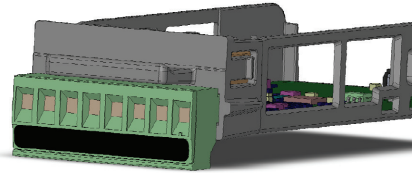


# F4T Flex Module Quick Start Guide



## Mixed Input / Output Modules Control, Limit, Auxiliary and CT FM [M or L] A- \_ \_ \_ A-A \_ \_ \_



1241 Bundy Boulevard., Winona, Minnesota USA 55987

Phone: +1 (507) 454-5300, Fax: +1 (507) 452-4507 <http://www.watlow.com/F4T.cfm>

0600-0097-0000 Rev. C

Made in the U.S.A.



May 2015

### Available F4T Literature and Resources

All of the user documents listed below can be found on the Watlow website: <http://www.watlow.com/F4T.cfm>. The Watlow Support Tools DVD can be acquired by contacting Watlow customer service (507-494-5300).

Document Title and Part Number	Description
F4T Installation and Troubleshooting User Guide, part number: 0600-0092-0000	Provides detailed specifications and information regarding mounting the F4T base, flex module wiring and troubleshooting.
F4T Setup and Operations User Guide, part number: 0600-0093-0000	Explains how to configure the controller for an application with Composer software and how to operate the controller via its touch-screen interface. Includes detailed descriptions of all controller features and parameter settings as well as application examples.
F4T Specification Sheet	Describes F4T hardware options, features, benefits and technical specifications.
Watlow Support Tools DVD, part number: 0601-0001-0000	Contains all product related user documents and software (Composer), video tutorials, application notes and more.

### Installation and Wiring

To install the flex module:

- Note the part number to determine the types of inputs and outputs available to be connected in step 7.
- Turn off power to the controller.
- Select a slot for the module. If replacing a module, remove the old module.
- Affix corresponding slot number labels (provided) to the module and to the removable screw terminal block.
- With the component side of the module facing right (viewing the controller from the rear) insert the module in to the slot until it latches.
- Remove the screw terminal block from the module.

1 2  
3 4

### Safety Information

We use caution symbols where needed within this document to draw your attention to important operational and safety information.

A “CAUTION” safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A “WARNING” safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The electrical hazard symbol, (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement. Further explanations follow:

Symbol	Explanation
 CAUTION or WARNING	CAUTION - Warning or Hazard that needs further explanation than label on unit can provide. Consult QSG for further information.
 Electrical Shock Hazard	AVERTISSEMENT : mise en garde ou danger qui demande plus de précisions que l'information sur l'étiquette de l'unité. Consultez le manuel de l'utilisateur pour plus d'informations.

### Document Overview

The purpose of this Quick Start Guide (QSG) is to acquaint the user with the F4T Flex Modules and associated wiring.

### Product Overview

Flex modules add functionality, inputs and outputs to an F4T system. The flex modules described in this document offer various input and output options as well as a safety over/under temperature limit. Each module can include one analog input and up to two outputs. All of these modules can be placed in any available slot.

- Wire field devices to the appropriate terminals. Wiring details for each input and output are provided in the following sections.
- Reconnect the wired screw terminal block to the module. Be sure to reconnect the terminal block to the correct module.
- Restore power to the controller.

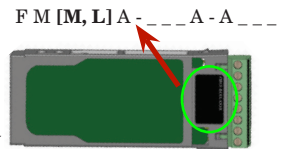
#### Note:

If the flex module is a replacement with the same part number and slot position, the controller uses it immediately when powered up. Otherwise, use Composer software to configure the F4T to expect and use the module.

### Module Characteristics

#### Description and Identification

Many of the modules appear to look alike at first glance, therefore, it is always recommended that the module part number be verified prior to plugging it into any of the available slots in a base. Each module is identified with a part number located on the back side of the assembly next to the screw terminal block, as displayed in the graphic above.



#### Wiring

Prior to wiring any of the I/O modules described in this document it is recommended that the warnings and notes listed below be reviewed.

**CAUTION:**

To prevent damage to the controller, do not connect wires to unused terminals.

**AVERTISSEMENT:** Pour prévenir tout endommagement du régulateur, ne pas faire de raccordements à des bornes inutilisées.

#### Note:

Maintain electrical isolation between the analog input, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

## Wiring (cont.)

### Note:

Modules IP10 when properly installed in base enclosure with slot caps in empty slots.

### CAUTION: Quencharc Note:

Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid-state relay or open collector output options requires use of an R.C. suppressor for AC load or a diode for a DC load.

**AVERTISSEMENT:** les charges inductives de commutation de lampes témoins (bobines de relais, solénoïdes, etc.) avec des options de sortie à relais mécanique, de relais statique ou collecteur ouvert requièrent un dispositif antiparasite R.C.

### Note:

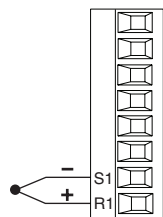
Wire size and torque for screw terminations:

- 0.0507 to 3.30 mm<sup>2</sup> (30 to 12 AWG) single-wire termination or two 1.31 mm<sup>2</sup> (16 AWG)
- 0.57 Nm (5.0 lb.-in.) torque

## Input Connections

### Thermocouple

FM [M, L] A - [L, U, Y] \_\_ A - A \_\_

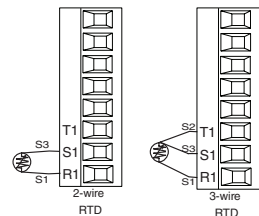


- Grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- 3 μA open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S terminal
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

## Input Connections (cont.)

### RTD

FM [M, L] A - [L, U, Y\*] \_\_ A - A \_\_

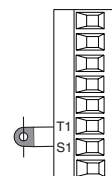


- 2- or 3-wire platinum, 100 and 1kΩ @ 32°F (0°C) calibration to DIN curve (0.00385 Ω/Ω°C)
- RTD excitation current of 0.09 mA typical. Each ohm of lead resistance may affect the reading by 2.55°C for a 100Ω platinum sensor or 0.25°C for a 1kΩ sensor.
- For 3-wire RTDs, the S1 lead (usually white) must be connected to R1.

Lead Wire Resistance Each Wire for 2-Wire RTDs	
AWG	Ohms/1000ft
14	2.575
16	4.094
18	6.510
20	10.35
22	16.46
24	26.17
26	41.62
28	66.17

\* This option does not support 3-wire RTDs

### Current Transformer FMMA - C \_\_ A - A \_\_

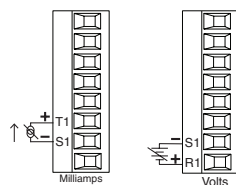


- Input range is 0 to 50mA (ac).
- Current transformer part number: 16-0246
- 100Ω input impedance
- Response time: 1 second maximum
- Accuracy +/-1mA typical

## Input Connections (cont.)

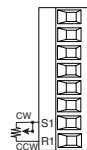
### Process

FM [M, L] A - [L, U] \_\_ A - A \_\_



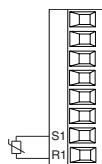
- 0 to 20mA @ 100Ω input impedance
- 0 to 10V<sub>rms</sub> (dc) @ 20kΩ input impedance
- 0 to 50mV<sub>rms</sub> (dc) @ 20MΩ input impedance
- Scalable

### Potentiometer FM [M, L] A - [L, U] \_\_ A - A \_\_



- Potentiometer: 0 to 1.2kΩ

### Thermistor FM [M, L] A - [M, T] \_\_ A - A \_\_



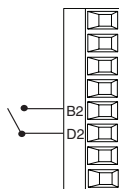
- > 20MΩ input impedance
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- User-selectable curves for Alpha Technics, Beta THERM and YSI
- User-scaling support for Steinhart-Hart coefficients

Thermistor Curve Setting	Base R @ 25 °C	Alpha Technics	Beta Therm	YSI
Curve A	2.252k	Curve A	2.2k3A	004
Curve B	10k	Curve A	10k3A	016
Curve C	10k	Curve C	10k4A	006
Custom	Use Steinhart-Hart equation coefficients (A, B and C) from thermistor manufacturer corresponding to the terms of the Steinhart-Hart equation: $1/T = A + B/\ln(R) + C(\ln(R))^3$			

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7 8

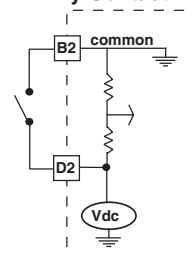
## Input Connections (cont.)

### Digital Input FMLA - Y E B A - A \_\_

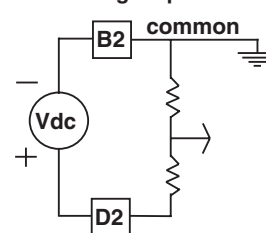


- Update rate 10Hz
- Dry Contact
  - Input inactive when ≥ 500Ω
  - Input active when ≤ 100Ω
  - Max. short circuit 13mA
- Voltage
  - Max. input 36V at 3mA
  - Input inactive when ≤ 2V
  - Input active when ≥ 3V at 0.25mA

### Dry Contact



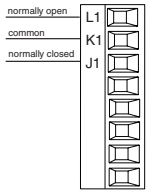
### Voltage Input



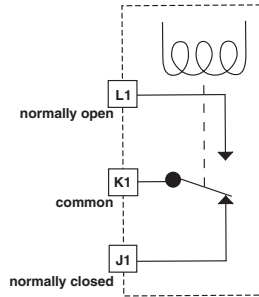
## Output Connections

### Mechanical Relay, Form C

FM [M, L] A - \_ [E] \_ A - A - \_ \_ \_



- 5A at 240V~ (ac) or 30V= (dc) maximum resistive load
- Requires a minimum load of 20mA at 24V
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- For use with ac or dc
- See Quencharc note (page 4).

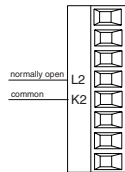


#### Note:

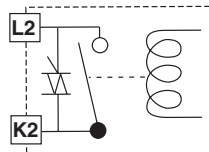
For part number FMLA-    EBA-A-     output 1 is fixed as the limit output.

### NO-ARC Relay, Form A

FMMA - \_ H A - A - \_ \_ \_



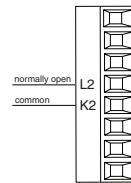
- 12A at 122°F (50°C), 85 to 264V~ (ac) resistive load only
- 2,000,000 cycle rating for rated load
- 100mA minimum load
- 2mA maximum off state leakage
- Do not use on dc loads.
- Output does not supply power
- Do not drive another relay or solenoid with this output type



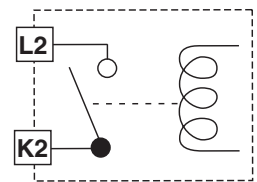
## Output Connections (cont.)

### Mechanical Relay, Form A

FM [M, L] A - \_ \_ J A - A - \_ \_ \_



- 5A at 240V~ (ac) or 30V= (dc) maximum resistive load
- 20mA at 24V minimum inductive load
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- For use with ac or dc
- See Quencharc note (page 4).

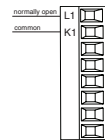


#### Note:

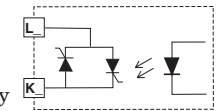
For part number FMLA-    J A - A -     output 2 is fixed as the limit output.

### Solid-State Relay, Form A

FMMA - \_ [K] [K] A - A - \_ \_ \_



- 0.5A at 149°F (65°C) to 1A at 50°F (10°C), 24 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- Opto-isolated, without contact suppression
- Maximum off state leakage of 105µA
- Output does not supply power
- Do not use on dc loads
- See Quencharc note (page 4)

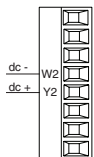


9 10  
11 12

## Output Connections (cont.)

### Switched DC / Open Collector

FM [M, L] A - \_ [C] [C] A - A - \_ \_ \_

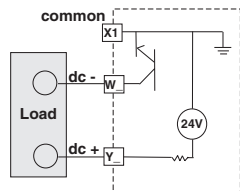


#### Switched DC

- 30mA dc maximum supply current
- Short circuit limited to < 50mA
- 22 to 32V= (dc) open circuit voltage
- Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible

#### Switched DC

FM [M, L] A - \_ [C] [C] A - A - \_ \_ \_

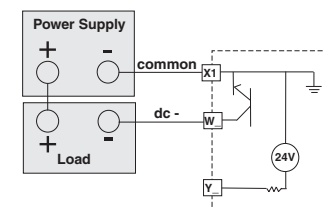


#### Open Collector

- 100mA maximum output current sink
- 30V= (dc) maximum supply voltage
- Any switched dc output can use the common terminal.
- Use an external class 2 or Safety Extra Low Voltage (SELV) power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to the open collector and common to the power supply negative.

#### Open Collector

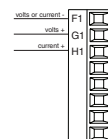
FM [M, L] A - \_ [C] \_ A - A - \_ \_ \_



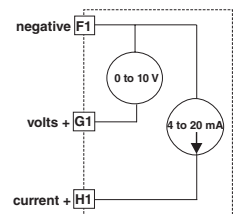
## Output Connections (cont.)

### Universal Process

FMMA - \_ F A - A - \_ \_ \_



- 0 to 20mA ±30µA into 800Ω maximum load with 5µA nominal resolution
- 0 to 10V= (dc) ±15mV into 1 kΩ minimum load with 2.5mV nominal resolution
- Scalable
- Output supplies power
- Cannot use voltage and current outputs at same time
- Output may be used as retransmit or control
- Temperature stability 100ppm/°C



## Warranty

F4T Flex modules are manufactured by ISO 9001 registered processes and are backed by a three-year warranty to the first purchaser for use, providing that the modules have not been misapplied.

## Technical Assistance

To get assistance from Watlow:

- Contact a local representative: see last page
- Email: [wintechsupport@watlow.com](mailto:wintechsupport@watlow.com)
- Call: +1 (507) 494-5656 from 7 a.m. to 5 p.m. Central Standard Time (CST)

This F4T Quick Start Guide (QSG) is copyrighted by Watlow Electric Manufacturing Company, © March 2015 with all rights reserved.

Symbol	Explanation
	Unit is compliant with European Union directives. See Declaration of Conformity for further details on directives and standards used for compliance.
	Unit has been reviewed and approved by Factory Mutual as a Temperature Limit Device per FM Class 3545 standard. See: <a href="http://www.fmglobal.com">www.fmglobal.com</a>
	Unit has been reviewed and approved by CSA International for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: <a href="http://www.csa-international.org">www.csa-international.org</a>
	Recognized component UL Files E185611 Process Control Equipment and E43684 Automatic Temperature Sensing Control Integrated Equipment, see conditions of acceptability.

### Specifications

Input Type	Max Error @ 25 Deg C	Accuracy Range		Operating Range		Units
		Low	High	Low	High	
*J	±1.75	0	750	-210	1200	Deg C
*K	±2.45	-200	1250	-270	1371	Deg C
*T (-200 to 350)	±1.55	-200	350	-270	400	Deg C
N	±2.25	0	1250	-270	1300	Deg C
*E	±2.10	-200	900	-270	1000	Deg C
R	±3.9	0	1450	-50	1767	Deg C
S	±3.9	0	1450	-50	1767	Deg C
B	±2.66	870	1700	-50	1816	Deg C
C	±3.32	0	2315	0	2315	Deg C
D	±3.32	0	2315	0	2315	Deg C

### Specifications (cont.)

Input Type	Max Error @ 25 Deg C	Accuracy Range		Operating Range		Units
		Low	High	Low	High	
*RTD, 100Ω	±2.00	-200	800	-200	800	Deg C
RTD, 1kΩ	±2.00	-200	800	-200	800	Deg C
mV	±0.05	0	50	---	---	mV
Volts	±0.01	0	10	---	---	Volts
mAdc	±0.02	2	20	---	---	mA DC
mAac	±5	-50	50	---	---	mA AC
Potentiometer 1k range	±1	0	1000	---	---	Ohms

\*NSF approved inputs

### Thermistor Input

Resistance Range	Max Error @ 25 Deg C	Accuracy Range		Units
		Low	High	
5k range	±5	0	5000	Ohms
10k range	±10	0	10000	Ohms
20k range	±20	0	20000	Ohms
40k range	±40	0	40000	Ohms

### Declaration of Conformity

#### Series EZ-ZONE® Flex Modules

WATLOW Electric Manufacturing Company

1241 Bundy Blvd.  
Winona, MN 55987 USA

ISO 9001 since 1996.

Declares that the following products:

Designation: **Series EZ-ZONE® Flex Modules**

Model Numbers: FMMA-X(A',C',E,F',K)(A',C',H,J,K)A-A(A',F',B',G')XX  
FMHA-(R',P',C',F',B',J,K,L)AAA-A(A',F',B',G')XX  
FMCA-XAAA-A(A',F',B',G')XX; Note: X' = Any letter or number

Classification: FMMA, FMMA and FMHA are Process Control modules, FMCA are Communication modules; Modules are Integrated Controls in either **EZ-ZONE® CC or F4T Bases**; Modules are IP10 when properly installed.

Rated Voltage and Frequency: Relay, SSR or No-Arc Control outputs 24 - 240 Vac 50/60 Hz, Switched DC, Process and communications; low voltage SELV.

Rated Power Consumption: At max 50°C; see manual for ratings at other ambient temperatures. No-arc relays 15A 1 C, Dual SSR module 1 C 10A each output, Mechanical relay 5A 125 VA, 25 VA at 24 Vac 1 B, Discreet SSR 1/2A 1 C 20VA, Quad SSR 1 C 0.7A 50 VA, Hex I/O 1.5A, all others SELV limited energy.

Flex Modules are considered components and have no function in and of themselves, it is only when installed in a **Watlow EZ-ZONE® CC or F4T Base** enclosure that they have useful function. Modules were tested as part of these systems for compliance with the following directives.

**EN 61326-1 2006 2004/108/EC Electromagnetic Compatibility Directive**  
Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class B Emissions).

**EN 61010-1:2010 ED3 2006/95/EC Low-Voltage Directive**  
Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements

**EN 60730-1:2011 2006/95/EC Low-Voltage Directive**  
Automatic electrical controls for household and similar use – Particular requirements for temperature sensing controls.

**EN 60730-2:2010 2006/95/EC Low-Voltage Directive**  
Particular requirements for temperature sensing controls. Only certain output options comply with 60730 spacing and dielectric requirements, see order information for compatible models.

Compliant with 2011/65/EC RoHS2 Directive

Per 2002/96/EC W.E.E Directive and 2006-66-EC Battery Directive Please Recycle Properly.

See the Declarations of Conformity for **Watlow EZ-ZONE® CC and F4T** models for further details on standards used for compliance.

Joe Millanes

Winona, Minnesota, USA

Name of Authorized Representative

Place of Issue

Director of Operations

July 2014

Title of Authorized Representative

Date of Issue

Signature of Authorized Representative

13 14  
15 16

### How to Reach Us

#### Corporate Headquarters

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12001 Lackland Road  
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