.) VARs A, B, C, Total (1 and 2)	Protocol Version
Demand (Min.) VAs A, B, C, Total (1 and 2)	PI Scale Factor
Demand (Min.) Volts Bus1, AN, BN, CN, NG, AB,	PT Scale Factor Divisor
BC, CA	Dulas Status Nagative (4 and 2)
Demand (Min.) Voits Dusz, AN, DN, CN, NG, AD,	Pulse Status- Negative VALHIS (1 and 2)
Demand (Min.) Watts A. B. C. Total (1 and 2)	Pulse Status- Negative WHrs (1 and 2)
Demand Amps A B C N Residual	Pulse Status- Positive VarHrs (1 and 2)
Demand Fundamental Amps A, B, C, N, Residual	Pulse Status-Positive WHrs (1 and 2)
Demand TDD Amps A B C N Residual	Pulse VAR-Hrs Normal (1 and 2)
Demand THD Volts Bust AN BN CN AB BC CA	Pulse VAR-His Reverse (1 and 2)
Demand THD Volts Bus2 AN BN CN AB BC CA	Pulse Watt-Hrs Normal (1 and 2)
Demand VARs A B C. Total	Pulse Watt-Hrs Reverse (1 and 2)
Demand VAs A B C Total	Reactance A B C (1 and 2)
Demand Volts Bus1 AN, BN, CN, NG, AB, BC, CA	Resistance A, B, C, (1 and 2)
Demand Volts Bus2 AN, BN, CN, AB, BC, CA	Slip Freq. Volts A Bus1-Bus2
Demand Watts A. B. C. Total	Slip Freq. Volts B Bus1-Bus2
Digital IO Module #0-6 Debounce Time	Slip Freq. Volts C Bus1-Bus2
Digital IO Module #0-6 Input Point 1-16	SNTP Time Sync
Digital IO Module #0-6 Output Point 1-4	Symmetrical comp. of Bus 1 voltage (mag.
5	and angle)
Digital IO Module #0-6 Status Output Point 1-4	Symmetrical comp. of Bus 2 voltage (mag.
	and angle)
Displacement Power Factor A, B, C (1 and 2)	Symmetrical comp. of current (mag. and
	angle, 1 & 2)
Displacement Power Factor Total (1 and 2)	System Frequency
Displacement Power Factor Total Arithmetic (1 and	Tag Register
Displacement Power Factor Total Equivalent L-L (1	IDD Amps A, B, C, N, Residual (1 and 2)
& 2) Displacement Dower Faster Total Equivalent L N	TDD Denominator A. R. C. N. (1 and 2)
	TDD Denominator A, B, C, N (T and Z)
Displacement Power Factor Total Geometric (1 &	TDD Even Amps A B C Residual (1 and 2)
	TDD, Even, Amps A, D, O, Residual (T and Z)
DNP Time Svnc	TDD, Odd, Amps A, B, C, Residual (1 and 2)
DR 1 Active	Temperature
DR1 Memory Full	THD Volts Bus1 AN, BN, CN, AB, BC, CA
DR1 Record Count	THD Volts Bus2 AN, BN, CN, AB, BC, CA
DR1 Stored	THD, Even, Volts Bus1 AN, BN, CN, AB, BC.
	CA
DR1 Triggered	THD, Even, Volts Bus2 AN, BN, CN, AB, BC,
	CA

Available Measurements	
DR2 Active	THD, Odd, Volts Bus1 AN, BN, CN, AB, BC, CA
DR2 Memory Full	THD, Odd, Volts Bus2 AN, BN, CN, AB, BC, CA
DR2 Record Count	Time Sync Error (µsec, msec, sec)
DR2 Stored	Transducer Input Module # 1-7, Input Point 1-
	8
DR2 Triggered	Trigger Derivative 1-120
DSP Version	Unbalance Volts (1 and 2)
Factory Version Hardware	Unbalance Amps (1 and 2)
Factory Version Software	User Gain Amps A, B, C, N, Residual (1 and 2)
Fault Completed (Bus 1, Bus 2)	Úser Gain Volts Bus1 A, B, C, N
Fault Count (Bus 1, Bus 2)	User Gain Volts Bus2 A, B, C, N
Fault Distance AN, BN, CN, AB, BC, CA (Bus 1,	User Gain Volts Bus2 Aux1-Gnd, Aux2-Gnd,
Bus 2)	Aux1-Aux2
Fault Target (A, B, C, Bus 1 and Bus 2)	User Phase Correction Amps A, B, C, N, Residual (1 and 2)
Fault Type (Bus 1, Bus 2)	User Phase Correction Volts Bus1 AN, BN,
	CN, NG, AB, BC, CA
Flicker Short (PST VAN, VBN, VCN Bus 1 and 2)	User Phase Correction Volts Bus2 AN, BN, CN, NG, AB, BC, CA
Flicker Long (PLT VAN, VBN, VCN Bus 1 and 2)	User Phase Correction Volts Bus2 Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
Frequency Amps A. B. C. Residual (1 and 2)	VA/PE Calc. Type (1 and 2)
Frequency Volts Bust A B C	VA-Hrs (1 and 2)
Frequency Volts Bus? A. B. C	VAR-Hrs L ag $(1 \text{ and } 2)$
Fund Amps A B C N Residual (1 and 2)	VAR-Hrs Lead (1 and 2)
Fund VAs Tot Arith (1 and 2)	VARs A B C Total (1 and 2)
Fund, VAs Tot, Equiv. L-L (1 and 2)	VAs A. B. C. Total (1 and 2)
Fund, VAs Tot, Equiv. L-N (1 and 2)	VAs Tot, Arith, (1 and 2)
Fund, VAs Tot, Geom. (1 and 2)	VAs Tot. Equiv. L-L (1 and 2)
Fund, VAs Total (1 and 2)	VAs Tot. Equiv. L-N (1 and 2)
Fund, Volts Bus1 AN, BN, CN, AB, BC, CA	VAs Tot, Geom. (1 and 2)
Fund, Volts Bus2 AN, BN, CN, AB, BC, CA	Virtual Input Point 1-32
Harmonic, Individual, Amps A. B. C. N (163 for 1	Virtual Output Point 1-32
& 2)	
Harmonic, Individual, Bus1, Volts A (163)	Volts Aux1-Gnd, Aux2-Gnd, Aux1-Aux2
Harmonic, Individual, Bus1, Volts AB (163)	Volts Bus1 AN, BN, CN, NG, AB, BC, CA
Harmonic, Individual, Bus1, Volts B (163)	Volts Bus2 AN, BN, CN, NG, AB, BC, CA
Harmonic, Individual, Bus1, Volts BC (163)	Watt-Hrs Normal (1 and 2)
Harmonic, Individual, Bus1, Volts C (163)	Watt-Hrs Reverse (1 and 2)
Harmonic, Individual, Bus1, Volts CA (163)	Watts A, B, C, Total (1 and 2)
Harmonic, Individual, Bus2, Volts A (163)	Waveform Status
Harmonic, Individual, Bus2, Volts AB (163)	WV1/WV2 Active
Harmonic, Individual, Bus2, Volts B (163)	WV1/WV2 Memory Full
Harmonic, Individual, Bus2, Volts BC (163)	WV1/WV2 Record Count

Available Measurements	
Harmonic, Individual, Bus2, Volts C (163)	WV1/WV2 Stored
Harmonic, Individual, Bus2, Volts CA (163)	WV1/WV2 Triggered
Health	Xfmr Ratio Amps A, B, C, N, Residual (1 and
	2)
Heartbeat	Xfmr Ratio Future Use
Impedance A, B, C (1 and 2)	Xfmr Ratio Volts Bus1 A, B, C, N
IrigB Time Sync	Xfmr Ratio Volts Bus2 A, B, C, N
K-factor Amps A (1 and 2)	Xfmr Ratio Volts Bus2 Aux1-Gnd, Aux2-Gnd,
	Aux1-Aux2

### 6.3 List of Display Capable Measurements from PowerPlex II

Available Measurements	
Amps A, B, C, Residual	K-factor Amps C
Average Volts AN, BN, CN, AB, BC, CA (Bus 1)	K-factor Amps Residual
Average (Max.) Volts AN, BN, CN, AB, BC, CA (Bus 1)	Phase Angle Amps A, B, C
Average (Min.) Volts AN, BN, CN, AB, BC, CA (Bus 1)	Phase Angle Volts A, B, C
Average Watts A, B, C, Total	Phase Angle Volts AB, BC, CA
Average (Max.) Watts A, B, C, Total	Phase Angle Volts A 1-2, B 1-2, C 1-2
Average (Min.) Watts A, B, C, Total	Power Factor A, B, C, Total
Average VARs A, B, C, Total	Slip Frequency Volts A 1-2, B 1-2, C 1-2
Average (Max.) VARs A, B, C, Total	TDD Amps A, B, C, Residual
Average (Min.) VARs A, B, C, Total	TDD Denominator A, B, C
Average VAs A, B, C, Total	THD Volts AN, BN, CN, AB, BC, CA
Average (Max.) VAs A, B, C, Total	Uncompensated VARs, Total
Average (Min.) VAs A, B, C, Total	Uncompensated Watts, Total
Demand (Max.) Amps A, B, C, Residual	VA-Hrs
Demand (Max.) Fund. Amps A, B, C, Residual	VAR-Hrs Lag
Demand Amps A, B, C, Residual	VAR-Hrs Lead
Demand Fundamental Amps A, B, C, Residual	VARs A, B, C, Total
Displacement Power Factor A, B, C	VAs A, B, C, Total
Displacement Power Factor Total	Volts AN, BN, CN, AB, BC, CA (1 and 2)
Frequency (System)	Volts Aux
Frequency Volts A, B, C (1 & 2)	Watt-Hrs Net
Fund. Amps A, B, C, Residual	Watt-Hrs Normal
Fund. Volts AN, BN, CN, AB, BC, CA (1 & 2)	Watt-Hrs Reverse
K-factor Amps A	Watts A, B, C, Total
K-factor Amps B	

Available Measurements	
Amps A, B, C, Residual	Heartbeat
Average 3-phase Amps <sup>1</sup>	K-factor Amps A <sup>1</sup>
Average 3-Phase Volts (L-L, L-N) <sup>1</sup>	K-factor Amps B <sup>1</sup>
Average Volts AN, BN, CN, AB, BC, CA <sup>1</sup>	K-factor Amps C <sup>1</sup>
Average (Max.) Volts AN, BN, CN, AB, BC, CA <sup>1</sup>	K-factor Amps Residual <sup>1</sup>
Average (Min.) Volts AN, BN, CN, AB, BC, CA <sup>1</sup>	Meter Type
Average Watts A, B, C, Total <sup>1</sup>	Phase Angle Amps A, B, C <sup>1</sup>
Average (Max.) Watts A, B, C, Total <sup>1</sup>	Phase Angle Volts A, B, C <sup>1</sup>
Average (Min.) Watts A, B, C, Total <sup>1</sup>	Phase Angle Volts AB, BC, CA <sup>1</sup>
Average VARs A, B, C, Total <sup>1</sup>	Power Factor A, B, C, Total
Average (Max.) VARs A, B, C, Total <sup>1</sup>	Protocol Version
Average (Min.) VARs A, B, C, Total <sup>1</sup>	PT Scale Factor
Average VAs A, B, C, Total <sup>1</sup>	PT Scale Factor Divisor
Average (Max.) VAs A, B, C, Total <sup>1</sup>	TDD Amps A, B, C, Residual <sup>1</sup>
Average (Min.) VAs A, B, C, Total <sup>1</sup>	TDD Denominator A, B, C, <sup>1</sup>
Class 0 Response Setup <sup>1</sup>	THD Volts AN, BN, CN, AB, BC, CA <sup>1</sup>
CT Scale Factor	Uncompensated VARs, Total
CT Scale Factor Divisor	Uncompensated Watts, Total
Demand (Max.) Amps A, B, C, Residual	VA-Hrs
Demand (Max.) Fund. Amps A, B, C, Residual <sup>1</sup>	VAR-Hrs Lag
Demand Amps A, B, C, Residual	VAR-Hrs Lead
Demand Fundamental Amps A, B, C, Residual <sup>1</sup>	VARs A, B, C, Total
Displacement Power Factor A, B, C <sup>1</sup>	VAs A, B, C, Total
Displacement Power Factor Total <sup>1</sup>	Volts AN, BN, CN, AB, BC, CA
Factory Version Hardware	Volts Aux
Factory Version Software	Watt-Hrs Net
Frequency	Watt-Hrs Normal
Fund. Amps A, B, C, Residual <sup>1</sup>	Watt-Hrs Reverse
Fund. Volts AN, BN, CN, AB, BC, CA <sup>1</sup>	Watts A, B, C, Total
Health	

### 6.4 List of Standard Display Measurements with D650 (M650 Measurements)

### 6.5 Calibration

Routine re-calibration is not recommended or required. A field calibration check every few years is a good assurance of proper operation

### APPENDIX

### A1 Ethernet Troubleshooting

If the Link LED fails to illuminate, this is an indication that there is trouble with the connection and communication will not proceed without solving the problem. If a copper connection is used between the D650 and the hub/switch, check the following items:

- 1. Verify that the connectors are fully engaged on each end.
- 2. Verify that the cable used is a "straight-through" cable connected to a "normal" port.
- 3. Verify that both the D650 and hub/switch are powered.
- 4. Try another cable.

5. If a long CAT-5 cable is used, verify that it has never been kinked. Kinking can cause internal discontinuities in the cable.

6. If a copper connection is used to an external fiber converter:

7. Verify that the LINK LED on the converter is lit on at least one side. Both sides need to be lit for a valid connection to be established.

8. At least one brand of converters will not output an optical idle unless it receives a forced 10 Mb copper link pulse (for some reason, auto-negotiation pulses confuse it). Some hubs/switches will not output an optical idle unless they receive an optical idle. This then inhibits the converter from outputting a copper link pulse enabling the D650 to link. In this condition, no device completes the link.

9. Verify that the fiber converter(s) and/or fiber hub/switch are matched for the same type of fiber connections. A 100BASE-FX port will NEVER inter-operate with the 10BASE-FL port (fiber auto-negotiation does not exist).

10. On the fiber connection, try swapping the transmit and receive connector on one end.

11. Verify that the fiber converter(s) and/or fiber hub/switch use the proper optical wavelength (100BASE-FX should be 1300nm).
# A2 Setting Screen configurations on PowerPlex II for D650 Detached Display – Screen Enable & Custom Display Screens

Settings / Screen Enable       Display Screen Enable       Display Screen Enable       Display Screen Enable       Amps A, B, C       Amps A, B, C       Yotts AN, EN, CN       Yotts AB, BC, CA       Watts A, B, C       Yeas A, Hours Reverse(-)       WYAR-Hours Reverse(-)       WYAR-Hours Reverse(-)       WYAR-Hours Net       Total Wats 30-PF - Frequency       Demand Amps A, B, C       Average Volts AH, BN, CN       Max Average Volts AB, BC, CA       Max Average Volts AB, BC, CA       Min Average Volts AB, B	ed Home Screen 0 0 0 0 0 0 0 0 0 0 0 0 0
Display Screen Enable Enable Amps A, B, C Amps Residual Volts AN, EN, CN Volts AB, BC, CA Varia A, B, C VARUA, B, C VARUA, B, C VARUA, B, C VARUA, B, C Total Wars-Total VARS VARUARS-Total VARS VARUARS-VARUARS VARUARS-VARUARS VARUARS-VARUARS-VARUARS VARUARS-VAR	ed Home Screen 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Display Screen Enable Enable Enable Amps A, B, C Amps Residual Volts AN, BN, CN Volts AB, BC, CA Vars A, B, C VARs A, B, C VARs A, B, C Total Wats-Total VARs VAS A, B, C Total VArs - Total VARs VAS A, B, C Total VArs - Total VARs VAS A, B, C Total VArs - Sup Power Factor Frequency KVAR-Hours Leading(-) KVAR-Hours Leading(-) KVAR-Hours Net Total Wats - Sup PF - Frequency Demand Amps AB,C Demand Amps AB,C Average Volts AB, BC, CA Max Average Volts AB, BC, CA Max Average Volts AB, BC, CA Min Average Volts A	ed Home Screen
Enable Amps A, B, C Amps Residual Volts AN, BN, CN Volts AB, BC, CA Watts A, B, C VARs A, B, C VARs A, B, C VARs A, B, C VARs A, B, C Total Wats-Total VARs VAS A, B, C Total VAs - 30 Power Factor Frequency WVatt-Hours Normal(*) WVatt-Hours Reverse(*) WVAtt-Hours Reverse(*) WVAtt-Hours Reverse(*) WVAtt-Hours Net Total Wats - 30 PF - Frequency WVAtt-Hours Net Total Wats - 30 PF - Frequency Demand Amps AB, C Demand Amps AB, C Average Volts AN, BN, CN Max Average Volts AN, BN, CN Max Average Volts AB, BC, CA Im Average Volts AB, BC,	Home See C C C C C C C C C C C C C C C C C
Amps A. B, C     Image A. B, C       Amps Residual     Image A. Beldual       Volts AN, EN, CN     Image A. B. C       Vatts A. B, C     Image A. B. C       Vatts A. B, C     Image A. B. C       Total Watts - Total VARs     Image A. B. C       Varka A. B, C     Image A. B. C       Power Factor A. B, C     Image A. B. C       Total Watts - Total VARs     Image A. B. C       Power Factor A. B, C     Image A. B. C       Total VARs - 3D Power Factor     Image A. B. C       KVAR - Hours Lagging(+)     Image A. B. C       KVAR - Hours Lagging(+)     Image A. B. C       Emmand Amps A. B, C     Image A. B. C       Demand Amps A. B, C     Image A. B. C       Average Volts A. B, B. C, CA     Image A. B. C       Ima Average Volts A. B, B. C, CA     Image A. Ange - Min       Total VARs Max - Ange - Min     Image A. Ange - Min       Total VARs Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR S Max - Ange - Min     Image A. Ange - Min       Total VAR	
Amps Residual       Volts AN, Residual         Volts AN, BN, CN       Volts AB, BC, CA         Walts A, B, C       VARa A, B, C         Total Walts - Total VARs       V         VARa A, B, C       V         Power Factor A, B, C       V         Power Factor A, B, C       V         Vatt-Hours Lagging(+)       V         WVatt-Hours Lagging(+)       V         WVatt-Hours Lagging(+)       V         WARt-Hours Lagging(+)       V         WVatt-Hours Lagging(+)       V         WVatt-Hours Lagging(+)       V         WVatt-Hours Lagging(+)       V         WAR-Hours Lagging(+)       V         Watt-Hours Lagging(+)       V         WAR-Hours Lagging(+)       V         Watt-Hours Leagendig(-)       V         WAR-Hours Lagging(+)       V         Watt-Hours Leagendig(-)       V         Watt-Hours Leagendig(-)       V         Watt-Hours Leagendig(-)       V         Watt-Hours Lagging(+)       V         Watt-Hours Net	
Valts AB, BC, CA     Y       Walts A, B, C     YARa A, B, C       VARa A, B, C     YARa A, B, C       Total Walts - Total VARs     Y       VS A, B, C     Y       Power Factor A, B, C     Y       Total VARs - 30 Power Factor     Y       KWatt-Hours Lagging(+)     Y       KVAR-Hours Lagging(+)     Y       KVAR-Hours Lagging(+)     Y       Watt-Hours Lagging(+)     Y       Watt-Hours Lagging(-)     Y       WAR-Hours Lagging(-)     Y       Watt-Hours Lagging(-)     Y       Watt-Hours Lagging(-)     Y       Watt-Hours Leagling(-)     Y       Watt-Hours Lagging(-)     Y       Watt-H	
Watts A, B, C       Image: Constraint of the second s	
VARA A.B. C.	
Iotal Watts - Iotal VARS     Image: Section 2014       Power Factor A, B, C       Power Factor A, B, C       Total VAs - 3D Power Factor       Vistat-Hours Lagging(+)       KWatt-Hours Leading(-)       KVAR-Hours Lagging(+)       KVAR-Hours Lagging(+)       Edwards A, B, C       Demand Amps Residual       Max Average Volts AJ, BN, CN       Max Average Volts AJ, BN, CN       Max Average Volts AJ, BN, CN       Ima Average Volts AJ, BN, CN       Total VARS Max - Avg - Min       Total VARS Max - Avg - Min       Total VARS Max - Avg - Min       Fund Amps Residual       Fund Amps Residual       Fund Amps Residual	000000000000000000000000000000000000000
Power Factor A, B, C  Total VAs - 30 Power Factor  Total VAs - 30 Power Factor  Frequency  WVatt-Hours Normal(*)  WVatt-Hours Reverse(-)  WVAtt-Hours Lagging(*)  WVAtt-Hours Leading(-)  WVAtt-Hours Net  Total Watts - 30 PF - Frequency  Demand Amps A, B, C  Average Volts AN, BN, CN  Max Average Volts AN, BN, CN  Total VAts Max - Avg - Min  Total VAs Max - Avg - Min  Total VAs Max - Avg - Min  Fund Amps Residual  Fund Volts AN, BN, CN	
Total VAs - 3D Power Factor     Image: Comparison of the second of the sec	
Frequency     Ø       KWatt-Hours Normal(*)     Ø       KVAR-Hours Reverse(-)     Ø       KVAR-Hours Leading(-)     Ø       KVAR-Hours Net     Ø       Total Watts - 30 PF - Frequency     Ø       Demand Amps A.B.C     Ø       Demand Amps A.B.C     Ø       Max Demand Amps A.B.C     Ø       Average Volts AN, BN, CN     Ø       Max Average Volts AB, BC, CA     Ø       Max Average Volts AB, BC, CA     Ø       Min Average Volts AB, BC, CA     Ø       Fund Amps Residual     Ø	
NATARMOUND FORMULT       NATARMOUND Reverse(-)       KVAR-Hours Leading(-)       KVAR-Hours Net       Total Watts - 30: PF - Frequency       Demand Amps AB,C       Demand Amps AB,C       Max Demand Amps AB,C       Average Volts AN, BN, CN       Max Average Volts AB, BC, CA       Min Average Volts AB, BC, CA       Fund Amps Residual       Fund Amps Residual       Fund Volts AN, BN, CN	000000000000000000000000000000000000000
WAR-Hours Lagging(*)         WAR-Hours Leading(-)         WAR-Hours Net         Total Watts - 30: PF - Frequency         Demand Amps A.B.C         Demand Amps A.B.C         Max Demand Amps A.B.C         Average Volts AN, BN, CN         Average Volts AB, BC, CA         Max Average Volts AB, BC, CA         Min Average Volts AB, BC, CA         Fund Amps Residual         Fund Amps Residual         Fund Amps Residual         Fund Amps Residual         Fund Volts AN, BN, CN	000000000000000000000000000000000000000
KVAR-Hours       Image: Comparison of the co	
KVA-Hours       Image: Start Sta	
Winder-Hould's Net     Image Amps A.B.C.       Demand Amps A.B.C.     Image Amps A.B.C.       Demand Amps A.B.C.     Image Amps A.B.C.       Average Volts AN, B.N. CN     Image Average Volts AN, B.N. CN       Average Volts AN, B.N. CN     Image Average Volts AN, B.N. CN       Max Average Volts AN, B.N. CN     Image Average Volts AN, B.N. CN       Ima Average Volts AN, B.N. CN     Image Average Volts AN, B.N. CN       Total Valts Max - Avg - Min     Image Average Volts A.B. C. CA       Total VARs Max - Avg - Min     Image Average Volts A.B. C. CA       Fund Amps A.B. C     Image Average Volts A.B. C       Fund Amps Residual     Image Average Volts A.B. C       Fund Amps Residual     Image Average Volts A.B. C       Fund Average Num     Image Average A	000000000000000000000000000000000000000
Demand Amps A.B.C.	
Demand Amps Residual Max Demand Amps A.B.C Average Volts AN, BN, CN Average Volts AN, BN, CN Max Average Volts AN, BN, CN Max Average Volts AN, BN, CN Max Average Volts AN, BN, CN Min Average Volts AN, BN, CN Total VAts Max - Avg - Min Fund Amps A, B, C Fund Amps Residual Fund Volts AN, BN, CN	
Max Demand Amps A.B.C  Average Volts AN, BN, CN Average Volts AN, BN, CN Max Average Volts AN, BN, CN Max Average Volts AN, BN, CN Max Average Volts AN, BN, CN Min Average Volts AN, BN, CN Total Valts Max - Avg - Min Fund Amps A, B, C Fund Amps Residual Fund Volts AN, BN, CN	
Average Volts AN, EN, CN Average Volts AN, EN, CN Max Average Volts AN, EN, CN Max Average Volts AN, EN, CN Max Average Volts AN, EN, CN Min Average Volts AN, EN, CN Total VARs Max - Avg - Min Total VARs Max - Avg - Min Total VARs Max - Avg - Min Fund Amps A, B, C Fund Amps Residual Fund Volts AN, EN, CN	
Max Average Volts AN, BN, CN Max Average Volts AB, BC, CA Min Average Volts AB, BC, CA Min Average Volts AB, BC, CA Min Average Volts AB, BC, CA Total Vafts Max - Avg - Min Total VARS Max - Avg - Min Total VARS Max - Avg - Min Total VARS Max - Avg - Min Fund Amps A, B, C Fund Amps Residual Fund Volts AN, BN, CN	
Max Average Volts AB, BC, CA.	
Min Average Volts AN, BN, CN	
Min Average Velta Ab. Bo, CA	
Total VARs Max - Avg - Min  Total VARs Max - Avg - Min Fund Armps A, B, C Fund Armps Residual Fund Volts AN, BN, CN	0 0 0
Total VAS Max - Avg - Min  Fund Amps A, B, C Fund Amps Residual Fund Volts AN, BN, CN	0 0
Fund Amps A, B, C	0
Fund Volts AN, BN, CN	0
	0
Fund Volts AB, BC, CA	0
TDD Amps A.B.C	0
THD Volts AN, BN, CN	0
K-Factor Amos A.B.C	0
Displacement Power Factor A.B.C	õ
Displacement Power Factor Total	0
Fund Demand Amps A.B.C	0
Max Fund Demand Amps A.B.C	0
Average Watts A, B, C	0
Max Average Watts A, B, C	0
Min Average Walts A, B, C	0
Max Average VARs A. B. C	0
Min Average VARs A. B. C	0
Average VAs A, B, C	0
Max Average VAs A, B, C	0
Secondary Volts AN, BN, CN	õ
Secondary Volts AB, BC, CA	0
Volts Aux	0
Clear All Check All	
Apply	

Custom Display Screen Settings: Two Sections – Build/Edit and Summary

The Custom Display Screen Configuration page contains two sections: the Build/Edit panel and the Summary panel. One custom display screen is built at a time in the Build/Edit panel and is then added to the Summary panel, which presents a list of all the custom screens that have been built. The Build/Edit panel is presented if there are no custom screens stored on the IED when the page is loaded; otherwise, the Summary panel is presented. Only one panel is visible at a time.

#### Build/Edit panel

Select a measurement to be displayed on each display line from the dropdown lists and enter an alphanumeric label that describes the display screen.

Special character buttons insert the characters shown on the buttons into the "Label" field. The "k/M/G" (kilo/Mega/Giga) button inserts an underscore character into the "Label" field, which is automatically replaced with the appropriate unit prefix when displayed on the IED's front panel. The dot character is used to separate parts of a single label into multiple labels that apply to the different display lines. It is necessary to place dots between underscore that apply to different display lines.

The MIN, MAX, AVG, line and phase LEDs are automatically lit by the IED, based on the selected measurements.

Click the "Next >" button to view the summary panel.

<b>∲</b> Bit	ronic	S	
Home Data	Resets Setti	ngs Contact	
Settings / Custom D	splay Screens		
Custom Displa Mea Line 1. NO	ay Screen Conf asurement NE	iguration	
Line 2. NC	NE NE	×	
Lab Alphanumeric	el	Special Characters	
Next> Cance	91		

#### Summary panel

Screens are saved to IED once the "Apply" button has been clicked. A row (screen) from the summary table can be selected for viewing, editing or deleting by clicking its radio button.

The order of the screens can be changed by selecting a screen from the list and clicking on the up or down arrows.

# **Ø**Bitronics

Home Data Resets Settings Contact

Settings / Custom Display Screens

Custom Display Screen Configuration

	Label	Measurement 1	Measurement 2	Measurement 3	Enabled
0	1 _V·A·_WA	RMS Volts A	RMS Amps A	RMS Watts A	
0	2 _V·A·_WB	RMS Volts B	RMS Amps B	RMS Watts B	~
0	3 _VA WC	RMS Volts C	RMS Amps C	RMS Watts C	
0	4 kVARh_W	KVAR-Hrs Lag	KVAR-Hrs Lag	RMS Watts Total	
0	5 _V DmdAΦ	Max Demand RMS Volts A	Demand RMS Volts A	Min Demand RMS Volts A	
0	6 _V DmdBΦ	Max Demand RMS Volts B	Demand RMS Volts B	Min Demand RMS Volts B	
0	7 V DmdCΦ	Max Demand RMS Volts C	Demand RMS Volts C	Min Demand RMS Volts C	<b>v</b>
Λ					

Edit Add Delete

Apply

## A3 PowerPlex II Display Screens – Standard Formats

INST	ANTANEOUS Format	DISPLAY SCREENS Quantity
1.	00000 00000 00000 АтрsФ	Phase A Amperes Phase B Amperes Phase C Amperes
2.	00000 	Residual Amperes <sup>1</sup> Unused Unused
3.	00000 00000 00000 xVolts	Phase A Volts <sup>1</sup> Phase B Volts Phase C Volts
4	00000 00000 00000 xVolts	Phase A-B Volts Phase B-C Volts Phase C-A Volts
5.	00000 00000 00000 xWatts Φ	Phase A Watts <sup>1</sup> Phase B Watts Phase C Watts
6.	00000 00000 00000	Phase A VARs <sup>1</sup> Phase B VARs Phase C VARs

7. 00000 Total Watts 00000 Total VARs DDDDD Unused xW·xVAR

xVAR Φ

8. 00000 Phase A VAs<sup>1</sup> 00000 Phase B VAs 00000 Phase C VAs xVA  $\Phi$ 

- 9.
   00000
   Phase A PF<sup>-1</sup>

   00000
   Phase B PF

   00000
   Phase C PF

   PF Φ
- 10.
   00000
   Total VAs

   00000
   3Φ PF

   □□□□□
   Unused

   xVAs·PF
- 11. 00.000 Frequency □□□□□ Unused □□□□ Unused Hz
- 12. 12345 ) Positive 6789A. J kWh □□□□□ Unused +kWh
- 13. 12345 ) Negative 6789A. J kWh □□□□□ Unused -kWh
- 14. 12345 ) Positive 6789A. J kVARh □□□□□ Unused +kVARh
- 15. 12345 ) Negative 6789A. ) kVARh □□□□□ Unused -kVARh
- 16. 000.00 VA hours (Most significant half)
   000.00 VA hours (Least significant half)
   □□□□□ Unused
   kVAh
- 17. 00000 Watt hours Net (Most significant half)

00000 Watt hours Net (Least significant half) □□□□□ Unused kWh NET

 18.
 00000
 Total Watts

 00000
 3Φ PF

 0000
 Frequency

 xW·PF·Hz

<sup>1</sup> - Screen available on WYE meters only

x - indicates blank, (k)ilo, (M)ega, or (G)iga

## DEMAND DISPLAY SCREENS

	Format C	Quantity
19.	000.00 000.00 000.00 Amps Dmd	Phase A Amps Demand Phase B Amps Demand Phase C Amps Demand
20.	00000 00000 00000 Amps MAX	Phase A Maximum Amperes Demand Phase B Maximum Amperes Demand Phase C Maximum Amperes Demand
21.	000.00 000.00 □□□□□ AmpsDmdR	Residual Amps Demand Maximum Residual Amps Demand Unused
22.	000.00 000.00 000.00 xV Avg	Phase A Average Voltage Phase B Average Voltage Phase C Average Voltage
23.	00000 00000 00000 xV MAX	Phase A Maximum Volts Demand <sup>1</sup> Phase B Maximum Volts Demand Phase C Maximum Volts Demand
24.	00000 00000 00000 xV MIN	Phase A Minimum Volts Demand <sup>1</sup> Phase B Minimum Volts Demand Phase C Minimum Volts Demand
25.	000.00 000.00 000.00 xV Avg	Phase A-B Average Voltage Phase B-C Average Voltage Phase C-A Average Voltage
26.	00000 00000 00000 xV MAX	Phase A-B Maximum Volts Demand Phase B-C Maximum Volts Demand Phase C-A Maximum Volts Demand
27.	00000 00000 00000 xV MIN	Phase A-B Minimum Volts Demand Phase B-C Minimum Volts Demand Phase C-A Minimum Volts Demand
28.	00000 00000	Total Maximum Watt Demand Total Watts (Also on Screen 7)

00000 Total Minimum Watt Demand  $xW \cdot \uparrow \cdot \downarrow$ 

- 29. 00000 Total Maximum VAR Demand 00000 Total VARs (Also on Screen 7) 00000 Total Minimum VAR Demand xVAR · ↑ ·↓
- $\begin{array}{cccc} 30. & 00000 & Total Maximum VAs \\ 00000 & Total VAs (Also on Screen 10) \\ 00000 & Total Minimum VAs \\ xVA \cdot \uparrow \cdot \downarrow \end{array}$
- <sup>1</sup> Screen available on WYE meters only
- x indicates blank, (k)ilo, (M)ega, or (G)iga

# HARMONIC SUMMARY DISPLAY SCREENS

	Format	Quantity
31.	00000 00000 00000 Fnd Amps	Phase A Fundamental Amperes Phase B Fundamental Amperes Phase C Fundamental Amperes
32.	00000 00000 0000 FndN · Amp	Fundamental Residual Amperes <sup>1</sup> Unused Unused s
33.	00000 00000 00000 Fnd xV	Phase A Fundamental Volts Phase B Fundamental Volts Phase C Fundamental Volts
34.	000.00 000.00 000.0 Fnd xV	Phase A-B Fundamental Voltage Phase B-C Fundamental Voltage Phase C-A Fundamental Voltage
35.	000.00 000.00 000.00 %TDD I	Phase A Current %Total Demand Distortion (%TDD) Phase B Current %Total Demand Distortion (%TDD) Phase C Current %Total Demand Distortion (%TDD)
36.	000.00 000.00 000.00 %THD V	Phase A Voltage %Total Harmonic Distortion (%THD) <sup>1</sup> Phase B Voltage %Total Harmonic Distortion (%THD) Phase C Voltage %Total Harmonic Distortion (%THD)
37.	000.00 000.00 000.00 %THD V	Phase A-B Voltage %Total Harmonic Distortion (%THD) Phase B-C Voltage %Total Harmonic Distortion (%THD) Phase C-A Voltage %Total Harmonic Distortion (%THD)
38.	00.000 00.000 00.000 K-Factor	K-Factor Phase A (Current) K-Factor Phase B (Current) K-Factor Phase C (Current)

<sup>1</sup> - WYE meters only x - indicates blank, (k)ilo, (M)ega, or (G)iga

#### HARMONIC SUMMARY DISPLAY SCREENS (Cont'd)

- Format Quantity
- 39. 0.0000 Phase A Displacement PF<sup>1</sup>
   0.0000 Phase B Displacement PF
   0.0000 Phase C Displacement PF
   DispPF Φ
- 40. 00000 3⊕ Displacement PF
  □□□□□ Unused
  □□□□□ Unused
  DispPF T
- 41. 000.00 Phase A Fundamental Demand Amps
   000.00 Phase B Fundamental Demand Amps
   000.00 Phase C Fundamental Demand Amps
   FndDmdIΦ
- 42. 000.00 Phase A Maximum Fundamental Demand Amps
   000.00 Phase B Maximum Fundamental Demand Amps
   000.00 Phase C Maximum Fundamental Demand Amps
   FndDmdIΦ
- 43. 000.00 Maximum Fundamental Demand Amps Residual 000.00 Fundamental Demand Amps Residual Unused FundDmdIR
- 44. 000.00 Phase A Average Watts 000.00 Phase B Average Watts 000.00 Phase C Average Watts xW Avg
- 45. 000.00 Phase A Maximum Average Watts 000.00 Phase B Maximum Average Watts 000.00 Phase C Maximum Average Watts xW Max
- 46. 000.00 Phase A Minimum Average Watts 000.00 Phase B Minimum Average Watts 000.00 Phase C Minimum Average Watts xW Min

- 47. 000.00 Phase A Average VARs 000.00 Phase B Average VARs 000.00 Phase C Average VARs xVAR Avg 48. 000.00 Phase A Maximum Average VARs 000.00 Phase B Maximum Average VARs Phase C Maximum Average VARs 000.00 xVAr Max 49. 000.00 Phase A Minimum Average VARs Phase B Minimum Average VARs 000.00 Phase C Minimum Average VARs 000.00 xVAR Min 000.00 50. Phase A Average VAs 00.00 Phase B Average VAs 000.00 Phase C Average VAs xVA Avg 51. 000.00 Phase A Maximum Average VAs 000.00 Phase B Maximum Average VAs 000.00 Phase C Maximum Average VAs xVA Max 52. 000.00 Phase A Minimum Average VAs 000.00 Phase B Minimum Average VAs 000.00 Phase C Minimum Average VAs xVA Min 53. 00000 Phase A Secondary Volts<sup>1</sup> 00000 Phase B Secondary Volts 00000 Phase C Secondary Volts SecVolts 54. 00000 Phase A-B Secondary Volts 00000 Phase B-C Secondary Volts 00000 Phase C-A Secondary Volts SecVolts
- 55. 000.00 Auxiliary Voltage

V aux

- <sup>1</sup> Screen available on WYE meters only x indicates blank, (k)ilo, (M)ega, or (G)iga



# A4 PowerPlex II Standard Display Screens – Visual Representations D650





















## A5 Configuring the D650MX Universal Display

New User Settings have been added to simplify the setup of the D650MX to devices other than Bitronics products. There is a new check box to show or not show Bitronics meter settings.

Default for the MX is to not show Bitronics meter settings. Checking the box on the top right will add additional settings that are native to the Bitronics 50 and 60 Series meters and are useful in setting up displays connected to M87x or PPX II devices. Some settings tabs are not affected by checking this. Checking or unchecking this box applies to all screens.

Connect to the display with the standard IP address of 192.168.0.171. You can change this either directly from the front buttons or on the 'Network' page which is part of the 'Settings' tab. Before leaving any page, you should hit 'Apply' to save changes made to that page. There are options to restore to default on individual pages as well as an overall option to restore all pages on the 'Load/Store Settings' page.

When you connect, it will be to the 'Home' Page. Clicking the 'Show Bitronics meter settings' button has no effect on this page.

∳Bitro	nics	
Home Settings	itatus Contact	Show Bitronics meter settings build 4837
Device Summary		
Device Name Device Model Device Type Serial Number Firmware Version Display Version IP Address MAC Address	D650_name D650MXU011 Advanced 1113979 32.16.0 2.200 192.168.0.171 00:D0:4F:03:50:D1	

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Click on the 'Settings' tab at the top to configure the display. Again for this page there will be no change by clicking on the 'Show Bitronics meter settings' button.

<b>∲</b> Bit	ronics		
Home Setting	os Status Contact		Show Bitronics meter setting
INDUT	OUTPUT		
		<b>W</b>	
Input	Flex Scaling	Load/Store Settings	
<u>Protocol</u> Network	Custom Screens Screen Enable	Password Security Firmware Upload	
Serial Port	Identity	<u>I minuro opiouu</u>	

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The items under 'UTILITIES' are not needed for configuration but are useful for saving and uploading configurations, adding password security including disabling the ability to make changes to configuration via the front display, and uploading new firmware that may become available from time to time.

The 'Input' page is not needed for set up of the D650MX Universal Display. The 'Serial Port' or 'Network' pages may be needed if you are connecting to the Display in one of these ways and need to make a change. The 'Identity' page is useful for assigning specific names and descriptions to the D650 display. A name change will appear in the 'Home' page.

Home Se	ttings Status	Contact	Show Bitronics meter se
Settings / Ident	ity		
Identity			
Name	D650_name		
Description	D650_desc		
Owner	D650_owner		
Location	D650_locat		

# Bitronics

Home Settings

Settings / Network

Network Configuration

Hostname	hostname
IP Address	192.168.0.171
Subnet Mask	255.255.255.0
Router Address	192.168.0.1

Status

Contact

Apply

Restore Defaults

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Settings / Serial Port	
Serial Port Configuration	
Serial Port ModeRS232 ~Baud Rate9600 ~ParityNONE ~	
TX Output Control	
min RX-to-RTS Delay0millisecondsRTS-to-TX Delay0millisecondsRTS holdup after TX0milliseconds	
RS232 Hardware Flow Control	
RTS - Modem or Ext RS232/485 Converter     O       RTR - Null Modem     Image: Converter for the second se	
Serial Port Diagnostics	

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To configure the D650MX Universal Display there are four key steps done in this order:

Create 'Flex Scaling' and assign Measurements

□ Show Bitronics meter settings

- Assign points or registers under 'Protocol'
- Configure 'Custom Displays'
- Assign which displays you want to appear under 'Screen Enable'

Again, remember to hit 'Apply' or 'Next' on each page you change. You do not need to 'Reset' until all changes are made but can do so if you have many changes and you want to make sure you don't lose your changes.

Before starting, it is useful to view the points list of the device you will be polling. If for example you were polling an OrionLX, below is an example points list viewed in NCD:

ort Options: Copy Port	Move Port Delete Port Close Port 🗋									
Add New RTU	( Inputs		D650 (16 Item(s) - Filter By: All	Points)					Fam	- Te
Port D650	Pront Logic - Logic		Dearch 🛛	BZE	Configured in	pute				
Inputs	Point Name		Orion Point Name	Point Type	Point Address	Class	Deadband	Normal	Min	Max
Outputs	Fan_animation @Logic		Feeder01_PhA_Ampe @Logic	Analog	0	2	1		0	9999999
	Feeder01_PhA_Amps @Logic	<<	Feeder01 PhA MVar @Logic	Analog	1	2	đ		0	9999999000
	Feeder01_PhA_MVar @Logic		Feeder[1] PhA_MW @Loais	Analog	2	2	1		0	00000000
	Feeder01_PhA_MW @Logic		Feeder01 PhA Voltage (81 opin	Analog	1	5			0	999999
	Feeder01_PhA_Voltage @Logic		Foodard1 PhR Amon (Pl onio	Analog	4	0	1		0	000000
	Feeder01_PhB_Ampa @Logic		Feedero 1_Phb_Amps @Cogic	eeder01 PhB MVar@Logic Analog 5 7 1 0 97	3333333					
	Feeder01_PhB_MVar @Logic	8	reederu (_Phib_Myar @Logic	Analog	0	2	1		U .	999999000
	Feeder01_PhB_MW @Logic		Feeder01_PhB_MW @Logic	Analog	6	2	3		0	888988000
	FeederU1_PhB_Voltage @Logc		Feeder01_PhB_Voltage @Logic	Analog	7	2	1		0	999999
	Feeder01_Ph0_Amps@Logic	2	Feeder01_PhC_Ampe@Logic	Analog	8	2	1		0	999999
	Easter01 PhC Mill Storic	1.1	Feeder01_PhC_MVar@Logic	Analog	9	2	1		0	999999000
	Feeder01 PhC Voltage @Long	81. T.	Feader01_PhC_MW @Logic	Analog	10	2	1		Ū.	999999000
	Feeder02 PhA Amea @Logic		Feeder01_PhC_Voltage @Logic	Analog	11	2	1		0	999999
	Feeder02_PhA_MVar @Logic		Trans PhA Winding Temp@Logic	Analog	20	2	1		-99999990	99999900
	Feeder02_PhA_MW @Logic		Trans PhB Winding Terms 81 onio	Analog	21	2	4		-09999990	0000000
	Feeder02_PhA_Voltage @Logic		Trans PhC Working Terms #1 apr	Analog	22	3	7		0000000	00000000
	Feeder02_PhB_Amps @Logic		Rails @Occas 10	Analog	0	-			0	1201067205
	Feeder02_PhB_MVar @Logic		Foils @Onon_JO	Gounter	v	0				429490/295
	Feeder02_PhB_MW @Logic									
	Feeder02_PhB_Voltage @Logic									
	Feeder02_PhC_Amps @Logic			2						
	Feeder02_PhC_MVar@Logic			· · · ·						
	Peederu2_Pro_onv @cogic	2								
	Feederux_Pric_Vorage @Logic	~								

Start with the 'Flex Scaling' page, this only applies to D650MX Universal Display not the D650BX display.

Scaling is based on two separate point values on a linear scale (they can be, but don't need to be, min and max) as shown in the example in the graph below showing conversion for Celsius to Fahrenheit:



Some standard scaling calc types and example measurements have been created as part of the default page as shown below:

Polled	Displayed	Polled	Displayed	Add Scaling	Î
-1000	10.00	1000	1000	Delete	
0	0	100000	100000	Delete	
-1000	- 100.0	1000	100.0	Delete	
-1000	0.001	1000	10.00	Delete	
-1000	- 1000	1000	1.000	Delete	
3200	0.0.0	21200	100.00	Delete	
	Polled -1000 0 -1000 -1000 -1000 3200	Point 1           Poiled         Displayed           -1000         - 1000           0         0           -1000         - 1000           -1000         - 1000           -1000         - 1000           -1000         - 1000           3200         0.00	Point 1         Point 1           Point 1         Displayed         Point 1           -1000         - 1000         1000           -1000         - 1000         10000           -1000         - 1000         1000           -1000         - 1000         1000           -1000         - 1000         1000           -1000         - 1000         1000           -1000         - 1000         21200	Point 1         Point 2           Poiled         Displayed         Poiled         Displayed           -1000         - 1000         10000         10000           0         0         0         10000         100000           -1000         - 10000         100000         100000           -1000         - 10000         10000         100000           -1000         - 10000         10000         10000           -1000         - 10000         10000         10000           3200         0.0000         21200         1000.000	Poiled         Displayed         Poiled         Dusplayed         Add Scaling           -1000         -1000         1000         1000         1000         Delete           0         -1000         -1000         100000         100000         Delete           -1000         -10000         100000         100000         Delete           -1000         -10000         10000         10000         Delete           -1000         -10000         10000         Delete         Delete           -1000         -10000         10000         Delete         Delete

These can be used or deleted and replaced with user generated values. The subsequent screens will show how new Scalings and Measurements are added. First setup Scalings creating names and ranges for each calc type. We will create a kV phase-phase and kV phase-neutral as new scalings:

<b>W</b> DI II OI II CS
-------------------------

Home Settings	Status	Contact				Show Bitronics mete	r settings
Settings / Scaling							
Scalings							
Name	F	Polled	Displayed	Polled	Displayed	Add Scaling	^
No scaling		-10000	- 10000	10000	10000	Delete	
Divide by 10		-10000	- 1000.0	10000	1000.0	Delete	
Divide by 100		-10000	- 100.00	10000	100.00	Delete	
Divide by 1000		-10000	- 10.000	10000	10.000	Delete	
F-to-Cent		3200	0.00	21200	100.00	Delete	
kVpp		0	0.00	13800	13.80	Delete	
kVpn		0	0.00	7500	7.50	Delete	~
Measuremen	ts						
Name	Scaling		Phase	Modifier	Rows	Add Measurement	^
Amps - Ph A	No sca	ing ~	A ~	none ~	one ~	Delete	
MW - Total	Divide	by 1000 $$	none ~	none ~	one ~	Delete	
Freq	Divide	by 100 ~	none ~	none ~	one ~	Delete	
enter a name	select s	caling method	select optional	LEDs to illuminate	select row span		

In another example, we can add scaling for amps and MW:

iome Settings	Status Contact				Show Bitronics meter	50
ettings / Scaling						
Scalings						
Name	Polled	Displayed	Polled	Displayed	Add Scaling	
32bit counter	0	0	100000	100000	Delete	
Divide by 10	-1000	- 100.0	1000	100.0	Delete	
Divide by 100	-1000	- 10.00	1000	10.00	Delete	
Divide by 1000	-1000	- 1000	1000	1000	Delete	
F-to-Cent	3200	0.00	21200	100.00	Delete	
Amps	0	0.0	65000	1000.0	Delete	
ww	0	2.00	32767	00.05	Delete	
leasurements	3		10.000		Add	
lame	Scaling	Phase	Modifier	Rows	Measurement	
Amps - Ph A	No scaling $\sim$	Α ~	none v	one v	Delete	
WW - Total	Divide by 1000 $ \smallsetminus $	none ~	none ~	one v	Delete	
		Deces in	Lanna and	000	Delete	

Note that decimal points must match on both points or an error message will appear, and you will need to correct before proceeding:

Name	192.168.	1.206 says oints in Display for 'No	scaling' must match		Add Scaling	Î.
No scaling	Fix entry a	and press Apply.		0	Delete	
32bit counter					Delete	
Divide by 10				OK O	Delete	
Divide by 100	-1000	- 10.00	1000	:0.00	Delete	
Divide by 1000	-1000	- 1000	1000	1.000	Delete	
F-to-Cent	3200	0.00	21200	100.00	Delete	•
F-to-Cent Measurements Name	3200 Scaling	Phase	21200 Modifier	Rows	Delete Add Measurement	•
F-to-Cent Veasurements Name Amps - Ph A	Scaling	Phase A	21200 Modifier none ~	Rows	Delete Add Measurement Delete	•
F-to-Cent Vleasurements Name Amps - Ph A MW - Total	Scaling No scaling ~ Divide by 1000 ~	Phase A ~ none ~	21200 Modifier none ~ none ~	Rows one ~	Add Measurement Delete Delete	• •

Once the Scalings are established, they will appear in the drop down when selecting Measurements. Just enter a name and select one of the Scaling drop down values. Phase can be selected as well as Modifier. These options correspond to the small LEDs on the right side of the display next to each of the three 5-segment lines where values are displayed. One or two rows can be selected (two rows are typically used for energy values which may wrap beyond one line and are required for a 32-bit counter).

Measurements					
Name	Scaling	Phase	Modifier	Rows	Add ^ Measurement
Amps - Ph A	No scaling $\sim$	Α ~	none ~	one ~	Delete
MW - Total	Divide by 1000 $$	none ~	none ~	one ~	Delete
Freq	Divide by 100 $$	none ~	none ~	one ~	Delete
Vab	kVpp ~	none ~	none ~	one ~	Delete
enter a name	No scaling	select optional	LEDs to illuminate	select row span	
	Divide by 10				
	Divide by 100				~
Save to File	Divide by 1000	ile			
	F-to-Cent				
Apply	kVpp				
Restore Defaults	kVpn				

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Name	Scaling	Phase	Modifier	Rows	Add Measurement
Amps - Ph A	No scaling ~	<b>A</b> ~	none ~	one ~	Delete
MW - Total	Divide by 1000 $$	none ~	none ~	one ~	Delete
Freq	Divide by 100 $\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	none ~	none ~	one ~	Delete
Vab	kVpp ~	none ~	none ~	one ~	Delete
enter a name	select scaling method	none	LEDs to illuminate	select row span	
		A B			,
Save to File	Open from Fi	C			
	•	AB			
Apply		BC			
Restore Defaults		CA			

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Measurements

Measurements						
Name	Scaling	Phase	Modifier	Rows	Add Measurement	^
Amps - Ph A	No scaling ~	Α ~	none ~	one ~	Delete	
MW - Total	Divide by 1000 $$	none ~	none ~	one ~	Delete	
Freq	Divide by 100 $\sim$	none ~	none ~	one ~	Delete	
Vab	kVpp ~	none ~	none ~	one ~	Delete	
enter a name	select scaling method	select optional	<sub>Ll</sub> none	select row span		
			max			
			avg			$\sim$
Save to File	Open from Fi	ile	min			
Apply						
Restore Defaults						
		Copyright © 2020 Bitror	nics, LLC. All rights reserv	/ed.		

lame	Scaling	Phase	Modifier	R	ows	Add Measurement
/ab	kVpp ~	AB	~ none	~ 0	ne v	Delete
enter a name	select scaling method	select optic	nal LEDs to illuminate	, <b>(</b>	one	
				t	wo	
Save to File	Open from Fil	le				
		-				
Apply						

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# **Ø**Bitronics

Contact

Home

Settings Status

Settings / Scaling

Scalings

-	Poir	nt 1	Po	int 2		^
Name	Polled	Displayed	Polled	Displayed	Add Scaling	
No scaling	-10000	- 10000	10000	10000	Delete	
Divide by 10	-10000	- 1000.0	10000	1000.0	Delete	
Divide by 100	-10000	- 100.00	10000	100.00	Delete	
Divide by 1000	-10000	- 10.000	10000	10.000	Delete	- 1
F-to-Cent	3200	0.00	21200	100.00	Delete	
kVpp	0	0.00	13800	13.80	Delete	~

#### Measurements

Name	Scaling	Phase	Modifier	Rows	Add ^ Measurement
MW - Total	Divide by 1000 $$	none ~	none ~	one ~	Delete
Freq	Divide by 100 $\vee$	none ~	none ~	one 🗸	Delete
kVab	kVpp ~	AB ~	none ~	one 🗸	Delete
kVan	kVpn ~	Α ~	none ~	one ~	Delete
Amps - Ph A	OptRes-EngrUni ~	Α ~	none ~	one 🗸	Delete
enter a name	select scaling method	select optional	LEDs to illuminate	select row span	
					$\sim$

## You can set up many Scalings and Measurements as illustrated below:

Name	Scaling	Phase	8	Modifier		Rows		Add Measurem	ent	Î
F1_A_Amps	Amps ~	A	~	none	¥	one	~	Delete		1
F1_A_MVar	Divide by 1000 ~	A	~	none	~	one	*	Delete		
F1_A_MW	MW ~	A	~	none	¥	one	~	Delete		
F1_A_kV	Divide by 1000 $\sim$	A	~	none	Ŷ	one	¥.	Delete		
F1_A_W_Temp	F-to-Cent ~	A	~	none	¥	one	~	Delete		
Poll	32bit counter	none	v	none	~	two	×.	Delete		
Save to File	Open from	File	nalant opticioni	t EThe An Illioninia	fe.	malaint in	we enan			*
Apply										
Restore Defaults										

Show Bitronics meter settings

Measurements										
Name	Scaling		Phase		Modifier		Rows		Add Measurement	_ ^
Vab	k∨pp	$\sim$	AB	$\sim$	none	$\sim$	one	~	Delete	
Vbc	k∨pp	$\sim$	BC	$\sim$	none	$\sim$	one	$\sim$	Delete	
Vca	k∨pp	$\sim$	CA	$\sim$	none	$\sim$	one	$\sim$	Delete	
Va	k∨pn	$\sim$	A	$\sim$	none	$\sim$	one	$\sim$	Delete	
Vb	k∨pn	$\sim$	В	$\sim$	none	$\sim$	one	$\sim$	Delete	
Vc	k∨pn	$\sim$	С	$\sim$	none	$\sim$	one	$\sim$	Delete	
Ia	Amps	$\sim$	A	~	none	~	one	~	Delete	
Ib	Amps	$\sim$	В	~	none	~	one	$\sim$	Delete	- 1
Ic	Amps	$\sim$	С	~	none	$\sim$	one	$\sim$	Delete	
MW	MWtot	$\sim$	none	~	none	~	one	$\sim$	Delete	
Freq	SysHz	$\sim$	none	~	none	~	one	$\sim$	Delete	
enter a name	select scali	ing method		select optiona	LEDs to illumii	nate	select	row span		
Save to File	Ope	en from F	ile							
Apply										
Restore Defaults										
			Соруг	ight © 2020 Bitro	nics, LLC. All ri	ghts reserv	ed.			

Make sure to hit Apply before leaving this page to save your settings!

Save to File	Open from File						
Apply Settings stored successfully!							
Restore Defaults							

You can save the 'Flex Scaling' file and either open it up and edit directly in a text editor or you can save and later select Open File to retrieve the file.

Name Sc	aling					
on	×					
o open:						
n						
which is: JavaScript Object Notation (737 bytes)						
fox do with this file?	1					
Applications\notepad.exe (default)	~					
Do this automatically for files like this from now on.						
OK	Cancel					
	on o open: n aScript Object Notation (737 bytes) fox do with this file? Applications\notepad.exe (default) omatically for files like this from now on. OK					
```
scalings - Notepad
File Edit Format View Help
{
 "scalings": {
  "No scaling": [
   [-10000, "-10000"],
   [10000, "10000"]
  1,
  "Divide by 10": [
   [-10000, "-1000.0"],
   [10000, "1000.0"]
  ],
  "Divide by 100": [
   [-10000, "-100.00"],
   [10000, "100.00"]
  ],
  "Divide by 1000": [
   [-10000, "-10.000"],
   [10000, "10.000"]
  ],
  "F-to-Cent": [
   [3200, "0.00"],
   [21200, "100.00"]
  ],
  "kVpp": [
   [0, "0.00"],
   [13800, "13.80"]
  ],
  "kVpn": [
   [0, "0.00"],
   [7500, "7.50"]
  1
 },
 "measurements": {
  "Amps - Ph A": ["No scaling", "A", "none", "one"],
"MW - Total": ["Divide by 1000", "none", "none", "one"],
  "Freq": ["Divide by 100", "none", "none", "one"],
"kVab": ["kVpp", "none", "none", "one"],
"kVan": ["kVpn" "none" "none" "one"]
```

and the second s	-	×
<pre>File Edit Format View Help {     "scalings": {         "No scaling": [         [-100, "-100.0"],         [100, "100.0"]         ],         "32bit counter": [         [0, "0"],         [100000, "100000"]         ],         "Divide by 10": [         [-1000, "-100.0"],         [1000, "100.0"]         ],         "Divide by 100": [         [-1000, "-10.00"],         [1000, "10.00"]         ],         "Divide by 1000": [         [-1000, "-1.000"],         [1000, "1.000"]         ],         "Divide by 1000": [         [-1000, "-1.000"],         [1000, "1.000"]         ],         "F-to-Cent": [         [3200, "0.00"],         [21200, "100.00"]         ],         "Amps": [         [0, "0.0"],         [0.000 = 0"] </pre>		
[0,000, 1000.0 ]		~

You can make changes directly in Notepad or in a JSON editor. This is a very useful tool in creating long Scaling and Measurement lists. Instead of adding each Scaling and Measurment line by line in the 'Flex Scale' web page, you can copy and paste in the text editor (for example copy a list of A phase measurments to make corresponding B and C phase measurements via minor edits), then save and upload the JSON file back into the display.

```
[7977, "7.98"]
      ],
       "OptRes-EngrUnits": [
         [0, "0"],
         [52176, "1000"]
      1
   },
   "measurements": {
      "MW - Total": ["Divide by 1000", "none", "none", "one"],
      "Freq": ["Divide by 100", "none", "none", "one"],
      "kVab": ["kVpp", "AB", "none", "one"],
      "kVan": ["kVpn", "A", "none", "one"],
      "Amps - Ph A": ["OptRes-EngrUnits", "A", "none", "one"]
'kVbc": ["kVpp", "BC", "none", "one"],
      "kVbn": ["kVpn", "B", "none", "one"],
     "Amps - Ph B": ["OptRes-EngrUnits", "B", "none", "one"]
'kVca": ["kVpp", "CA", "none", "one"],
      "kVcn": ["kVpn", "C", "none", "one"],
     "Amps - Ph C": ["OptRes-EngrUnits", "C", "none", "one"]
  }
Another example:
  },
    'measurements": {
"F1_A_Amps": ["Amps", "A", "none", "one"],
"F1_A_Amvar": ["Divide by 1000", "A", "none", "one"],
"F1_A_MW": ["MW", "A", "none", "one"],
"F1_A_kV": ["Divide by 1000", "A", "none", "one"],
"F1_A_kV": ["Divide by 1000", "A", "none", "one"],
"F1_B_Amps": ["Amps", "B", "none", "one"],
"F1_B_Amvar": ["Divide by 1000", "B", "none", "one"],
"F1_B_MVar": ["Divide by 1000", "B", "none", "one"],
"F1_B_kV": ["Divide by 1000", "B", "none", "one"],
"F1_B_kV": ["Divide by 1000", "B", "none", "one"],
"F1_B_kV": ["Divide by 1000", "B", "none", "one"],
"F1_C_Amps": ["F-to-Cent", "B", "none", "one"],
"F1_C_Amps": ["Divide by 1000", "C", "none", "one"],
"F1_C_MVar": ["Divide by 1000", "C", "none", "one"],
"F1_C_KV": ["Divide by 1000", "C", "none", "one"],
     "F1_A_Amps": ["Amps", "A", "none", "one"],
  }
```

Save As							$\times$
← → ~ ↑ 🖡 > Th	is PC > Downloads		~	Ü	Search Download	ds	P
Organize   New folde	er					•	?
A Quick access	Name	Date modified	Туре	Size			
OneDrive - NovaT	scalings_demo	12/17/2020 11:49 AM	Text Document		2 KB		
3 This PC	Last week (1)     PCBViewer	12/10/2020 4:19 PM	File folder				
Desktop  Documents  Documents	V Earlier this year (2)     Intel Driver and Support Assistant     Wavewin Bitrapic Many DM H M 6 0724	5/21/2020 8:59 AM	File folder				
Music	Wavewin bittonics went Divi n.w.o 0/24	4/21/2020 9:15 AM	File lolder				
File name: scalin	ngs.json						~
Save as type: lext L	Jocuments (*.txt)						~
∧ Hide Folders		Encoding	g: UTF-8	~	Save	Cancel	

After saving the edited JSON file, go back to the web browser for the D650 to the 'Flex Scaling' page and select 'Open from File' near the bottom of the page and upload the file to the D650:

rganize 🔻 🛛 New fold	ler				H ·	?
^	Name	Date modified	Туре	Size		
Quick access	✓ Today (1)					
OneDrive - NovaT	scalings_demo	12/17/2020 11:49 AM	Text Document	2 KB		
🥏 This PC	<ul> <li>Earlier this week (1)</li> </ul>					
3D Objects	d650(3).cfg	12/14/2020 4:36 PM	CFG File	19 KB		
Desktop	∨ Last week (7)					
Documents	pcbviewer(1)	12/10/2020 4:16 PM	Application	530,319 KB		
Downloads	d650(2).cfg	12/10/2020 2:25 PM	CFG File	19 KB		
Music	scalings2	12/10/2020 1:48 PM	JSON File	1 KB		
Pictures	scalings(1)	12/10/2020 1:44 PM	JSON File	1 KB		
Videos	scalings	12/10/2020 10:30 AM	JSON File	1 KB		
Windows (C:)	d650(1).cfg	12/10/2020 10:28 AM	CFG File	19 KB		
Marketing (\\FAF	PCBViewer	12/10/2020 4:19 PM	File folder			
	<ul> <li>✓ Earlier this month (2)</li> </ul>					
Common (((IALI	M651.IGS	12/3/2020 4:11 PM	IGS File	15.666 KB		

V

### **Measurements**

Name	Scaling	Phase	Modifier	Rows	Add Measurement	^
kVan	kVpn ~	Α ~	none ~	one ~	Delete	
Amps - Ph A	$OptRes\text{-}EngrUni \; \lor \;$	A ×	none ~	one ~	Delete	
kVbc	kVpp ~	BC ×	none ~	one ~	Delete	
kVbn	kVpn ~	B ×	none ~	one ~	Delete	
kVca	kVpp ~	CA ~	none ~	one ~	Delete	
kVcn	kVpn 🖂	C ×	none ~	one ~	Delete	
enter a name	select scaling method	select optional l	EDs to illuminate	select row span		~
Save to File	Open from Fi	le				
Apply						

Restore Defaults

The additional BC, CA, B, and C kV lines have been added.

Next we will go to the 'Protocol' page. We will show an example for DNP3. Select DNP3, then Edit Points List

<b>Ø</b> Bitr	on	CS	
Home Settings	Status	Contact	Show Bitronics meter setting
Settings / Protocol			
Protocol Configu	uration		
Protocol	) ()	Modbus DNP3	
DNP Session			
Туре		TCP ~ Edit Points List	
Master (this display)		0	
Slave (remote device	e)	1	
Slave IP Address		0.0.0.0	
Slave Port		20000	
Apply		Advanced	
Restore DNP Defaul	ts		

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When you hit the 'Edit Points List' this page will not show points until you hit the 'Edit List' and the Measurements you created will be available (two examples shown below):

	Bitr	on	ics	
Home	Settings	Status	Contact	

 Home
 Settings
 Status
 Contact

 Settings / Protocol

 Pending changes will not take effect until after IED is reset.
 Reset

 DNP Points List Configuration

 DNP Type

 Analog Inputs

 DNP Point
 Calc Type

Edit List

	us obniact					Show Bitronics meter se
Settings / Protocol						
Pending changes will not take	effect until after IED is res	set.		Reset		
DNP Points List Cor	nfiguration					
DNP Type Analog Inputs ~						
		1				
Availa	ble	End of list	Selected	1		
MW - Total		Line of hoc				
Freq						
Van						
					-	
					V	

F1_A_MVar	Selected End of list	
F1_A_MW F1_A_KV F1_A_W_Temp F1_B_Amps F1_B_MVar F1_B_KV F1_B_W_Temp F1_C_Amps F1_C_Amps F1_C_MVar F1_C_MVar F1_C_MV F1_C_KV F1_C_W_Temp Poll		A V
Select All >> Filter: Measurement Name X	<	

You can then select any or all the available measurements. Select all and then hit the >> button to move them over.

You can use the 'Reserved' button to add in points to account for gaps in the list from where your points are in the IED you are communicating with.

Here is an example with non-continuous points. First select the points that are in order and transfer them over. Then add the reserve points.

F1 A Amps   F1 A MVar   F1 A MW   F1 A MW   F1 A W   F1 B Amps   F1 B MW   F1 C Measurement Name   X	Available	Selected
Select All     >       Filter: Measurement Name     X   Filter: Measurement Name	F1_A_Amps F1_A_MVar F1_A_MV F1_A_KV F1_A_KV F1_A_W_Temp F1_B_Amps F1_B_MVar F1_B_MV F1_B_KV F1_B_KV F1_B_W_Temp F1_C_Amps F1_C_MVar F1_C_KV F1_C_KV F1_C_W Temp	End of list
	Select All         >>           Filter:         Measurement Name         X	Filter: Measurement Name X

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

Cancel Next >



Available	Selected	
F1_A_Amps F1_A_MVar F1_A_MV F1_A_KV F1_A_KV F1_A_W_Temp F1_B_Amps F1_B_MVar F1_B_MV F1_B_KV F1_B_KV F1_C_Amps F1_C_MVar F1_C_MV F1_C_KV F1_C_W_Temp	000 F1_A_Amps 001 F1_A_MVar 002 F1_A_MV 003 F1_A_kV 004 F1_B_Amps 005 F1_B_MVar 006 F1_B_MV 007 FM_B_kV 008 F1_C_Amps 009 F1_C_MVar 010 F1_C_MV 011 F1_C_kV End of list	^ V
Select All         >>           Filter:         Measurement Name         X	Filter: Measurement Name	
Insert count o Reserved >>	Clear Page Clear All	

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

# Enter the number of reserve points you want

Insert 10 🔹 Reserved >>	Clear Page Clear All	

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

Next > Cancel

Cancel Next >



Available	Selected	
F1_A_Amps F1_A_MVar F1_A_MW F1_A_KV F1_A_KV F1_A_KV F1_B_Amps F1_B_Amps F1_B_MVar F1_B_KV F1_B_W_Temp F1_C_Amps F1_C_MVar F1_C_MV F1_C_W_Temp	006 F1_B_MW 007 F1_B_kV 008 F1_C_Amps 009 F1_C_MVar 010 F1_C_MW 011 F1_C_kV 012 Reserved 013 Reserved 014 Reserved 015 Reserved 016 Reserved 017 Reserved 018 Reserved 019 Reserved 019 Reserved 019 Reserved	1
Select All >>	Filter: Measurement Name X	

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

### DNP Type Analog Inputs ~

Available	Selected	1
F1_A_Amps + F1_A_MVar F1_A_MV F1_A_KV F1_A_KV F1_A_KV F1_B_Amps F1_B_MVar F1_B_MV F1_B_KV F1_B_KV F1_B_KV F1_B_KV F1_C_MW F1_C_MW F1_C_KV F1_C_W_Temp +	009 F1_C_MVar 010 F1_C_MW 011 F1_C_KV 012 Reserved 013 Reserved 013 Reserved 015 Reserved 016 Reserved 017 Reserved 018 Reserved 019 Reserved 020 F1_A_W_Temp 021 F1_B_W_Temp 022 F1_C_W_Temp End of fast	< >
Select All         >>           Filter:         Measurement Name         X	Filter: Measurement Name X	
Insert 7 Reserved >>	Clear Page Clear All	

Note: Settings are saved to IED upon clicking the "Apply" button on next page.

004         F1_B_Amps         Amps <sup>by</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_MW         MW         000           007         F1_B_KV         Divide by 1000         006           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         010           010         F1_C_KV         Divide by 1000         012           011         F1_C_KV         Divide by 1000         012           012         Reserved         013         Reserved           014         Reserved         015         Reserved           015         Reserved         Use         Use           016         Reserved         Use         Use	
004         F1_B_Amps         Amps <sup>145</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_MW         MW         007           007         F1_B_KV         Divide by 1000         008           009         F1_C_Amps         Amps         001           001         F1_C_MVar         Divide by 1000         010           010         F1_C_KV         Divide by 1000         012           011         F1_C_KV         Divide by 1000         012           012         Reserved         013         Reserved           014         Reserved         015         Reserved           015         Reserved         015         Reserved	
004         F1_B_Amps         Amps <sup>MS</sup> 005         F1_B_MVar         Divide by 1000         000           006         F1_B_MW         MW         000           007         F1_B_KV         Divide by 1000         000           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         010           010         F1_C_MV         MW         011           011         F1_C_KV         Divide by 1000         012           012         Reserved         013         Reserved           014         Reserved         014         Reserved           015         Reserved         014         Severved	
004         F1_B_Amps         Amps <sup>MS</sup> 005         F1_B_MVar         Divide by 1000         000           006         F1_B_MW         MW         000           007         F1_B_KV         Divide by 1000         000           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         010           010         F1_C_MV         MW         011           011         F1_C_KV         Divide by 1000         012           012         Reserved         013         Reserved           014         Reserved	
004         F1_B_Amps         Amps <sup>bg</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_KV         Divide by 1000         000           007         F1_B_KV         Divide by 1000         008           008         F1_C_Amps         Amps         009           009         F1_C_MVar         Divide by 1000         010           010         F1_C_MV         MW         011           011         F1_C_KV         Divide by 1000         012           012         Reserved         013         Reserved	
004         F1_B_Amps         Amps <sup>by</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_KV         Divide by 1000         000           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         010           010         F1_C_MV         MW         011           011         F1_C_KV         Divide by 1000         012           012         Reserved         Esserved         Esserved	
004         F1_B_Amps         Amps <sup>byc</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_MV         MW         007           007         F1_B_KV         Divide by 1000         008           008         F1_C_Amps         Amps         009           009         F1_C_MVar         Divide by 1000         010           010         F1_C_KV         MW         011	
004         F1_B_Amps         Amps <sup>byg</sup> 005         F1_B_MVar         Divide by 1000         000           006         F1_B_MV         MW         000           007         F1_B_KV         Divide by 1000         008           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         000           010         F1_C_MW         MW         000	
004         F1_B_Amps         Amps <sup>big</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_MV         MW         007           007         F1_B_KV         Divide by 1000         008           008         F1_C_Amps         Amps         000           009         F1_C_MVar         Divide by 1000         000	
004         F1_B_Amps         Amps <sup>big</sup> 005         F1_B_MVar         Divide by 1000         006         F1_B_MW         MW           007         F1_B_kV         Divide by 1000         000         006         F1_C Amps         Amps	
004         F1_B_Amps         Amps <sup>big</sup> 005         F1_B_MVar         Divide by 1000         006           006         F1_B_MW         MW         007           007         F1_B_KV         Divide by 1000	
004         F1_B_Amps         Amps <sup>MS</sup> 005         F1_B_MVar         Divide by 1000         006         F1 B MW         MW	
004 F1_B_Amps Amps <sup>PG</sup> 005 F1 B MVar Divide by 1000	
004 F1 B Amos Amos	
ooo TTTTTTT	
003 F1 A MV Divide by 1000 b	
000 F1_A_Amps Amps 000 000 000 000 000 000 000 000 000 0	
DNP Point Measurement Calc Type	

You can then move from the Analog points to Counters if you have any and add them in in the same way.

Cancel Next >

DNP Points List Configuration	
DNP Type Counters	
DNP Point Measurement	Calc Type
Edit Ligt	
Cancel Apply	

Available	Selected
F1_A_MVar F1_A_MW F1_A_KV F1_A_W_Temp F1_B_Amps F1_B_MVar F1_B_MW F1_B_KV F1_B_W_Temp F1_C_Amps F1_C_MVar F1_C_MV F1_C_KV F1_C_KV F1_C_W_Temp	End of list
Select All >> Filter: Measurement Name X	<

Cancel Next >

Available	Selected	
F1_A_MVar F1_A_MW F1_A_KV F1_A_W_Temp F1_B_Amps F1_B_MVar F1_B_MV F1_B_KV F1_B_KV F1_B_W_Temp F1_C_Amps F1_C_MVar F1_C_MV F1_C_KV F1_C_W_Temp Poll  v	OOD Poll End of list	
Select All >> Filter: Measurement Name X	<     Filter: Measurement Name X	
Insert 7 Reserved >>	Clear Page Clear All	

IP Type	
ounters	
DNP Point Measurement	Calc Type
000 Poll	32bit counter
dit List	

Select Next and you will see the measurements showing their respective calc types:

ARitropics			
<b>A</b> BIRIOLIICS			
Home Settings Status Contact			Show Bitronics meter settings printer friendly
Settings / Protocol			
Pending changes will not take effect until after IED is r	eset.	Reset	
DNP Points List Configuration			
DNP Type Analog Inputs			
DNP Measurement Ca	Іс Туре		
000         Amps - Ph A         No           001         MW - Total         Div	scaling ide by 1000		
002         Freq         Div           003         Vab         kVp	ide by 100 op		
004 Van kVp	n		
Edit List			
Cancel Apply			
Hit Apply and the custom points list	is saved:		
Edit List			
TUC u	pload success		
Please save pro	tocol page changes also	)	
Apply Next	>		

Hit Next> and then Apply Next go to the Custom Display Page. You will need to create the screens you want to display. Below is an example:

Home Settings Status Contact Settings / Custom Display Screens		Show Bitronics meter setting
Pending changes will not take effect until after IED is reset.	Reset	
Custom Display Screen Configuration		
Messurement Line 1. F1_A_Amps ~ Line 2. F1_B_Amps ~ Line 3. F1_C_Amps ~		
Label Special Characters Alphanumeric F. Ampel & † 1 k/M/G		
Connod Mouto		
Note: Settings are saved to IED upon clicking the "Apply" button on	nert nere	
	Little Fritzher	
	interi fraffici	
Copyright ID 2020 Binemics, Li	LC. A) rights reserved.	
Copyright @ 2020 Binemica, U	LC: Al optic reserved	
Grapyrique & 2020 Binemica, Li	LC All optim reserved.	
© Bitronics	LC Al optic manual	
Conyright & 2020 Brearies, La	LC. Al rights reserved.	
Compress & 2020 Browness La Bitronics Kome Settings Status Contact	LC. All rights reserved.	Show Biltronics meter settings
Copyright ID 2020 Effectives, La Bitronics kome Settings Status Contract attings / Curetom Display Screens	LC All optim reserved	Show Bitronics meter settings
Compress # 2020 Breenes, La Bitronics tome Settings Status Contact ettings / Custom Display Screens Pending changes will not take effect until after IED is reset.	Reset	Show Bitronics meter settings
Company to 2020 Birenics. La Company to 2020 Birenics. La Contact Settings Status Contact Settings / Custom Display Screens Pending changes will not take effect until after IED is resul. Custom Display Screen Configuration	I.C. Al rolm reserved	Show Bitronics meter settings
Comparent & 2020 Birecones, LA Comparent & 2020 Birecones, LA Contact Lettings / Curetorn Display Screens Pending changes will not take effect untill after IED is reset. Custom Display Screen Configuration Measurement Line 1. F1_A_MVar ~ Line 2. F1_B_MVar ~ Line 3. F1_C_MVar ~	Reset	Show Bitronics meter settings

ED is reset.	Reset	
Spocial Characters		
	Spocial Characters	special Characters

Note when you add the Poll (Counters) it takes up two lines and automatically reflects this in the Custom Display Screen Configuration:

out of the other	ings Status	Cont	act		Show Bitronics meter settings
ettings / Custo	m Display Screer	ns			
Pending chang	es will not take e	fiect until a	itter IED is reset.	Reset	
Line 1 Line 2	Measurement Poll Poll	×	- Muchinen		
Line 1 Line 2 Line 3	Measurement Poll NONE	× ×	Second Chargeton		

Iome Settings Sta Settings / Custom Display St Pending changes will not ta	atus Contact meens			Show Bitronics meter setting
Settings / Custom Display Si Pending changes will not ta	reens			
	ke effect until after IED is	resel.	Reset	
Custom Display So	reen Configuratio	0		
Lubel T M	saurement 1	Measurement 2	Measurement 3	Enabled
1 F1_Amps F1	_A_Amps	F1_B_Amps	F1_C_Amps	2
2 F1_MVar F1	_A_MVar	F1_B_MVar	F1_C_MVar	
3 F1_MW F1	_A_MW	F1_B_MW	F1_C_MW	
4 F1_KV F1	A kV	F1_B_kV	F1_C_kV	
5 F1 WTemp F1	A W Temp	F1 B W Temp	F1 C W Temp	
6 Poll     Pr	lk	Poll	NONE	2
A V				

Note: Measurements highlighted in yellow do not have state to populate them.

Apply

	olaldo obnider		L	Show Bitronics meter setting
<u>Settings</u> / Custom Disp	lay Screens			
Pending changes will r	not take effect until after IED is i	reset.	Reset	
Quatam Dianta	Coroon Configuration	0.0		
Custom Display	Screen Conligurati	011		
Label	Measurement 1	Measurement 2	Measurement 3	Enabled
1 AMPS	Amps - Ph A	NONE	NONE	$\checkmark$
$\bigcirc$ 2 TOT MW	MW - Total	NONE	NONE	$\checkmark$
○ 3 Hz	Freq	NONE	NONE	
• 4 kV AB	kVab	NONE	NONE	
0 5 KV A	kVan	NONE	NONE	$\checkmark$
Λ V				
	lata			
Edit Add Del	iele			

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You can add or edit as needed. Below is an example of clicking Measurement 4 and then Edit

Settings State	us Contact		Show Bitronics meter settir
Pending changes will not take	effect until after IED is reset.	Reset	
Measureme Line 1. KVab Line 2. NONE Line 3. NONE Label	Special Characters		
2017-1 01 01 01 01 01 01 01 01 01 01 01 01 01	AB Φ · ↑ ↓ k/M/G		

## Make sure to hit Apply to save your settings!

Note: Measurements highlighted in yellow do not have data to populate them.

Settings stored successfully!
Apply

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Next you need to go to the Enable Screen Page :

Home Settings Status Contact Settings / Screen Enable					Show Bitronics meter settings
Pending-changes will not take effect until after IED is reset. Reset					
isplay Screen Enable					
	Enabled	Home	Populated		
lusion Screen 1 [F1_Amps]	2	1	×		
Lustom Screen 2   F1_MVer ]		W.	V		
luntom Screen 3 [ Ft_MW ]			1		
usion Bereau 4 [#1_49]	2		4		
Luntom Screen 5 ( F1_WTemp )			1		
Latiom Screen 6 [ Poll ]	2		X		
Clear All Check Regulated Ch	ork All				

			Home Settings Status Contact					
Settings / Screen Enable								
er IED is reset.			Reset					
Enabled	Home Screen	Populated						
$\checkmark$	0	$\checkmark$						
$\checkmark$	$\odot$	$\checkmark$						
$\checkmark$	0	$\checkmark$						
$\checkmark$	0	$\checkmark$						
$\checkmark$	0	$\checkmark$						
t	ter IED is reset Enabled V V V V	ter IED is reset.	ter IED is reset.	Enabled     Home Screen     Populated       Image: Constraint of the sector of the se				

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You can choose what screen you want for the Home screen and decide if you want to display all or just some of the values you created.

Hit Apply and you will save your settings:

Screen settings saved!	
ОК	

Hit OK and then Reset to save all your changes. Done!

You can always check the status of the Device with a simple Green/Red display for Connection Status on the Status page:

Bitronics	
Home Settings Status Contact	Show Bitronics meter settings
Device Status	
Connection Status	
Health Status 0000 0000	

The remainder of the Settings pages are unaffected by checking the Show Bitronics meter settings (Identify, Load/Store Settings, Password Security, and Firmware Upload). Make sure to Reset if you have not already done so to save changes.

Now your display will be showing the screens you want:



Below is a link to the NovaTech Power Hour Webinar Recording for D650 Universal Display, Overview and Configuration:

https://power.novatechautomation.com/s/article/Power-Hour-2020-12-16



# **EC Declaration of Conformity**

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Manufacturer:	Bitronics LLC	Authorized	NovaTech Europe BVBA
	261 Brodhead Road	Representative	Kontichsesteenweg 71
	Bethlehem, PA 18017-8698	in the	2630 Aartselaar
	USA	European Union:	Belgium
	<b>T</b> +610.997.5100		T +32.3.458.0807
	F +610.997.5450		F +32.3.458.1817
	E bitronics@novatechweb.com		E info.europe@novatechweb.com

### hereby declare that the following product(s) :

Product type :	50 Series & 60 Series
Description :	Multifunction 3-Phase Scada Meters, Multifunction 3-Phase Scada Transducers, 3-Phase Scada Ammeters and Voltmeters, Detached Display
Models (50 Series):	M65xM3yzef, or M65xB3yzef, (where x=0,1,3) covering M650, M651, or M653, based on the following constructions:
	with Auxiliary voltage input monitoring (y = P, for models M3 only, but not B3), or without Auxiliary voltage input monitoring (y = U); including Measurement signal inputs for 3-Phase Voltages, and Current (CT) inputs rated for one of the following: Nominal input current of 1A ac or 5A ac (internal isolation for current input options, z = 1 or 5), or External Split Core CT rated 5A ac nominal (current input option z = C); including a 6-position option port selected as one of the following: without option port (e = 0), with serial port (e=1), with 4-20mA Analog Transducer Output port (e = 2), with 0-1mA Analog Transducer Output port (e = 3), including standard copper RJ45 Ethernet port (f = 0 with service port only, or f = 1 with port enabled for protocols), or an optional fiber Ethernet port (f = 2), <b>M350A3Uzef covering M350A3, based on the following constructions:</b> Ammeters with Measurement signal inputs for 3-Phase Current Transformer (CT) inputs rated nominal input current of 1A ac or 5 A ac (internal isolation for current input option port (e = 0), with serial port (e = 1), with 4-20mA Analog Transducer Output port (e = 2), with 0-1mA Analog Transducer Output port (e = 3); including standard copper RJ45 Ethernet port (f = 0), with serial port (e = 1), with 4-20mA Analog Transducer Output port (e = 2), with 0-1mA Analog Transducer Output port (e = 3); including standard copper RJ45 Ethernet port (f = 0) with service port only, or f = 1 with port enabled for protocols) or an optional fiber Ethernet port (f = 0).
	M350V3Uzef covering M350V3, based on the following constructions:
	Voltmeters with Measurement signal inputs for 3-Phase Voltage inputs ( $z = 0$ ); including a 6-position option port selected as one of the following: without option port ( $e = 0$ ), with serial port ( $e = 1$ ), with 4- 20mA Analog Transducer Output port ( $e = 2$ ), with 0-1mA Analog Transducer Output port ( $e = 3$ ); including standard copper R-45 Ethernet port ( $f = 0$ with service port only, or $f = 1$ with port enabled for protocols) or an optional fiber Ethernet port ( $f = 2$ ). <b>D650BXy0ef covering D650 based on the following construction:</b>
	Detached Display without Auxiliary voltage input monitoring (y = U) ; with serial port (e = 1); including standard copper RJ45 Ethernet port (f = 0 with service port only).

### Reference Number :

Date of issue :

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Models	M66xM3yzef, (where x=0,1,3) covering
(60 Series):	M660, M661, or M663, based on the following constructions:
IEC 61850 protocol	with Auxiliary voltage input monitoring ( $y = P$ ), or without Auxiliary voltage input monitoring ( $y = U$ ); including Measurement signal inputs for 3-Phase Voltages, and Current (CT) inputs rated for one of the following: Nominal input current of 1A ac or 5A ac (internal isolation for current input options, $z = 1$ or 5), or External Split Core CT rated 5A ac nominal (current input option $z = C$ ); including an Ethernet fiber option port selected as one of the following: without Ethernet fiber port ( $e = 0$ ) or with Ethernet fiber port ( $e=5$ ), including standard copper RJ45 Ethernet port ( $f = 1$ with port enabled for protocols).

#### Conform(s) with the protection requirements of the following directive(s) :

1. European Community Directive on EMC (EMCD) 2014/30/EU, superceding 2004/108/EC, and Directive 91/263/EC [TTE/SES].
Fulfilment of the essential requirements set out in Annex I has been demonstrated.
2. European Community Directive on Low Voltage (LVD) 2014/35/EU, superceding 2006/95/EC. Fulfilment of the safety
objectives referred to in Article 3 and set out in Annex I has been demonstrated.

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation: Directives 2004/108/EC & 2006/95/EC (until April 19th, 2016) and Directives 2014/30/EU &, 2014/35/EU (from April 20th, 2016).

The regulation ends for the following	u dina séiva (a) ura na daéa mina da ba ba ba sa bina bina b	1.
The requirements for the following	i airectiveist were deternined to be not abblicad	ie
	anoon of a nore actor more to be not approad	

Directive #	Subject of Directive	Reason Directiive is Not Applicable
2011/65/EU	Restriction of the Use of Certain Substances in electrical equipment (RoHS)	Not applicable - large scale fixed installation is exempt per Article 2, clause 4e (utility substation equipment which is designed in)
2012/19/EU	Waste Electrical and Electronic (WEEE)	Not applicable - large scale fixed installation is exempt per Article 2, clause 4c (utility substation equipment which is designed in)

Reference Number : Date of issue : DOC B005 5-December-2016 Issue : F

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The following route(s) were used to establish conformity :

1. 2014/30/EU: (EMCD) In accordance with Article 14, Annex II (internal production control) supported by a Technical File, superceding 2004/108/EC, in accordance with Article 7, Annex II.

Technical File No. :	TF B005
Date Issued or Revised :	5-Dec-2016 or later - New Legislative Framework & EMC Directive, (Original issue: 13-Jul-2012, Reissued: 28-Oct-2013, 21-Mar-2016)
Conformity Assessment Body : (C.A.B.)	Underwriters Laboratories, LLC, WiSE, Melville Division 1285 Walt Whitman Road, Melville, NY 11747-3081 USA
Compliance Certificate / Test Report:	1001403534, 11ME06423, MC16183, 50 Series, EMC Assessment; 10059253, M66x, EMC Assessment; D650 reliance on preceding reports is based on similar construction with a subset of inputs/parts removed.

2. 2014/35/EU: (LVD) Self Certification supported by a Technical File, in accordance with Article 12, Annex III (internal production control), superceding 2006/95/EC.

Technical File No. :	TF B005
Date Issued or Revised :	5-Dec-2016 or later - New Legislative Framework & LVD Directive, (Original issue: 13-Jul-2012, Reissued :28-Oct-2013 - transition to IEC 61010-1, Ed. 3, & 21-Mar-2016)
Conformity Assessment Body : (C.A.B.)	UL International (UK) Limited, Wonersh House, The Guildway, Old Portsmouth Road, Guilford, Surrey, GU3 1LR, United Kingdom
Compliance Certificate / Test Report: (Superceded)	CB Certificate No. DK-27045-UL issued by National Certification Body: UL (Demko), Borupvang 5A DK-2750 Ballerup, Denmark / CB Test Report E164178-A1-CB-1, 50 Series/60 Series, Product Safety Assessment
Conformity Assessment Body : (C.A.B.)	Underwriters Laboratories, LLC, Melville Division 1285 Walt Whitman Road, Melville, NY 11747-3081 USA
Compliance Certificate / Test Report:	CB Certificate No. US-22466-UL-A1 supercedes US-22466-UL & US-19849-UL issued by National Certification Body: UL (US), 333Pfingsten Rd., Northbrook, IL 60062, USA / CB Test Reports, E164178-A4-CB-1, including Amendment 1, Correction 2 & 1, supercedes E164178-A1-CB-2 & -1, 50 Series/60Series, Product Safety Assessments

Reference Number :

Date of issue :

DOC B005 5-December-2016 Issue : F

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IEC/EN 61010-1, Edition 3, 2010	Safety requiroments for electrical equipment for	
UL 61010-1, Edition 3, 2012/05/11	measurement, control, and laboratory use. Part 1: General requirements	
CAN/CSA No. 22.2, No. 61610-1-12, Ed. 3, 2012/05/01		
IEC/EN 61810-2-030, Edition 1, 2010	Safety requirements for electrical equipment for	
UL 61010-2-030, Edition 1, 2012/06/11	measurement, control and laboratory use. Part 2:030:	
CAN/CSA No. 22.2, No. 61010-2-630-12, Ed. 1, 2012/05/01	Particular requirements for testing and measuring circuits	
EN 61326-1: 2013	Electrical Equipment for measurement, control and iaboratory use – EMC requirements	
EN 51000-6-4: 2007 + A1: 2011	Electromagnetic compatibility Part 6-4: Generic emission standard – Industrial environment.	
EN 61600-5-2: 2005 + AC: 2005	Electromagnetic compatibility (EMC) Part 6-2. Generic standards - Immunity for Industrial environments.	
EN 55011: 2009 + A1: 2010,	Radiated Emissions Electric Field Strength,	
EN 55011: 2015, Group 1 Class A	AC Powerfine Conducted Emissions	
EN 55022: 2010 + AC: 2011,	Electromagnetic compatibility of multimedia	
EN 55032: 2012 + AC: 2013,	equipment - Emission Requirements	
EN 55032: 2015 + AC: 2016-07,		
Group 1 Class A (Conducted on Ethernet port)		
EN 61000-4-2: 2009	Electrostatic Discharge (ESD)	
EN 61090-4-3: 2006 + A1: 2008 + A2: 2010	Immunity to Radiated Electromagnetic Energy	
Class III	(Radio Frequency)	
EN 61000-4-4: 2012,	Electrical Fast Transient / Burst Immunity	
Severity Level 4 (AC Power)		
EN 61000-4-5: 2014,	Surge Immunity	
nstallation Class 3		
IN 51000-4-5: 2014,	Immunity to Conducted Disturbances Induced by	
evel 3	Radio Frequency Fields	
N 61009-4-8: 2010	Immunity to Power Frequency Magnetic Fields	
N 61000-4-11: 2004	AC Supply Voltage Dips and Short Interruptions	
ANS! ( ICEE 037 00 4. 2002	Course Million and Course Mills 20 and A Barrier	

Signed for and on behalf Alan Staatz, Vice President, Engineering of the Company :

CC Marking Year 2012, 2013, 2016

issue: F

Reference Number : Date of issue : DOC 8005 5-December-2016

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Revision	Date	Changes	Ву
А	1/29/2016	Draft - Original Issue	R.Fisher
		Figure 2 shows prior board with plugs and	
		Figure 3 dimensional drawing shows CTs but	
		not part of D650. DOC for 50 Series needs	
		to be updated to include D650.	
A	2/12/2016	Final draft with corrections/updates	E. DeMicco,
		throughout – still need some updated figures	P. Dunmire
		to complete.	
A	5/17/16	Final version with new Figure 2	E. DeMicco
В	11/17/16	Added PPX II to D650 RS485 Information	E. DeMicco
		section 3.4.6, added new DOC	
С	5/22/17	Updated standards references in section 1.4	E. DeMicco
			R. Fisher
D	8/17/17	Updated information on inarp on page 23	E. DeMicco
E	6/22/18	Added information for D650MX Universal	E. DeMicco
		Display	
F	9/5/19	Added information for flex scaling in D650	E. DeMicco
		Universal Display	
G	2/22/21	Changed reference to 'Client' and 'Universal'	E. DeMicco
		Display; added new Appendix A5 for	
		configuration of Universal Display	



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