USER MANUAL

User's Manual Pub. 0300287-05 Rev. A

# PowerFlex®
# 8-Channel Universal Analog Input Module

Catalog Number: 20-750sc-8U

SPECTRUM CONTROLS

## Important Notes

1. Please read all the information in this owner's guide before installing the product.
2. The information in this owner's guide applies to hardware Series A and firmware version 1.1 or later.
3. This guide assumes that the reader has a full working knowledge of the relevant processor.

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# Table of Contents

## Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- Who should use this manual
- How to use this manual
- Related documentation
- Technical support
- Conventions used in this manual

## Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use the PowerFlex® 8 Channel Universal Analog Input Module.

## How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate and troubleshoot a control system using the 20-750sc-8U Plug-In Module.

## Related Documentation

The table below provides a listing of publications that contain important information about Allen-Bradley AC drive systems.

| ***For*** | ***Refer to this Document*** | ***Allen-Bradley Pub. No.*** |
|---|---|---|
| A description and overview of the PowerFlex 750-Series AC Drives and Installation. | PowerFlex 750-Series AC Drives Installation Instructions | 750-IN0010-EN-P, 20F, 20G, 21G |
| Detailed information on I/O, control, and feedback options, parameters and programming, faults, alarms, and troubleshooting. | PowerFlex 750-Series AC Drives Programming Manual | 750-PM001 |
| Detailed information on drive specifications, option specifications, fuse and circuit breaker ratings. | PowerFlex 750-Series AC Drives Technical Data publication. | 750-TD001 |
| Detailed information on HIM components, operation, features. | PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual. | 20HIM-UM001 |
| Detailed information on preventative maintenance, component testing, and hardware replacement features. | PowerFlex 750-Series AC Drives Hardware Service Manual - Frame 8 and Larger. | 750TG001 |

| ***For*** | ***Refer to this Document*** | ***Allen-Bradley Pub. No.*** |
|---|---|---|
| Detailed information on how to configure, use, and troubleshoot PowerFlex 750-series communication option modules and adapters. | PowerFlex 755 Drive Embedded EtherNet/IP Adapter User Manual.<br>PowerFlex 750-Series Drive DeviceNet Option Module User Manual.<br>PowerFlex 7-Class Network Communication Adapter User Manual. | 750COM-UM001<br>750COM-UM002<br>750COM-UM*xxx* |
| Detailed information on how to install, configure, and operate the 750-series safety option modules. | PowerFlex 750-Series Safe Torque Off User Manual<br>Safe Speed Monitor Option Module for PowerFlex 750-Series AC Drives Safety Reference Manual. | 750-UM002<br>750-RM001 |
| Basic information to properly wire and ground PWM AC drives. | Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives. | DRIVES-IN001 |
| Basic information to properly wire and ground PWM AC drives with a common bus. | PowerFlex AC Drives in Common Bus Configurations | DRIVES-AT002 |
| General guidelines for the application, installation, and maintenance of solid-state control. | Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control. | SGI-1.1 |
| Practices for guarding against Electrostatic damage. | Guarding Against Electrostatic Damage. | 8000-4.5.2 |
| Declarations of conformity, certificates, and other certification details. | Product Certification website: http://ab.com | |

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- USA 440-646-6900
- United Kingdom 01908 635230
- Australia 1800-809-929
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## Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- **Bold** type identifies headings and sub-headings:

| | |
|---|---|
| **WARNING** | Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. These messages help you to identify a hazard, avoid a hazard, and recognize the consequences. |
| **ATTENTION** | Actions ou situations risquant d'entraîner des blessures pouvant être mortelles, des dégâts matériels ou des pertes financières. Les messages « Attention » vous aident à identifier un danger, à éviter ce danger et en discerner les conséquences. |
| **NOTE** | Identifies information that is critical for successful application and understanding of the product. |

# Chapter 1
# Module Overview

The PowerFlex® 8 Channel Universal Analog Input Module (20-750sc-8U) is an 8-point universal analog option card designed for use in PowerFlex 753/755 systems. The option card supports up to 8 concurrent channels of current, voltage, and resistance measurements, and/or up to 4 channels of 3- and 4-wire resistance temperature detector (RTD) measurements. (3- and 4-wire RTD measurements use adjacent channel pairs, which reduces the number of available channels.) All inputs have fault tolerance and ESD protection to avoid damage to the circuitry on the board. The option card is designed to plug into an available option slot (4, 5, or 6) within a PowerFlex 753/755 series drive. This chapter includes information about:

- General Description
- Input Specifications
- Hardware Features
- System overview and option card operation

## Section 1.1 General Description


The 20-750sc-8U option card plugs into I/O module openings 4, 5, or 6, in the Control Pod of the PowerFlex 750 family of AC drives. The option card uses a 64-pin edge connector to provide the connection to the AC drive. The option card has pre-defined locations to hold configuration, status, and channel values that are accessible to the AC drive through the backplane Drive Peripheral Interface (DPI). Each input channel can be defined as voltage, current, resistance, or RTD. You connect the analog input signals to the option card using a 24-pin spring-cage, removable terminal block on the option card.

You use Rockwell-supplied CCW software, version 10.0 or later, to configure the option card upon installation, and to communicate with the option card via the AC drive and the backplane. You may also program the option card with the HIM interface that plugs into the front of the AC drive. Data exchanged between the option card and the AC drive communicates option card configuration, status, and digitized samples from the 8 analog inputs. Types of communication include reset commands from the AC drive to the option card, interrupts from the option card to the AC drive, option card status queries from the AC drive, and configuration changes.

Power is provided to the option card across the backplane. The option card provides power to run the attached resistances or RTDs.

| | |
|---|---|
| **WARNING** | **Hazard of injury to personnel or damage to equipment.**<br>**Do NOT hot-swap a 20-750sc-8U option card. This will damage the option card, and/or cause injury to the personnel.**<br>The unit is not designed to be hot swapped. The option card must be plugged into the drive before power is turned on to the drive.<br>When removing the option card, power must be turned off to the drive before attempting to remove the option card. |

## Section 1.2 Input Specifications

The 20-750sc-8U option card has the following input specifications:

**Table 1-1 Input/Performance/Environmental Requirements**

| Input Description | Value |
|---|---|
| Operating Temperature | -5 ºC to 65 ºC (23 ºF to 149 ºF) (unless otherwise noted) |
| Storage/Non-Operating Temperature | -40 ºC to + 85 ºC (-40 ºF to + 185 ºF) |
| Operating Humidity | 5% to 85%, non-condensing |
| Storage/Non-Operating Humidity | 5% to 95%, non-condensing |
| Vibration/Operating | 2 Hz to 13.2 Hz, 0.040 in. max. displacement<br>13.2 Hz, 0.7 g, max to 55 Hz, per curve<br>55 Hz to 512 Hz, 2 g, max |
| Storage//Non-Operational Vibration | 2 Hz to 2 kHz, 5 g max |
| Operating Shock | 15 g, peak acceleration, 11±1 ms pulse. |
| Storage/Non-Operating Shock | 50 g peak acceleration, 11±1 ms pulse. |
| Pollution Level | Meets Pollution Degree 2 requirements. |
| ESD | Meets CE requirements for operating ESD category B at 4 kV. On ADC corruption detection, last valid value may be reported for up to 3 consecutive samples. Contact discharges are tested to up to 6 kV; air discharges are tested up to 8 kV. |

| Input Description | Value |
|---|---|
| ESD/Non-operating/Not installed | Option card is open on all sides when not installed. ESD standard is only applicable to points that are accessible when option card is installed in an AC drive. |
| RoHS | Meets European and Chinese RoHS component standards (January 2011 and earlier). |
| REACH | Meets European REACH requirements, (March 2011 and earlier). |
| Inputs per option card | 8 channels of voltage/current/resistance<br>6 channels of voltage/current/resistance + 1 channel of 4 (3) wire RTD inputs<br>4 channels of voltage/current/resistance + 2 channels of 4 (3) wire RTD inputs<br>2 channels of voltage/current/resistance + 3 channels of 4 (3) wire RTD inputs<br>4 channels of 4 (3) wire RTD inputs<br>(Analog Multiplexed into one ADC) |
| Input ranges | Current: 0-20 mA, 4-20 mA,<br>Voltage: 0-5 V, 0-10 V, ±10 V,<br>Resistance: 0-150 Ω, 0-500 Ω, 0-1000 Ω, 0-3000 Ω<br>A 0-20 Ohm range is available to even channels.<br>Platinum:<br>100 PT 385<br>100 PT 3916<br>200 PT 385<br>200 PT 3916<br>500 PT 385<br>500 PT 3916<br>1000 PT 385 and 3916<br>Nickel:<br>100 NI 618<br>120 NI 672<br>Nickel-Iron:<br>604 NI-FE 518<br>Copper:<br>10 CU 427<br>For input type versus temperature range support, see Table 1-2. |
| Voltage accuracy<br>(4 and 17 Hz filters) | ± 12 mV maximum for 0-5 V inputs<br>± 40 mV maximum for 0-10 V inputs<br>± 40 mV maximum for ± 10 V inputs<br><br>System accuracy at 25 ºC<br>± 6 mV maximum for 0-5 V inputs<br>± 20 mV maximum for 0-10 V inputs<br>± 20 mV maximum for ±10 V inputs |

| Input Description | Value |
|---|---|
| Current accuracy<br>(4 and 17 Hz filters) | ± 120 uA maximum for 0-20 mA inputs<br>± 120 uA maximum for 4-20 mA inputs<br><br>System accuracy at 25 ºC<br>± 50 uA maximum for 0-20 mA inputs<br>± 50 uA maximum for 4-20 mA inputs |
| RTD accuracy<br>(4 and 17 Hz filters) | ± 5.1 ºC for 100 Ω Platinum 385<br>± 4.7 ºC for 100 Ω Platinum 3916<br>± 3.9 ºC for 200 Ω Platinum 385<br>± 3.6 ºC for 200 Ω Platinum 3916<br>± 2.4 ºC for 500 Ω Platinum 385<br>± 2.3 ºC for 500 Ω Platinum 3916<br>± 1.2 ºC for 1000 Ω Platinum 385 and 3916<br>± 5.1 °C for Nickel<br>± 1.0 °C for Nickel-Iron<br>± 3.6 °C for Copper<br><br>System accuracy at 25 ºC<br>± 3.4 ºC for 100 Ω Platinum 385<br>± 3.1 ºC for 100 Ω Platinum 3916<br>± 2.6 ºC for 200 Ω Platinum 385<br>± 2.4 ºC for 200 Ω Platinum 3916<br>± 1.5 ºC for 500 Ω Platinum 385<br>± 1.4 ºC for 500 Ω Platinum 3916<br>± 0.7 ºC for 1000 Ω Platinum 385 and 3916<br>± 1.0 °C for Nickel<br>± 0.5 °C for Nickel-Iron<br>± 1.1 °C for Copper |
| Resistance accuracy<br>(4 and 17 Hz filters) | ± 0.5 Ω for 150 Ω range<br>± 0.5 Ω for 500 Ω range<br>± 2.5 Ω for 1000 Ω range<br>± 2.5 Ω for 3000 Ω range<br><br>System accuracy at 25 ºC<br>± 0.3 Ω for 150 Ω range<br>± 0.3 Ω for 500 Ω range<br>± 1.5 Ω for 1000 Ω range<br>± 1.5 Ω for 3000 Ω range<br><br>0-20 Ohms for even channels |

| Input Description | Value | | |
|---|---|---|---|
| Repeatability (at 25 ºC) | 4 Hz filter | 17 Hz filter | 60, 240, and 470 Hz filters[1] |
| 0-5 V, 0-10 V, ±10 V | ± 1.5 mV | ± 1.8 mV | ± 6 mV |
| 0-20 mA, 4-20 mA | ± 1 mA | ± 4 mA | ± 15 mA |
| RTD, Platinum 385, 3916 | ± 0.3 ºC | ± 0.4 ºC | ± 2 ºC |
| Resistance | ± 0.2 Ω | ± 0.3 Ω | ± 2 Ω |
| CMRR | 84 dB minimum at 50 and 60 Hz for 4 Hz and 17 Hz filters | | |
| NMRR | 4 Hz filter | 72 dB minimum at 50 and 60 Hz | |
| | 17 Hz filter | 62 dB minimum at 50 and 60 Hz | |
| Crosstalk | -70 dB maximum | | |
| Cable resistance (applies only to 3- and 4-wire RTD & resistance measurements) | 25 Ω maximum except 5 Ω max for 10 Ω Cu RTD | | |
| Input bias current (Voltage ranges only) | Less than ± 2.5 µA steady state for ±10 V inputs. Less than 1.75 mA for all other voltage inputs. Less than ±40 mA peak for all voltage input configurations. | | |
| Current input impedance | 249 Ω ± 0.1%, 10 PPM/°C | | |
| Voltage input impedance | 10 MΩ, typical | | |
| Input protection | Voltage Mode ± 30 VDC continuous.<br>Current Mode 28 mA continuous. | | |
| Current source | 210 mA ± 5% @ 25 °C, ± 8% from -5 °C to 65 °C<br>1 mA ± 5% @ 25 °C, ± 8% from -5 °C to 65 °C for 10 Ω Cu RTD | | |
| Power source | 12 VDC from backplane | | |
| Input to backplane isolation | 4.2 kVDC for 1 minute; 250 VAC continuous | | |
| Channel-to-channel isolation | None | | |
| Power consumption | <3.0 W | | |
| Inrush current | <500 mA at 12 V, for < 1 Sec. | | |
| Fusing | 0.47 Ω 1/10 W resistor on 12 VDC input | | |
| Fault detection | Over/under range for all types, open circuit in voltage, RTD, resistance ranges shown as over-range | | |
| Input sampling rates | 4 Hz, 17 Hz, 60 Hz, 470 Hz, 240 Hz | | |
| Wire size:<br>#16 to #24 AWG | Connection data | Conductor Cross Section | |
| | Solid min | 0.2 $mm^2$ | |
| | Solid max | 1.5 $mm^2$ | |
| | Stranded min | 0.2 $mm^2$ | |
| | Stranded max | 1.5 $mm^2$ | |

[1] These filters do not reject 50/60 Hz. Repeatability for these filters is strongly dependent on how much 50/60Hz noise is in the system.

| Input Description | Value | |
|---|---|---|
| | Stranded, with ferrule without plastic sleeve min | 0.25 mm² |
| | Stranded, with ferrule without plastic sleeve max | 1.5 mm² |
| | Stranded, with ferrule with plastic sleeve min | 0.25 mm² |
| | Stranded, with ferrule with plastic sleeve max | 0.75 mm² |
| Agency approvals / evaluations | CE and UL/cUL 508C | |
| Manufacturing | RoHS & REACH compliant | |
| Dimensions | 130 mm × 83.1 mm × 25 mm | |

**Table 1-2 Input Type versus Temperature Range Support**

| Sensor Type | Low Temperature Limit | High Temperature Limit |
|---|---|---|
| Platinum 385 | -200 ºC | 850 ºC |
| Platinum 3916 | -200 ºC | 630 ºC |
| Copper 427 | -100 ºC | 260 ºC |
| Nickel 618 | -100 ºC | 260 ºC |
| Nickel 672 | -80 ºC | 260 ºC |
| Nickel-Iron 518 | -100 ºC | 200 ºC |

**Table 1-3 Environmental Specification Table**

| Environmental Tests | Industry Standards |
|---|---|
| Temperature (Operating)<br>(Performance Criteria A) | IEC60068-2-1: (Test Ad, Operating Cold),<br>IEC60068-2-2: (Test Bd, Operating Dry Heat),<br>IEC60068-2-14: (Test Nb, Operating Thermal Shock) |
| Temperature<br>(Non-operating)<br>(Performance Criteria B) | IEC60068-2-1:<br>(Test Ab, Unpackaged Non-operating Cold),<br>IEC60068-2-2:<br>(Test Bb, Unpackaged Non-operating Dry Heat),<br>IEC60068-2-14:<br>(Test Na, Unpackaged Non-operating Thermal Shock) |
| Operating Altitude | 2000 meters (6561 feet) |
| Humidity (Operating)<br>(Performance Criteria A) | IEC60068-2-30:<br>(Test Db, Unpackaged Damp Heat): |
| Vibration (Operating)<br>(Performance Criteria A) | IEC60068-2-6: (Test Fc, Operating) |
| Shock (Operating)<br>(Performance Criteria A) | IEC60068-2-27: (Test Ea, Unpackaged Shock) |

| Environmental Tests | Industry Standards |
|---|---|
| Shock (Non-operating) (Performance Criteria B) | IEC60068-2-27: (Test Ea, Unpackaged Shock) |
| Radiated Emissions | CISPR 11; Group 1, Class A |
| Conducted Emissions | IEC 61000-6-4:2011 |
| ESD immunity (Performance Criteria B) | IEC 61000-4-2 |
| Radiated RF immunity (Performance Criteria A) | IEC 61000-4-3: Level 3 |
| EFT/B immunity (Performance Criteria B) | IEC 61000-4-4* |
| Surge transient immunity (Performance Criteria B) | IEC 61000-4-5 |
| Conducted RF immunity (Performance Criteria A) | IEC 61000-4-6 |
| AC Mains Voltage Dips, Interruptions and Variations | IEC 61000-4-11 |

**Table 1-3 Safety Test Specification Table**

| Safety Tests | Industry Standards |
|---|---|
| UL Safety | UL 508C, Power Conversion Equipment and UL 61800-5-1 Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy<br><br>Canadian National Standard C22.2 No. 274-13 ADJUSTABLE SPEED DRIVES |
| CE Low Voltage Directive | EN 61800-5-1:2007 Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy |

## Section 1.3 Hardware Features

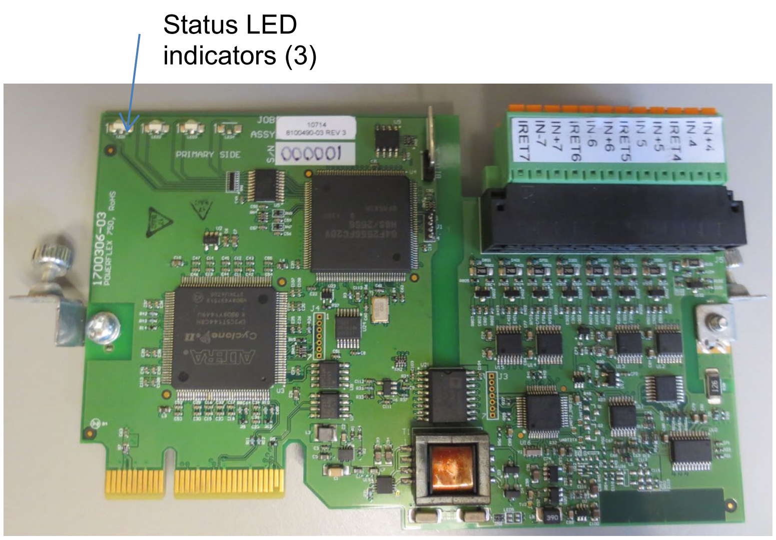
Channels are wired as differential inputs. Open-circuit detection is available in the form of open circuit inputs going over-range for the voltage, resistance, and RTD ranges. Inputs are protected from electrostatic discharge up to 4 kV, fault-protected up to 30 V for voltage inputs, and 28 mA for current inputs. The 20-750sc-8U option card samples input channels one-by-one and provides readings to the rest of the system via Data Links (DLs).

Option card configuration is done via Rockwell-supplied CCW software, version 10.0 or later. The following languages are supported:

- English
- French
- Spanish
- Italian
- German
- Portuguese
- Dutch
- Chinese (Simplified)
- Japanese

The option card Device parameters are stored on the card. Host Parameters are stored in the memory of the AC drive. Refer to your drive's user manual for more information. The illustration below shows the option card's hardware features.

**Figure 1 20-750sc-8U Module**




### 1.3.1 LED Indicators

The 20-750sc-8U option card uses three LEDs to show operational status (Rockwell standard function). These LEDs are not visible after the option card is installed and the drive cover is closed. The status LEDs are defined below (as documented in RA Publication 750COM-UM005-EN-P).

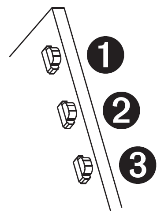
|  | LED | Name | Description |
|---|---|---|---|
| | ❶ | Port Status | Option card port status |
| | ❷ | Mod Status | Option card status |
| | ❸ | Channel Status | Option card channel status |

**Table 1-4 LED Status Indicators**

| **Indicator** | **State** | **Description** |
|---|---|---|
| **Option Card Port Status** | Off | No power applied to device or not properly connected to the drive.<br>To correct: Securely connect and ground the option card to the drive by fully inserting it into the drive port and tightening its captive screws to the recommended torque. Torque both screws to 0.45 to 0.67 Nm (4.0 to 6.0 lb-in). Apply power to the drive. |
| | Solid Green | Option card is properly connected and communicating with the drive. No action is required. |
| | Flashing Green | The option card is establishing communication with the drive. No action is required. |
| | Flashing Red | The option card is not receiving any communication from the drive.<br>To correct: Cycle power to the drive after securely connecting and grounding the option module to the drive by fully inserting it into the drive port and tightening its two captive screws to the recommended torque. |
| | Solid Red | The option card detected a duplicate or invalid drive port ID. Cycle power to the drive after securely connecting and grounding the option card to the drive by fully inserting it into the drive port and tightening its two captive screws to the recommended torque. Option card can only be installed in slots 4, 5, and 6. |
| | Flashing Red/Green | Device is in self-test mode.<br>This is only used during factory test and power-up. |
| | Steady Orange | The option card and drive brands do not match. Connect the option card to a compatible product of the same brand (an Allen-Bradley PowerFlex 750-series drive). |
| **Channel Status** | Off | The option card is not powered on.<br>To correct: Securely connect and ground the option card to the drive by fully inserting it into the drive port and tightening its captive screws to the recommended torque. Torque both screws to 0.45 to 0.67 Nm (4.0 to 6.0 lb-in). |
| | Solid Green | All channels operating normally. No action required. |
| | Flashing alternating Red/Green | Calibration mode. This condition only exists during the manufacturing process. It is not enabled in the field. |

| Indicator | State | Description |
|---|---|---|
| | Solid Red | Double-check configuration parameters.<br>Check Input Status bits to determine which channel(s) has the invalid setting. |
| | Flashing Red | One or more channels is open circuit. Check connections to terminal block (spring-loaded). Disable unused/unconnected channels. |
| **Mod Status** | Off | The option card is not powered on.<br>To correct: Securely connect and ground the option card to the drive by fully inserting it into the drive port and tightening its captive screws to the recommended torque. Torque both screws to 0.45 to 0.67 Nm (4.0 to 6.0 lb-in). Apply power to the drive. |
| | Solid Green | The option module is properly connected and communicating with the drive. No action required. |
| | Solid Red | A critical hardware error occurred.<br>To correct, cycle power to the drive, or replace the option card. |
| | Flashing Red | The option card has failed the firmware test.<br>To correct: Cycle power to the drive. Parameter settings may have changed. Clear faults in the option card. If cycling power does not correct the problem, the option card parameter settings may have been corrupted. Reset defaults and reconfigure the option card. The factory calibration data may be corrupted. Replace the module. |

## Section 1.4 System Overview

The PowerFlex 750 series AC drives use a spring-loaded, edge card connector to interface to the 20-750sc-8U option card. The option card receives 12 VDC power through the bus interface. The option card is expected to operate indefinitely. It does not require periodic maintenance or calibration.

### 1.4.1 Option Card Power-up

At power-up, the option card performs a check of its internal circuits, memory, and basic functions. If no faults are found during power-up diagnostics, the option card status LED is turned on.

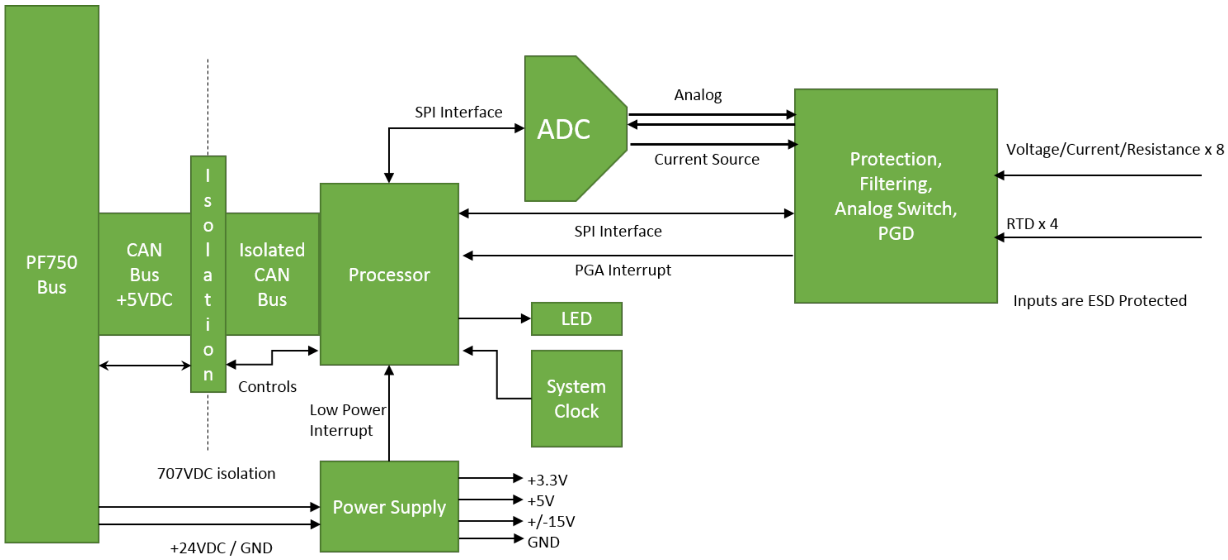
After power-up checks are complete, the option card loads its stored configuration parameters. When new, the option card begins operation in a default usable condition. The default configuration is all channels enabled in the 4-20 mA range.

### 1.4.2 Option Card Operation

The 750sc-8U option card provides eight independent analog input channels. Each channel includes four selectable filter settings and can be configured for voltage, thermocouple, current, resistance or RTD input types.

The 750sc-8U option card uses an Analog to Digital Converter (ADC) to achieve 20-bit resolution. Inputs to the ADC are first multiplexed through analog switches then buffered by a precision, low offset and drift, programmable gain amplifier. The ADC also provides the programmable current source used in resistive measurements.

The 750sc-8U plug-in option card communicates over the backplane Drive Peripheral Interface (DPI) to the PLC AC drive. See the block diagram below:



# Chapter 2
# Installation and Wiring

This chapter will cover:

- Compliance to European union directives
- Power requirements
- General considerations
- Mounting
- Field wiring connections

## Section 2.1 Compliance to European Union Directives

This product is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

### 2.1.1 EMC Directive

The 750sc-8U option card is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- IEC 61000-6-4 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- IEC 61000-6-2 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments

This product is intended for use in an industrial environment.

### 2.1.2 Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests. For specific information required by EN61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- *Industrial Automation, Wiring and Grounding Guidelines for Noise Immunity*, publication 1770-4.1
- *Automation Systems Catalog*, publication B113

## Section 2.2 Power Requirements

The option card receives power through the bus interface from the AC drive +12 VDC power supply only. The supply is 12 VDC (9 VDC minimum, 15 VDC maximum). Current rating is 250 mA maximum. Power rating is 3 Watts maximum.

## Section 2.3 General Considerations

20-750sc-8U option card is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments Pollution degree 2[2].

### 2.3.1 Hazardous Location Considerations

This equipment is not suitable for hazardous locations.

### 2.3.2 Prevent Electrostatic Discharge

**WARNING**

Electrostatic discharge can damage integrated circuits or semiconductors if you touch analog I/O option card bus connector pins or the terminal block on the input option card. Follow these guidelines when you handle the option card:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the option card.
- If available, use a static-safe work station.
- When it is not in use, keep the option card in its static-shield bag.

### 2.3.3 Remove Power

**WARNING**

Remove power before removing or inserting this option card. When you remove or insert an option card with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

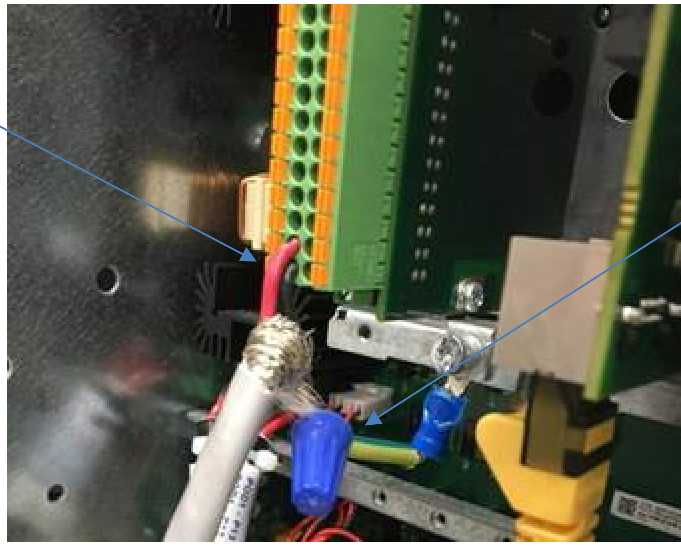
- Sending an erroneous signal to your system's field devices, causing unintended machine motion.
- Causing an explosion in a hazardous environment.
- Electrical arcing causes excessive wear to contacts on both the option card and its mating connector and may lead to premature failure.

### 2.3.4 Reducing Noise

Route shielded, twisted-pair analog wiring away from any high voltage I/O wiring, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives. The inputs must be wired using twisted shielded pairs, with the shield terminated at the PowerFlex POD with a very short wire (the shorter the better) and any exposed wire being kept to less than 2 inches (the shorter the better). Good high frequency termination would be a 360 degree termination. If only a small portion of the cable shielding is being terminated, it can appear as a high impedance to high frequency. Low

[2] Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.

noise methods of wiring require a low impedance path to ground for the shielding.




## Section 2.4 Mounting

### 2.4.1 Before You Begin

Note that product can be used with the following:

- Rockwell Automation 750 series drives ONLY, using CCW software, version 10 or later.

### 2.4.2 Install the I/O Option Card

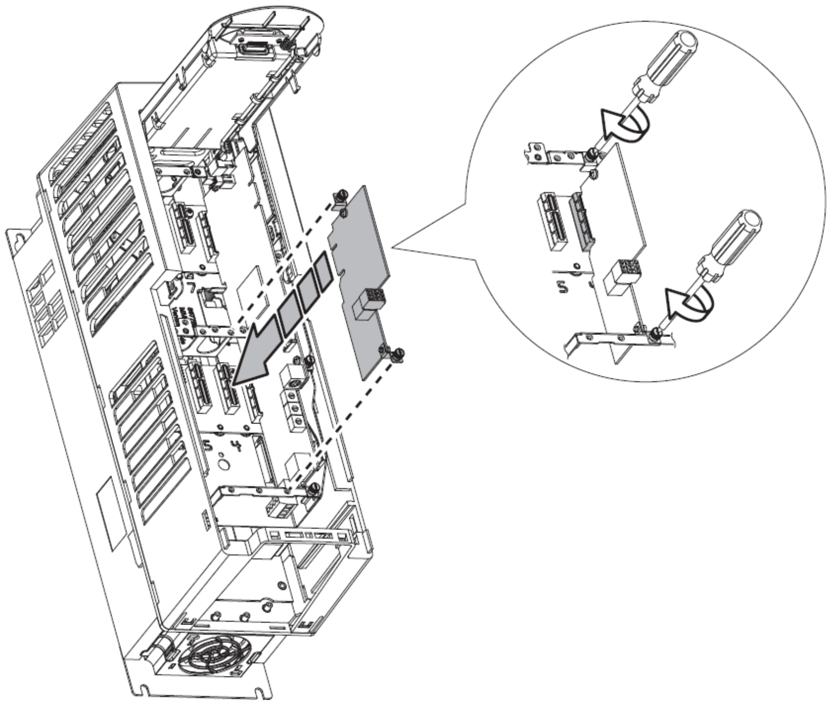
The option card uses a 64-pin connector for the drive backplane library. The 750sc-8U option card is restricted to ports 4, 5, and 6 in the drive.

| | |
|---|---|
| **WARNING** | **EQUIPMENT DAMAGE HAZARD**<br>If an option card is installed or removed while the drive is powered, you can damage the option card or the drive. To avoid damaging the drive, verify that the voltage on the bus capacitors on the drive has discharged completely, and all control power is removed before performing any work on the drive.<br>For complete information about installing I/O option cards in 750 Series drives, refer to Rockwell Automation Publication 750-IN001-EN-P – October 2014. |

| | |
|---|---|
| **NOTE** | Avoid over-tightening retaining screws. |

To install an option card:

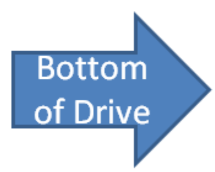
1. Firmly press the option card edge connector into the desired port.
2. Tighten the top and bottom retaining screws.
    - Recommended torque is 0.45 N.m (4.0 lb.in)
    - Recommended screwdriver is T15 Hexalobular.

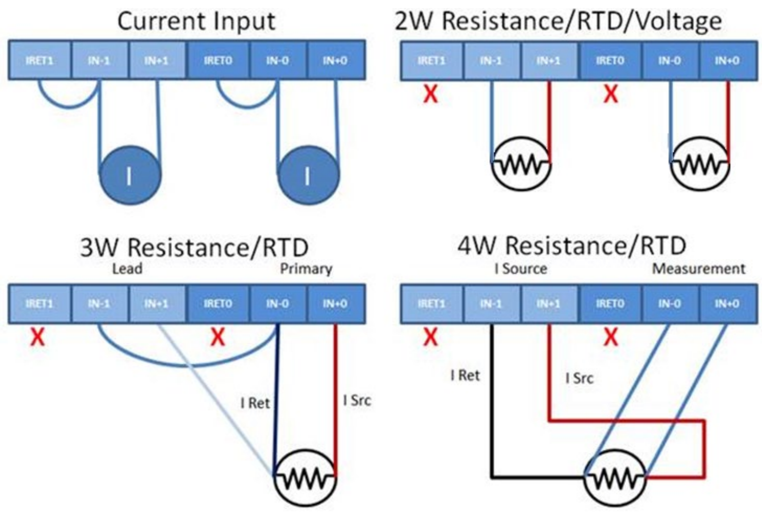


### 2.4.3 Wiring Diagram

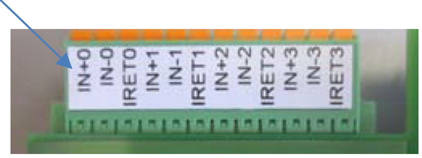
The following images explain the general layout of the option card terminal block and the associated wiring diagrams for the various input types:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IRET3 | IN-3 | IN+3 | IRET2 | IN-2 | IN+2 | IRET1 | IN-1 | IN+1 | IRET0 | IN-0 | IN+0 |
| IRET7 | IN-7 | IN+7 | IRET6 | IN-6 | IN+6 | IRET5 | IN-5 | IN+5 | IRET4 | IN-4 | IN+4 |

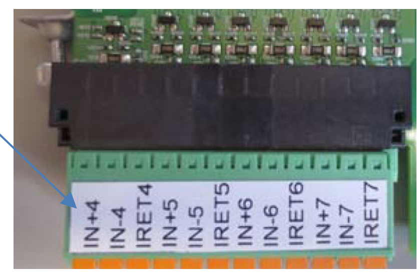



Current Input
IRET1 IN-1 IN+1 IRET0 IN-0 IN+0
I
I
2W Resistance/RTD/Voltage
IRET1 IN-1 IN+1 IRET0 IN-0 IN+0
X
X
3W Resistance/RTD
Lead
Primary
IRET1 IN-1 IN+1 IRET0 IN-0 IN+0
X
X
I Ret
I Src
4W Resistance/RTD
I Source
Measurement
IRET1 IN-1 IN+1 IRET0 IN-0 IN+0
X
X
I Ret
I Src

Pin 1


IN+0 IN-0 IRET0 IN+1 IN-1 IRET1 IN+2 IN-2 IRET2 IN+3 IN-3 IRET3

Pin 2


IN+4 IN-4 IRET4 IN+5 IN-5 IRET5 IN+6 IN-6 IRET6 IN+7 IN-7 IRET7

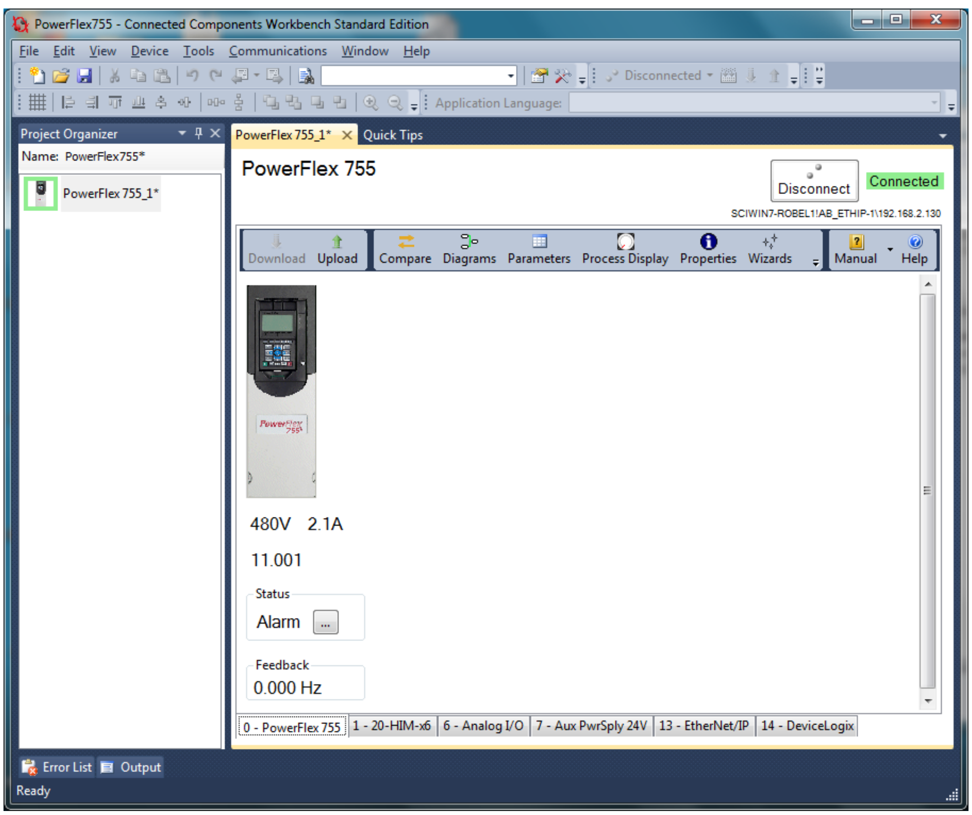
# Chapter 3
# Configuring the 20-750sc-8U Using CCW

This chapter covers the following subjects:

- Using Connected Components Workbench (CCW) software to configure the option card.
- Analog Data and Status settings.
- Data Links settings.
- Setting configuration parameters and associated values.
- Using CopyCat to download individual parameters or parameter sets for the host drive or any of its connected peripherals into a Human Machine Interface (HIM).

## Section 3.1 Introduction

You use CCW programming software to configure the 20-750sc-8U:



## Section 3.2
## Analog Data and Status

The analog data and status information are written to the first ten Data Links From Net. Data Links 01 to 08 represent the eight input channels in order (0 to 7). The last two Data Links (09 and 10) represent status.

### 3.2.1 Data Links

The following table lists Data Link from Net data channels and data types:

**Table 3-1 Data Link Representations from Net**

| Data Link from Net: | Name: | Type: |
|---|---|---|
| 01 | Chan 0 Data | REAL |
| 02 | Chan 1 Data | REAL |
| 03 | Chan 2 Data | REAL |
| 04 | Chan 3 Data | REAL |
| 05 | Chan 4 Data | REAL |
| 06 | Chan 5 Data | REAL |
| 07 | Chan 6 Data | REAL |
| 08 | Chan 7 Data | REAL |
| 09 | Input Status | UDINT |
| 10 | Module Status | UDINT |

You configure the drive and option card Data Links to be used. Data written to each Channel *n* Data is a REAL data type. Both Status Data Links are of UDINT or DWORD type so that individual bits are readable.

After each channel completes an acquisition, the values are updated. The Data Links are transmitted continuously over the backplane at 2-millisecond intervals. Actual acquisition rate is determined by the filter settings.

The following table maps channel names to all other ports in the system, including Data Link commands, and shows data flow between the ports from left to right:

| ODK Card in Port 6 | Port 6<br>Host Parameters | Port 0<br>Drive Parameters | Port 4<br>(COMM) Parameters |
|---|---|---|---|
| Chan 0 Data | DL From Net 01 | UserData Real 00 (1800) | DL To Net 01 |
| Chan 1 Data | DL From Net 02 | UserData Real 01 (1801) | DL To Net 02 |
| Chan 2 Data | DL From Net 03 | UserData Real 02 (1802) | DL To Net 03 |
| Chan 3 Data | DL From Net 04 | UserData Real 03 (1803) | DL To Net 04 |
| Chan 4 Data | DL From Net 05 | UserData Real 04 (1804) | DL To Net 05 |
| Chan 5 Data | DL From Net 06 | UserData Real 05 (1805) | DL To Net 06 |
| Chan 6 Data | DL From Net 07 | UserData Real 06 (1806) | DL To Net 07 |
| Chan 7 Data | DL From Net 08 | UserData Real 07 (1807) | DL To Net 08 |
| Input Status | DL From Net 09 | UserData Int 00 (1700) | DL To Net 09 |
| Module Status | DL From Net 10 | UserData Int 01 (1701) | DL To Net 10 |

### Table 3-2 Analog Input Status

Each channel is allocated 4 bits for status. See below for details.

| **Values** | CH7 BC | Ch7 UR | Ch7 OR | Ch7 OC | Ch6 BC | Ch6 UR | Ch6 OR | Ch6 OC | Ch5 BC | Ch5 UR | Ch5 OR | Ch5 OC | Ch4 BC | Ch4 UR | Ch4 OR | Ch4 OC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bit[31:16]** | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |

| **Values** | Ch3 BC | Ch3 UR | Ch3 OR | Ch3 OC | Ch2 BC | Ch2 UR | Ch2 OR | Ch2 OC | Ch1 BC | Ch1 UR | Ch1 OR | Ch1 OC | Ch0 BC | Ch0 UR | Ch0 OR | Ch0 OC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bit[15:00]** | 1<br>5 | 1<br>4 | 1<br>3 | 1<br>2 | 1<br>1 | 1<br>0 | 0<br>9 | 0<br>8 | 0<br>7 | 0<br>6 | 0<br>5 | 0<br>4 | 0<br>3 | 0<br>2 | 0<br>1 | 0<br>0 |

**OC (Open Circuit)**. Wire disconnected. Bit is not set for 0-20 mA range. For the 4-20 mA range, an input less than 2 mA will be considered Open Circuit. This bit is cleared when the condition no longer exists.

| NOTE | When the input is greater than 3 mA, the open circuit bit is cleared for the 4-20 mA range, to prevent toggling of the status. |
|---|---|

**OR (Over Range)**. Value is greater than or equal to High Range value (see Range Value Table). This bit is cleared when the condition no longer exists.

**UR (Under Range)**. Value is less than or equal to Low Range value (see Range Value Table). This bit is cleared when the condition no longer exists.

**BC (Bad Configuration)**. The configuration data for the channel is invalid. If an invalid configuration is set for a channel it will be considered disabled (analog value set to 0.0) until a valid setting is passed. When an even numbered channel is configured for 3 or 4-wire resistive measurements, the adjacent odd channel configuration will be ignored.

**Table 3-3 Option Card Status**

| **Values** | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bit[31:16]** | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |

| **Values** | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Unused | Firmware | Cal Fault | Watchdog | Comms Fault | ADC Fault |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Default** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Bit[15:00]** | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |

**Bit-0:** ADC Fault. Bit set when an error is detected by the analog processor while communicating with the ADC.

**Bit-1:** Comms Fault. Bit set when communications to the analog processor is disrupted.

**Bit-2:** Watchdog TO. Watchdog timer has timed out. A critical software error has taken place.

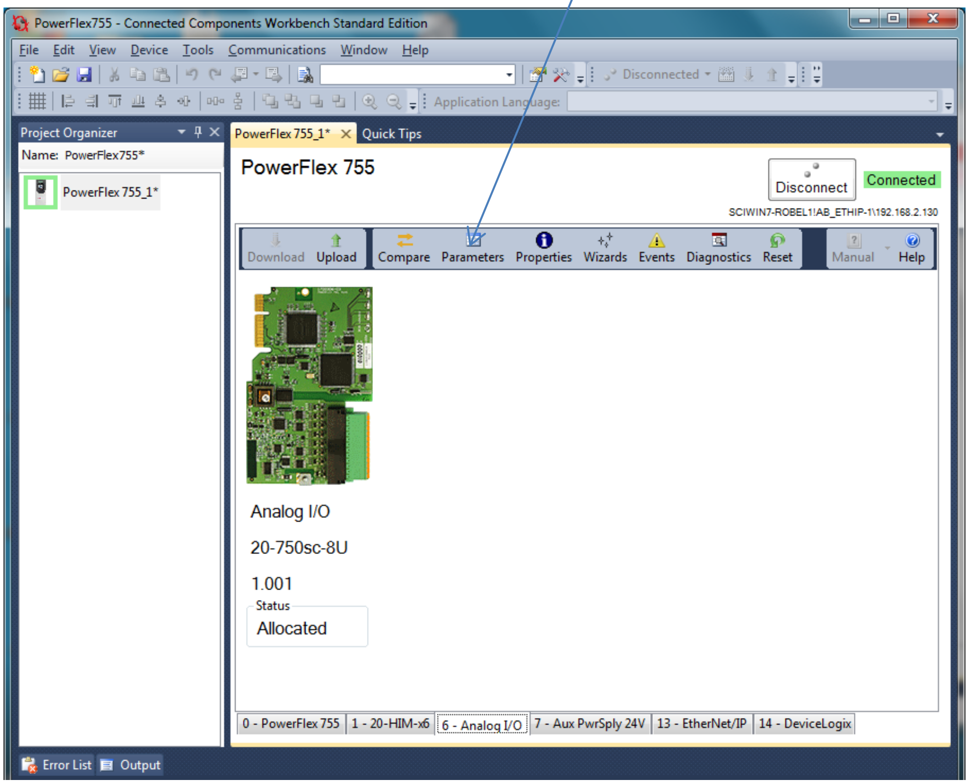
**Bit-3:** Cal Fault. Calibration data is invalid, and the option card is running with uncalibrated measurements. Calibration must be performed at the factory.

**Bit-4:** Firmware Fault. Firmware mismatch between main CPU and Analog CPU.

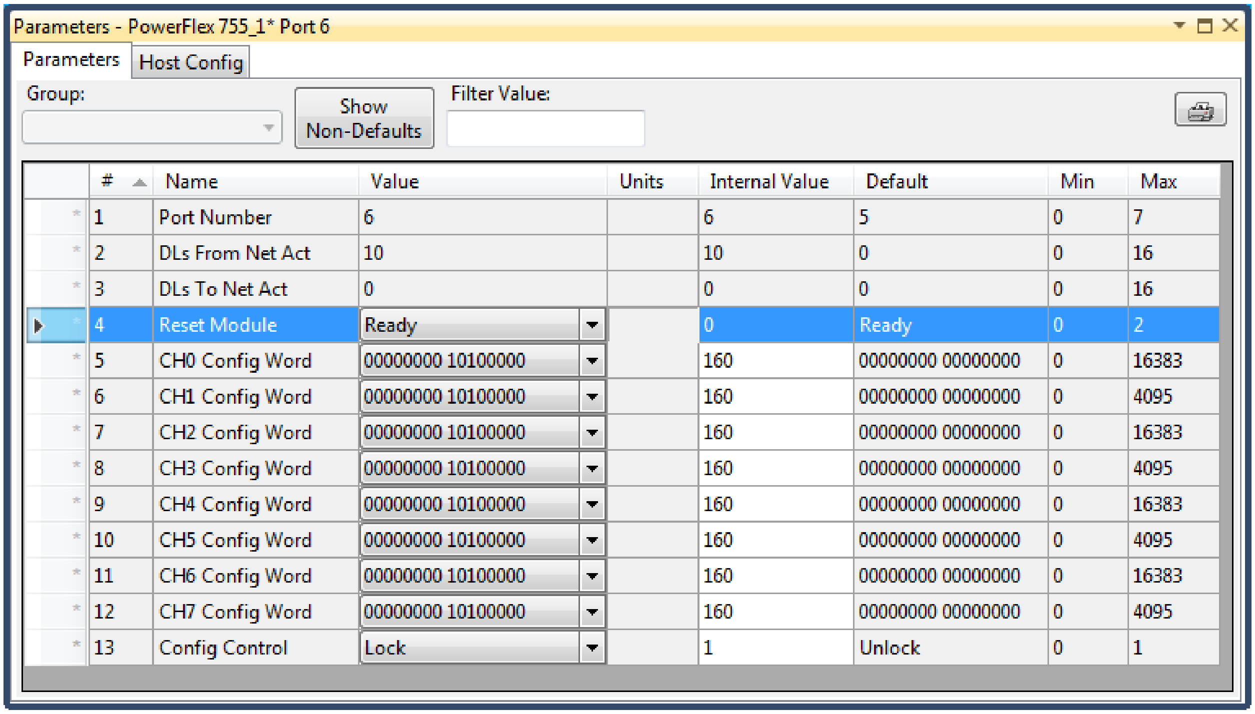
## Section 3.3
## Setting Configuration Parameters

You set configuration parameters using the CCW Parameters option table. You may set the parameters directly in the table or double-clicking a parameter in the list to access the Parameter Properties dialog. You can also change the configuration for each channel through the LCD display on the drive:

Click on
Parameters option



The Parameter List Window displays with the following column headers and pull-down menu options access:

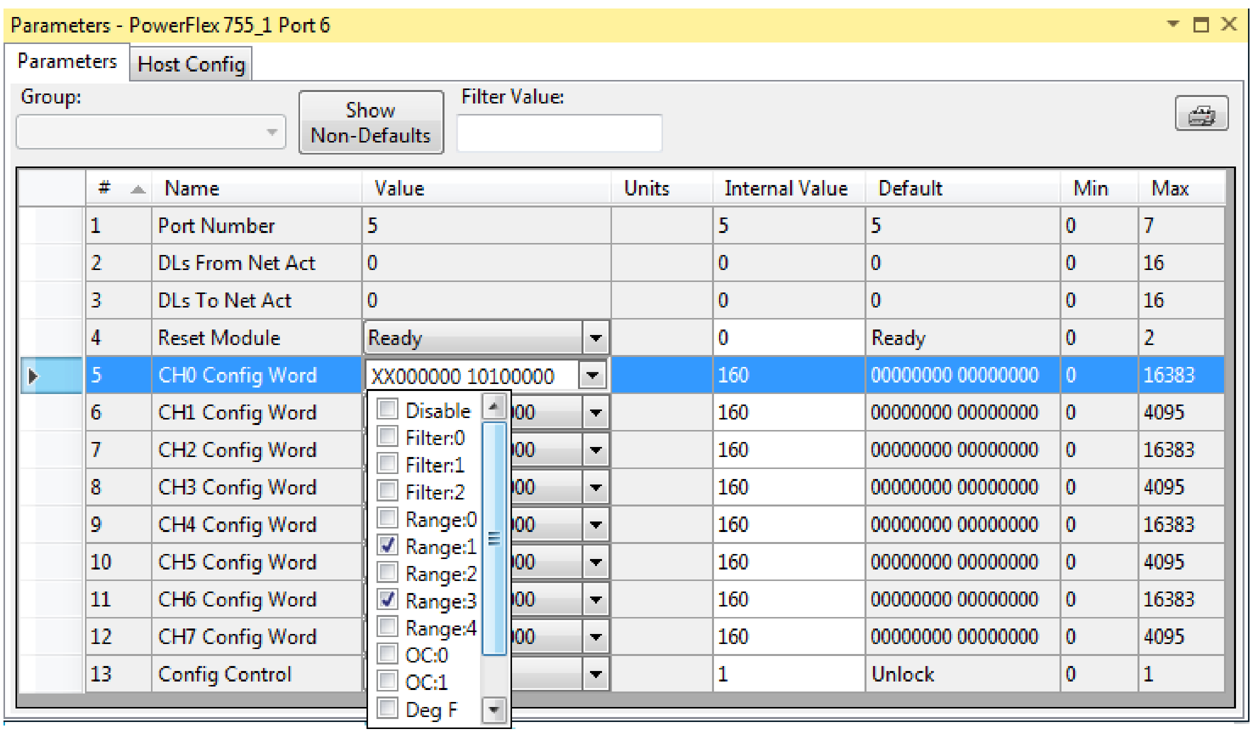


Parameters - PowerFlex 755_1* Port 6

Parameters | Host Config

Group: | Show Non-Defaults | Filter Value:

| # | Name | Value | Units | Internal Value | Default | Min | Max |
|---|---|---|---|---|---|---|---|
| 1 | Port Number | 6 | | 6 | 5 | 0 | 7 |
| 2 | DLs From Net Act | 10 | | 10 | 0 | 0 | 16 |
| 3 | DLs To Net Act | 0 | | 0 | 0 | 0 | 16 |
| 4 | Reset Module | Ready | | 0 | Ready | 0 | 2 |
| 5 | CH0 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 16383 |
| 6 | CH1 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 4095 |
| 7 | CH2 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 16383 |
| 8 | CH3 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 4095 |
| 9 | CH4 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 16383 |
| 10 | CH5 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 4095 |
| 11 | CH6 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 16383 |
| 12 | CH7 Config Word | 00000000 10100000 | | 160 | 00000000 00000000 | 0 | 4095 |
| 13 | Config Control | Lock | | 1 | Unlock | 0 | 1 |



Parameters - PowerFlex 755_1 Port 6

Parameters | Host Config

Group: | Show Non-Defaults | Filter Value:

| # | Name | Value | Units | Internal Value | Default | Min | Max |
|---|---|---|---|---|---|---|---|
| 1 | Port Number | 5 | | 5 | 5 | 0 | 7 |
| 2 | DLs From Net Act | 0 | | 0 | 0 | 0 | 16 |
| 3 | DLs To Net Act | 0 | | 0 | 0 | 0 | 16 |
| 4 | Reset Module | Ready | | 0 | Ready | 0 | 2 |
| 5 | CH0 Config Word | XX000000 10100000 | | 160 | 00000000 00000000 | 0 | 16383 |
| 6 | CH1 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 4095 |
| 7 | CH2 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 16383 |
| 8 | CH3 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 4095 |
| 9 | CH4 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 16383 |
| 10 | CH5 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 4095 |
| 11 | CH6 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 16383 |
| 12 | CH7 Config Word | 00 | | 160 | 00000000 00000000 | 0 | 4095 |
| 13 | Config Control | | | 1 | Unlock | 0 | 1 |

The following description of columns is copied from CCW Help.

| Column | Description |
|---|---|
|  | Currently selected parameter. As a device is monitored and updated, an asterisk (*) appears in this column. |
| # | Parameter number. Click the column header to list the data in the column in ascending (default) or descending order. |
| Name | Short name of the parameter. Click the column header to list the data in the column in ascending (default) or descending order. |
| Value | The current value of the parameter. Writable parameter values are shown with a white background and can be changed directly in this field. |
| Units | The measurement units used for this parameter (examples: Volts and Amps). |
| Internal Value | The unscaled value used internally in the device and by AC drives that communicate with the device. The information in this field provides the scaling information to calculate Internal Value from a scaled value. |
| Default | The initial value of a parameter as defined at the factory. |
| Min | The minimum value is the lowest possible value for this parameter. |
| Max | The maximum value is the highest possible value for this parameter. |

Naming conventions similar to the existing analog option card are used.

### 3.3.1 Parameter List

| Param# | Display Name<br>Full Name<br>Description | Values | | Read/Write | Data Type |
|---|---|---|---|---|---|
| **1** | **Port Number**<br>*Port Number*<br>Current port number of option card.<br>This is a read-only parameter that indicates the slot where the option card is installed. | Default:<br><br>Options: | 4 or 5 or 6<br><br>Read-only parameter. | R | 8-bit INT |
| **2** | **DLs From Net Act**<br>*Data Links from Net Active*<br>Indicates the number of DLs from Net that are active | Default:<br><br>Options: | 10<br><br>Read-only parameter<br><br>Set to 0 when Config Control set to Unlock. | R | 8-bit INT |
| **3** | **DLs To Net Act**<br>*Data Links to Net Active*<br>Indicates the number of DLs to Net that are active. | Default:<br><br>Options: | 0<br><br>This will be set to 4 when BITE jumper is installed.<br><br>Set to 0 when Config Control set to Unlock. | R | 8-bit INT |
| **4** | **Reset Module**<br>*Reset Module*<br>This parameter allows the user to remotely reset the module or set factory defaults.<br><br>0 – This is for display only and does not perform an action.<br>1 = Soft reset of module. Forces a reboot.<br>2 = Reset all parameters to factory defaults. | Default:<br><br>Options: | 0 – "Ready"<br><br>0 – "Ready"<br>1 – "Reset Module"<br>2 – "Set Defaults" | RW | 8-bit INT |
| **5** | **CH0 Config Word**<br>*Channel 0 Configuration Word*<br>Used to configure Channel 0 | Default:<br><br>Options: | 0<br><br>(see EVEN Channel Configuration Table) | RW | 16-bit INT |
| **6** | **CH1 Config Word**<br>*Channel1 Configuration Word*<br>Used to configure Channel 1 | Default:<br><br>Options: | 0<br><br>(see ODD Channel Configuration Table) | RW | 16-bit INT |
| **7** | **CH2 Config Word**<br>*Channel 2 Configuration Word*<br>Used to configure Channel 2 | Default:<br><br>Options: | 0<br><br>(see EVEN Channel Configuration Table) | RW | 16-bit INT |
| **8** | **CH3 Config Word**<br>*Channel 3 Configuration Word*<br>Used to configure Channel 3 | Default:<br><br>Options: | 0<br><br>(see ODD Channel Configuration Table) | RW | 16-bit INT |

| Param# | **Display Name**<br>**Full Name**<br>**Description** | **Values** | | **Read/Write** | **Data Type** |
|---|---|---|---|---|---|
| **9** | **CH4 Config Word**<br>*Channel 4 Configuration Word*<br>Used to configure Channel 4 | Default:<br><br>Options: | 0<br><br>(see EVEN Channel Configuration Table) | RW | 16-bit INT |
| **10** | **CH5 Config Word**<br>*Channel 5 Configuration Word*<br>Used to configure Channel 5 | Default:<br><br>Options: | 0<br><br>(see ODD Channel Configuration Table) | RW | 16-bit INT |
| **11** | **CH6 Config Word**<br>*Channel 6 Configuration Word*<br>Used to configure Channel 6 | Default:<br><br>Options: | 0<br><br>(see EVEN Channel Configuration Table) | RW | 16-bit INT |
| **12** | **CH7 Config Word**<br>*Channel 7 Configuration Word*<br>Used to configure Channel 7 | Default:<br><br>Options: | 0<br><br>(see ODD Channel Configuration Table) | RW | 16-bit INT |
| **13** | **Config Control**<br>*Data Link Configuration Control*<br>Used to to allow configuration of Data Links. | Default:<br><br>Options: | 0 (Unlocked)<br><br>0 = Unlock<br>1 = Lock<br><br>**Unlock** allows configuration of the Data Links.<br>**Lock** allows data to flow through the Data Links. | RW | 8-bit BYTE |

## 3.3.2 EVEN Channel Configuration Table

| | **Bit Names:** | **Ignored** | **Ignored** | **Wire 1** | **Wire 0** | **Tmp Units** | **OC 1** | **OC 0** | **Range 4** | **Range 3** | **Range 2** | **Range 1** | **Range 0** | **Filter 2** | **Filter 1** | **Filter 0** | **Disable** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | **Setting** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| Disable | Enable (Default) | | | | | | | | | | | | | | | | 0 |
| | Disabled | | | | | | | | | | | | | | | | 1 |
| Filter | 17 Hz (Default) | | | | | | | | | | | | | 0 | 0 | 0 | |
| | 4 Hz | | | | | | | | | | | | | 0 | 0 | 1 | |
| | 60 Hz | | | | | | | | | | | | | 0 | 1 | 0 | |
| | 240 Hz | | | | | | | | | | | | | 0 | 1 | 1 | |
| | 470 Hz | | | | | | | | | | | | | 1 | 0 | 0 | |
| Range | 4-20 mA (Default) | | | | | | | | 0 | 0 | 0 | 0 | 0 | | | | |
| | 0-20 mA | | | | | | | | 0 | 0 | 0 | 0 | 1 | | | | |
| | 0-5 V | | | | | | | | 0 | 0 | 0 | 1 | 0 | | | | |
| | 0-10 V | | | | | | | | 0 | 0 | 0 | 1 | 1 | | | | |
| | 0 to 20 ohm | | | | | | | | 0 | 0 | 1 | 0 | 0 | | | | |
| | 0 to 150 ohm | | | | | | | | 0 | 0 | 1 | 0 | 1 | | | | |
| | 0 to 500 ohm | | | | | | | | 0 | 0 | 1 | 1 | 0 | | | | |
| | 0 to 1000 ohm | | | | | | | | 0 | 0 | 1 | 1 | 1 | | | | |
| | 0 to 3000 ohm | | | | | | | | 0 | 1 | 0 | 0 | 0 | | | | |
| | 10 ohm Copper 426 | | | | | | | | 0 | 1 | 0 | 0 | 1 | | | | |
| | 100 ohm Platinum 385 | | | | | | | | 0 | 1 | 0 | 1 | 0 | | | | |
| | 200 ohm Platinum 385 | | | | | | | | 0 | 1 | 0 | 1 | 1 | | | | |
| | 500 ohm Platinum 385 | | | | | | | | 0 | 1 | 1 | 0 | 0 | | | | |
| | 1000 ohm Platinum 385 | | | | | | | | 0 | 1 | 1 | 0 | 1 | | | | |
| | 100 ohm Platinum 3916 | | | | | | | | 0 | 1 | 1 | 1 | 0 | | | | |
| | 200 ohm Platinum 3916 | | | | | | | | 0 | 1 | 1 | 1 | 1 | | | | |
| | 500 ohm Platinum 3916 | | | | | | | | 1 | 0 | 0 | 0 | 0 | | | | |
| | 1000 ohm Platinum 3916 | | | | | | | | 1 | 0 | 0 | 0 | 1 | | | | |
| | 120 ohm Nickel 672 | | | | | | | | 1 | 0 | 0 | 1 | 0 | | | | |
| | 100 ohm Nickel 618 | | | | | | | | 1 | 0 | 0 | 1 | 1 | | | | |
| | 604 ohm Nickel-Iron 518 | | | | | | | | 1 | 0 | 1 | 0 | 0 | | | | |
| OC Action | Full Scale (Default) | | | | | | 0 | 0 | | | | | | | | | |
| | Minimum Scale | | | | | | 0 | 1 | | | | | | | | | |
| | Zero | | | | | | 1 | 0 | | | | | | | | | |
| Temp. Units | Deg C (Default) | | | | | 0 | | | | | | | | | | | |
| | Deg F | | | | | 1 | | | | | | | | | | | |
| Wire Mode | 3-Wire (Default) | | | 0 | 0 | | | | | | | | | | | | |
| | 4-Wire | | | 0 | 1 | | | | | | | | | | | | |
| | 2-Wire | | | 1 | 0 | | | | | | | | | | | | |
| Ignored | N/A | X | X | | | | | | | | | | | | | | |

### 3.3.3 ODD Channel Configuration Table

| | **Bit Names:** | **Ignored** | **Ignored** | **Ignored** | **Ignored** | **Temp Units** | **OC 1** | **OC 0** | **Range 4** | **Range 3** | **Range 2** | **Range 1** | **Range 0** | **Filter 2** | **Filter 1** | **Filter 0** | **Disable** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | **Setting** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| Disable | Enable (Default) | | | | | | | | | | | | | | | | 0 |
| | Disabled | | | | | | | | | | | | | | | | 1 |
| Filter | 17 Hz (Default) | | | | | | | | | | | | | 0 | 0 | 0 | |
| | 4 Hz | | | | | | | | | | | | | 0 | 0 | 1 | |
| | 60 Hz | | | | | | | | | | | | | 0 | 1 | 0 | |
| | 240 Hz | | | | | | | | | | | | | 0 | 1 | 1 | |
| | 470 Hz | | | | | | | | | | | | | 1 | 0 | 0 | |
| Range | 4-20 mA (Default) | | | | | | | | 0 | 0 | 0 | 0 | 0 | | | | |
| | 0-20 mA | | | | | | | | 0 | 0 | 0 | 0 | 1 | | | | |
| | 0-5 V | | | | | | | | 0 | 0 | 0 | 1 | 0 | | | | |
| | 0-10 V | | | | | | | | 0 | 0 | 0 | 1 | 1 | | | | |
| | Invalid | | | | | | | | 0 | 0 | 1 | 0 | 0 | | | | |
| | 0 to 150 ohm | | | | | | | | 0 | 0 | 1 | 0 | 1 | | | | |
| | 0 to 500 ohm | | | | | | | | 0 | 0 | 1 | 1 | 0 | | | | |
| | 0 to 1000 ohm | | | | | | | | 0 | 0 | 1 | 1 | 1 | | | | |
| | 0 to 3000 ohm | | | | | | | | 0 | 1 | 0 | 0 | 0 | | | | |
| | Invalid | | | | | | | | 0 | 1 | 0 | 0 | 1 | | | | |
| | 100W Platinum 385 | | | | | | | | 0 | 1 | 0 | 1 | 0 | | | | |
| | 200W Platinum 385 | | | | | | | | 0 | 1 | 0 | 1 | 1 | | | | |
| | 500W Platinum 385 | | | | | | | | 0 | 1 | 1 | 0 | 0 | | | | |
| | 1000W Platinum 385 | | | | | | | | 0 | 1 | 1 | 0 | 1 | | | | |
| | 100W Platinum 3916 | | | | | | | | 0 | 1 | 1 | 1 | 0 | | | | |
| | 200W Platinum 3916 | | | | | | | | 0 | 1 | 1 | 1 | 1 | | | | |
| | 500W Platinum 3916 | | | | | | | | 1 | 0 | 0 | 0 | 0 | | | | |
| | 1000W Platinum 3916 | | | | | | | | 1 | 0 | 0 | 0 | 1 | | | | |
| | 120W Nickel 672 | | | | | | | | 1 | 0 | 0 | 1 | 0 | | | | |
| | 100W Nickel 618 | | | | | | | | 1 | 0 | 0 | 1 | 1 | | | | |
| | 604W Nickel-Iron 518 | | | | | | | | 1 | 0 | 1 | 0 | 0 | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| OC Action | Full Scale (Default) | | | | | | 0 | 0 | | | | | | | | | |
| | Minimum Scale | | | | | | 0 | 1 | | | | | | | | | |
| | Zero | | | | | | 1 | 0 | | | | | | | | | |
| Temp. Units | Deg C (Default) | | | | | 0 | | | | | | | | | | | |
| | Deg F | | | | | 1 | | | | | | | | | | | |
| Ignored | N/A | X | X | X | X | | | | | | | | | | | | |

### 3.3.4 Diagnostics

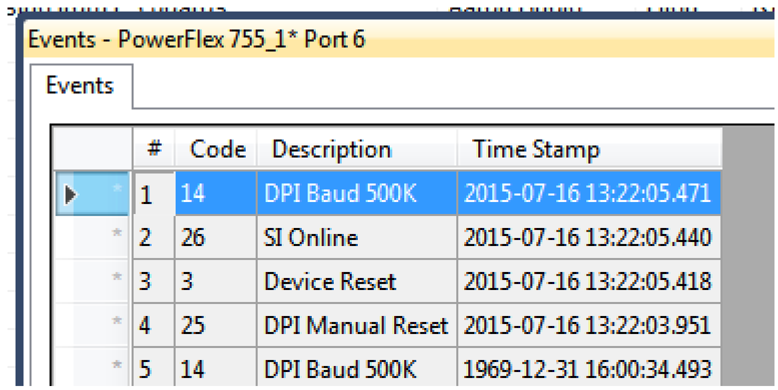
The 20-750sc-8U is capable of displaying diagnostic data to the end-user via CCW. This information is for troubleshooting purposes and cannot be used programmatically. All of the diagnostic data is read-only and cannot be user-modified:

| Instance | Name |
|---|---|
| 1 | Common Logic Cmd |
| 2 | Prod Logic Cmd |
| 3 | Reference |
| 4 | Common Logic Sts |
| 5 | Prod Logic Sts |
| 6 | Feedback |
| 7 | Chan 0 Analog |
| 8 | Chan 1 Analog |
| 9 | Chan 2 Analog |
| 10 | Chan 3 Analog |
| 11 | Chan 4 Analog |
| 12 | Chan 5 Analog |
| 13 | Chan 6 Analog |
| 14 | Chan 7 Analog |
| 15 | Chan Status |
| 16 | Module Status |
| 17 | DL To Net 01 Val |
| 18 | DL To Net 02 Val |
| 19 | DL To Net 03 Val |
| 20 | DL To Net 04 Val |
| 21 | DPI Rx Errs |
| 22 | DPI Rx Errs Max |
| 23 | DPI Tx Errs |
| 24 | DPI Tx Errs Max |

### 3.3.5 Event Log

The 20-750sc-8U is capable of logging event information related to certain operations. The log holds a maximum of 32 events. After the log has reached 32 events, the oldest event is removed from the list. This information is stored across power-cycles.

The following example show how the Event Log is displayed in CCW:




| # | Code | Description | Time Stamp |
|---|---|---|---|
| 1 | 14 | DPI Baud 500K | 2015-07-16 13:22:05.471 |
| 2 | 26 | SI Online | 2015-07-16 13:22:05.440 |
| 3 | 3 | Device Reset | 2015-07-16 13:22:05.418 |
| 4 | 25 | DPI Manual Reset | 2015-07-16 13:22:03.951 |
| 5 | 14 | DPI Baud 500K | 1969-12-31 16:00:34.493 |

- #. Sequential numbered list of events.
- **Code**. Numeric code for the event
- **Description**. Text string of the event
- **Time Stamp**. When the event occurred.

A full list of events is provided below:

| Code | Text |
|---|---|
| 1 | No Event |
| 2 | Device Power Up |
| 3 | Device Reset |
| 4 | EEPROM CRC Error |
| 5 | App Updated |
| 6 | Boot Updated |
| 7 | Watchdog Timeout |
| 8 | DPI Bus Off |
| 9 | DPI Ping Timeout |
| 10 | DPI Port Invalid |
| 11 | DPI Port Changed |
| 12 | DPI Host Reset |
| 13 | DPI Baud 125K |
| 14 | DPI Baud 500K |
| 15 | DPI Host Invalid |
| 16 | DPI Dup Port |
| 17 | DPI Type 0 Logon |
| 18 | DPI Type 0 Time |

| Code | Text |
|---|---|
| 19 | DPI DL Logon |
| 20 | DPI DL Error |
| 21 | DPI DL Time |
| 22 | DPI Ctrl Disable |
| 23 | DPI Ctrl Enable |
| 24 | DPI Msg Timeout |
| 25 | DPI Manual Reset |
| 26 | SI Online |
| 27 | SI Logon Error |
| 28 | SI Comm Fault |
| 29 | Net Link Up |
| 30 | Net Link Down |
| 31 | Net Dup Address |
| 32 | Net Comm Fault |
| 33 | Net Sent Reset |
| 34 | Net IO Close |
| 35 | Net Idle Fault |
| 36 | Net IO Open |
| 37 | Net IO Timeout |
| 38 | Net IO Size Err |
| 39 | PCCC IO Close |
| 40 | PCCC IO Open |
| 41 | PCCC IO Timeout |
| 42 | Msg Ctrl Open |
| 43 | Msg Ctrl Close |
| 44 | Msg Ctrl Timeout |
| 45 | Peer IO Open |
| 46 | Peer IO Timeout |
| 47 | Net Bus Off |
| 48 | Net Poll Timeout |
| 49 | Net IO Frag Err |
| 50 | Net COS Timeout |
| 51 | Net Poll Alloc |
| 52 | Net COS Alloc |
| 53 | Net Poll Close |
| 54 | Net COS Close |
| 55 | BOOTP Response |
| 56 | Email Failed |

| Code | Text |
|---|---|
| 57 | Option Card Flt |
| 58 | Module Defaulted |

### 3.3.6 Spectrum Defined Events

These event codes are defined and used by Spectrum Controls.

| Code | Text |
|---|---|
| 59 | ADC Fault |
| 60 | Comms Fault |
| 61 | Calibration Fault |
| 62 | Analog WDT |
| 63 | Firmware Fault |

### 3.3.7 Scan Time

The amount of time it takes to scan all enabled channels varies. The number of enabled channels and the filter settings for each channel determine the total scan time.

These are documented maximum scan times per channel. To determine the total scan time for all enabled channels, add the scan time for each filter. It is recommended to disable unused channels to improve performance.

For 4-wire resistive measurements, the adjacent odd channel is not considered.

For 3-wire resistive measurements, the worst case time will be 2× Scan Time since the lead wire is periodically measured from the adjacent odd channel using the same filter frequency:

| Filter Setting | Per Channel Scan Time |
|---|---|
| 4 Hz | 505 ms |
| 17 Hz | 145 ms |
| 60 Hz | 60 ms |
| 240 Hz | 35 ms |
| 470 Hz | 30 ms |

### 3.3.8 Input Under Range/Over Range

Software will provide input under range and over range indication to the user through Under Range (UR)/Over Range (OR) status bits. The input value that determines Under Range or Over Range depends on the input type. See the Data Format table in section 5.1.3 for these values.

The OR bit is set when the input value is greater than or equal to the High Range value. This bit may also be set during an open wire condition if the OC Action parameter is set to “Full Scale”.

The UR bit is set when the input value is less than or equal to the Low Range value. This bit may also be set during an open wire condition if the OC Action parameter is set to “Minimum Scale”.

### 3.3.9 Input Display Data Limit

The following table describes displayed data Range and Limit values. Measured values that exceed the Limit values are clipped.

| Input Range | Condition | mA, Volts, Deg. C, Ohms | Deg. F |
|---|---|---|---|
| **4..20 mA** | High Limit | 21.0 | N/A |
| | High Range | 20.0 | N/A |
| | Low Range | 4.0 | N/A |
| | Low Limit | 3.0 | N/A |
| **0..20 mA** | High Limit | 21.0 | N/A |
| | High Range | 20.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0..5 V** | High Limit | 5.250 | N/A |
| | High Range | 5.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0..10 V** | High Limit | 10.5 | N/A |
| | High Range | 10.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **100 Ohm Pt 385** | High Limit | 850.0 | 1562.0 |
| | High Range | 850.0 | 1562.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **200 Ohm Pt 385** | High Limit | 850.0 | 1562.0 |
| | High Range | 850.0 | 1562.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **500 Ohm Pt 385** | High Limit | 850.0 | 1562.0 |
| | High Range | 850.0 | 1562.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **1000 Ohm Pt 385** | High Limit | 850.0 | 1562.0 |
| | High Range | 850.0 | 1562.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **100 Ohm Pt 392** | High Limit | 630.0 | 1166.0 |
| | High Range | 630.0 | 1166.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **200 Ohm Pt 392** | High Limit | 630.0 | 1166.0 |
| | High Range | 630.0 | 1166.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **500 Ohm Pt 392** | High Limit | 630.0 | 1166.0 |

| Input Range | Condition | mA, Volts, Deg. C, Ohms | Deg. F |
|---|---|---|---|
| | High Range | 630.0 | 1166.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **1000 Ohm Pt 392** | High Limit | 630.0 | 1166.0 |
| | High Range | 630.0 | 1166.0 |
| | Low Range | -200.0 | -328.0 |
| | Low Limit | -200.0 | -328.0 |
| **10 Cu 426** | High Limit | 260.0 | 500.0 |
| | High Range | 260.0 | 500.0 |
| | Low Range | -100.0 | -148.0 |
| | Low Limit | -100.0 | -148.0 |
| **100 Ni 618** | High Limit | 260.0 | 500.0 |
| | High Range | 260.0 | 500.0 |
| | Low Range | -100.0 | -148.0 |
| | Low Limit | -100.0 | -148.0 |
| **120 Ni 672** | High Limit | 260.0 | 500.0 |
| | High Range | 260.0 | 500.0 |
| | Low Range | -80.0 | -112.0 |
| | Low Limit | -80.0 | -112.0 |
| **604 NiFe 518** | High Limit | 200.0 | 392.0 |
| | High Range | 200.0 | 392.0 |
| | Low Range | -100.0 | -148.0 |
| | Low Limit | -100.0 | -148.0 |
| **0-20 Ohms** | High Limit | 20.0 | N/A |
| | High Range | 20.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0-150 Ohms** | High Limit | 150.0 | N/A |
| | High Range | 150.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0-500 Ohms** | High Limit | 500.0 | N/A |
| | High Range | 500.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0-1000 Ohms** | High Limit | 1000.0 | N/A |
| | High Range | 1000.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |
| **0-3000 Ohms** | High Limit | 3000.0 | N/A |
| | High Range | 3000.0 | N/A |
| | Low Range | 0.0 | N/A |
| | Low Limit | 0.0 | N/A |

### 3.3.10 Open Wire Indication

The module has an open-wire indication for the following inputs. When detected, the value is set according to the OC Action parameter. Temperature ranges set to display Fahrenheit are scaled accordingly. The input circuitry uses pull-up resistors to swing the input to full-scale high when there is no physical connection. The detection method looks for full-scale ADC counts directly from the ADC. Therefore it is possible to trigger an open circuit by overdriving the inputs. The table below shows *approximate* trigger points.

Physically open wires are guaranteed to hit full-scale values for voltage ranges and 2/3-wire resistive ranges. 4-wire resistive ranges can only be guaranteed to measure open circuit when the primary measurement leads have been opened. If the source leads are open, measurement values can be unpredictable and may not display open circuit.

| Range | O.C. Input Trigger |
|---|---|
| 4-20 mA | Inputs less than 2.0 mA |
| 0-20 mA | There is no open circuit indication for this range. |
| 0-10 V | >= 11.1 V (± 0.4 V) |
| 0-5 V | >= 11.1 V (± 0.4 V) |
| 0-20 Ohm | >= 144.4 ohms |
| 0-150 Ohm | >= 577.4 ohms |
| 0-500 Ohm | >= 1154.8 ohms |
| 0-1000 Ohm | >= 1154.8 ohms |
| 0-3000 Ohm | >= 4896.1 ohms |

## Getting Technical Assistance

Note that your option card contains electronic components which are susceptible to damage from electrostatic discharge (ESD). An electrostatic charge can accumulate on the surface of ordinary plastic wrapping or cushioning material**.**

**In the unlikely event that the option card should need to be returned to Spectrum Controls, Inc., please ensure that the unit is enclosed in approved ESD packaging (such as static-shielding / metalized bag or black conductive container).**

Spectrum Controls, Inc. reserves the right to void the warranty on any unit that is improperly packaged for shipment.

**RMA (Return Merchandise Authorization) form required for all product returns.**

For further information or assistance, please contact your local distributor, or call the Spectrum Controls Technical Support at:

**USA - 425-746-9481**

## Declaration of Conformity

Available upon request.

# Appendix A
# Using CopyCat for 20-750sc-8U Uploads and Downloads

| NOTE | |
|---|---|
| | The behavior of the Copycat function is affected by the presence of an Universal Analog option card. There is a known anomaly that prevents restoring a complete drive configuration with the option card installed.<br>You may back up the complete drive configuration with the option card installed. You will need to physically remove the option card, perform the restore operation, and then re-install the option card in order for the restore to be successful.<br>You will receive an error message if you try to restore a complete configuration with the option card installed.<br>You may use the Copycat function to backup and restore just the option card configuration as documented below. |

A human-interface module is able to perform a CopyCat upload of the 20-750sc-8U Module contents using your standard HIM procedure.

However, downloading a module contents to the same module, or to another module when copying a standard configuration, has a very specific set of steps that differ from those you may use with other add-on modules.

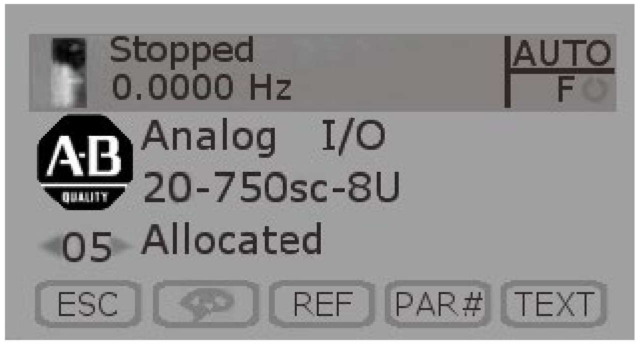
Use the following CopyCat procedures to upload and download a 20-750sc-8U module contents, either to the same module, or to a different module.

These procedures switch between the locked and unlocked states at the correct step in each set of steps.

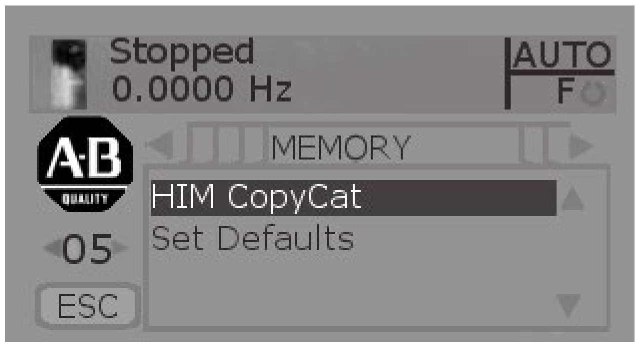
## Uploading a Configuration from the 20-750sc-8U

1. Install the 20-750sc-8U into an available port (Port 5 for this example) of the PowerFlex 753/755 AC Drive via CCW.
3. In the Parameters list, before you use CopyCat, set the **Config. Control** to **Unlocked**.
4. Leave the module connected to CCW.

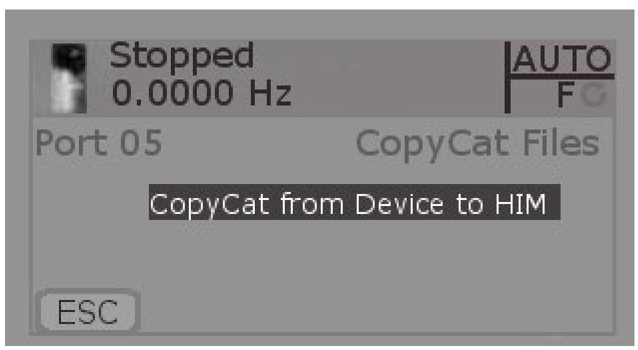
5. From the LCD HIM, navigate to Port 5 from the main screen.




6. Using the left and right arrows, navigate to the **Memory** tab.



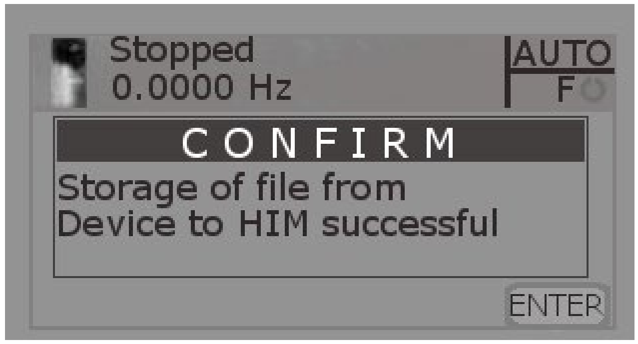

7. Select **HIM CopyCat**.
8. Select **CopyCat from Device to HIM**. This is an upload of the configuration from the module to the HIM. The configuration is then stored in the HIM.




9. Select **New File**. This is the configuration file that will be created from the upload.


10. Select **Enter** to confirm and start the upload. When it is completed you receive a

confirmation popup on the LCD.

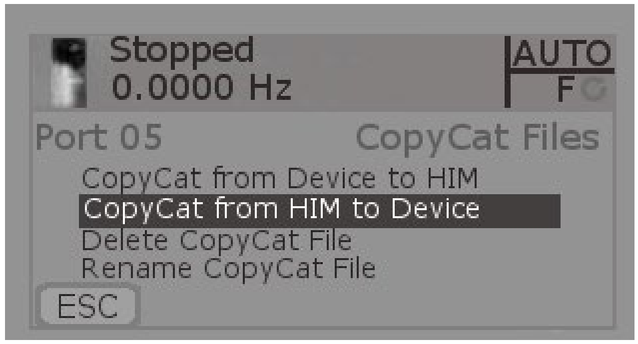



11. Now you have a configuration file stored on the HIM, so you can put in a new 20-750sc-8U module and configure the module quickly by using this CopyCat feature.
12. Set the **Config. Control** to **Locked** to allow operation of the card.

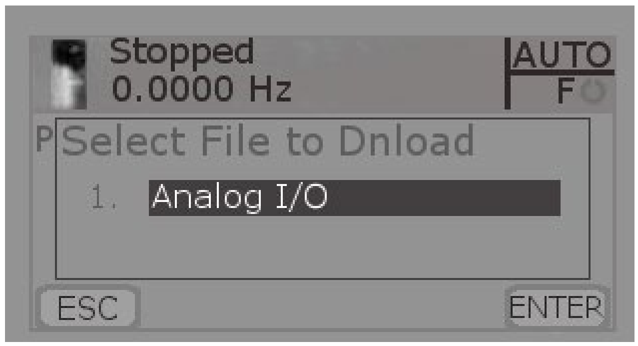
## Downloading a Configuration to a 20-750sc-8U

1. Using CCW or the HIM, change the **Config Control** to **Unlocked**.
2. On the LCD HIM, once again navigate to the memory tab and select **CopyCat**.

3. Select **CopyCat from HIM to Device**. This is basically a download from the LCD HIM memory to the 20-750sc-8U.




4. Select **Analog I/O** as the file you would like to download. This is the file that was created when you did the upload.




5. The download starts, but is interrupted by an error text **DPI Error – Object State Conflict**'. At present, you may ignore this error.The download actually downloads correctly. Select **ESC** to exit out of this popup screen.
6. Once the download is completed, go back to CCW, and in the parameter list, once again change the **Config. Control** to **Locked**.

# Index

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