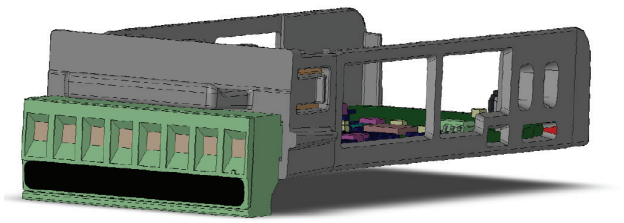
F4T Flex Module
Quick Start Guide



High Density Input/Output Modules
FMHA-_ _ _ _-_ _ _ _

TOTAL CUSTOMER SATISFACTION 3 Year Warranty

ISO 9001 Registered Company Winona, Minnesota USA

WATLOW

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0600-0096-0000 Rev. C Made in the U.S.A.

April 2015

1 2 3 4

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 touchscreen 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:

1. Note the part number to determine the number and type of inputs or outputs available to be connected in step 7.
2. Turn off power to the controller.
3. Select a compatible base slot for the module. See the Flex Module-Slot Dependencies table below. If replacing a module, remove the old module.
4. Affix corresponding slot number labels (provided) to the module and to the removable screw terminal block.
5. 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.
6. Remove the screw terminal block from the module.
7. Wire field devices to the appropriate terminals. Wiring details for each input and output are provided in the following sections.
8. Reconnect the wired screw terminal block to the module. Be sure to reconnect the terminal block to the correct module.
9. 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.

Flex Module - Slot Dependencies

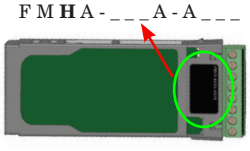
Module Type	Slot # 1	2	3	4	5	6
Dual SSR * FMHA-K	Y	Y	N	Y	Y	N
Communications FMCA-(2)	N	N	N	N	N	Y
All Other Modules	Y	Y	Y	Y	Y	Y

Y = Allowed N = Not allowed
* Requires two adjacent slots

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 to the right.



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.

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 WARNING or Electrical Shock Hazard	CAUTION – Warning or Hazard that needs further explanation than label on unit can provide. Consult QSG for further information. 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 High Density (HD) Flex Modules and associated wiring.

Product Overview

Flex modules serve as the interface between real-world devices and the F4T system. The flex modules described in this document offer various input and output options and greater density (more than 1) than the standard flex modules. With the exception of the Dual SSR module, all of these modules can be placed in any available slot.

Note:

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

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 anti parasite R.C.

Note:

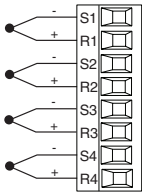
Wire size and torque for screw terminations:

- 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
- 0.57 Nm (5.0 lb.-in.) torque

Input Connections

Thermocouple

FM**H**A - [**R**] A A A - A _ _ _

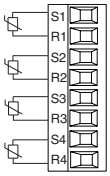


- Grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max
- 3µA open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S terminal
- To reduce errors, the extension wire for thermocouples must be of the same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

Input Connections (cont.)

Thermistor

FM**H**A - [**P**] A A A - A _ _ _

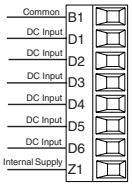


- >20MΩ input impedance
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- User-selectable curves for Alpha Technics, Beta THERM and YSI
- User-scaling support for Steinhart-Hart coefficients

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: $1 / T = A + B\ln(R) + C\ (\ln(R))^3$			

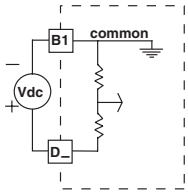
Six Digital Inputs

FM**H**A - [**C**] A A A - A _ _ _

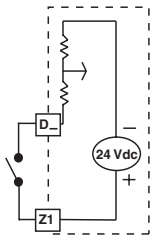


- Voltage
  - Max. input 36V at 3mA
  - Input inactive when ≤ 2V
  - Input active when ≥ 3V at 0.25mA
- Dry Contact
  - Input inactive when ≥ 500Ω
  - Input active when ≤ 100Ω
  - Max. short circuit 13mA

Voltage Input



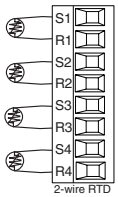
Dry Contact



Input Connections (cont.)

RTD

FM**H**A - [**R**] A A A - A _ _ _



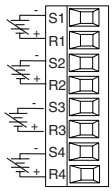
- Platinum, 100 and 1kΩ @ 32°F (0°C) calibration to DIN curve (0.00385 Ω/Ω/°C)
- RTD excitation current of 0.09mA typical. Each ohm of lead resistance may affect the reading by 2.55°C for a 100Ω platinum sensor or 0.25°C for a 1kΩ sensor (see table to right)

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

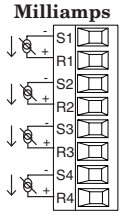
Process

FM**H**A - [**R**] A A A - A _ _ _

Volts



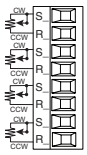
Milliamps



- 0 to 20mA @ 100 Ω input impedance
- 0 to 10V⎓ (dc) @ 20kΩ input impedance
- 0 to 50mV⎓ (dc) @ 20MΩ input impedance
- Scalable

Potentiometer

FM [M, L] A - [C, L, Y, R] _ _ A - A _ _ _

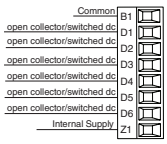


- Potentiometer: 0 to 1.2kΩ

Output Connections

Six Digital Outputs

FM**H**A - [**C**] A A A - A _ _ _



Open Collector

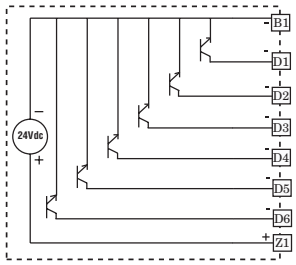
- Maximum switched open collector voltage is 32V⎓ (dc)
- 400mA, maximum open circuit voltage of 25V⎓ (dc), typical 8V⎓ (dc) at 80mA
- Maximum output sink current per output is 1.5A (external class 2 or SELV* supply required)
- Total sink current for all outputs not to exceed 8A
- Do not connect outputs in parallel

* Safety Extra Low Voltage

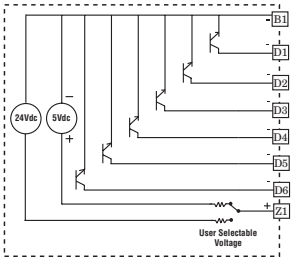
Switched DC

- User selectable voltage, 5V⎓ (dc) at 130mA or 19 to 22V⎓ (dc) at 80mA

Open Collector Outputs



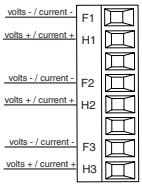
Switched DC Outputs



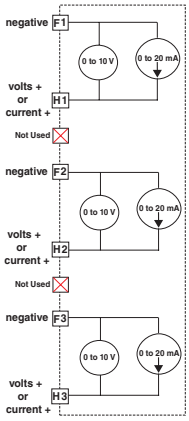
Output Connections (cont.)

Tri-Process/Retransmit Outputs

FMHA - [F] A A A - A _ _ _

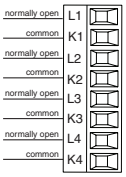


- 0 to 20mA into 400Ω maximum load
- 0 to 10V⎓ (dc) into 4 kΩ minimum load
- Outputs are scalable
- Output supplies power
- Each output can be independently set for voltage or current
- Output may be used as retransmit or control



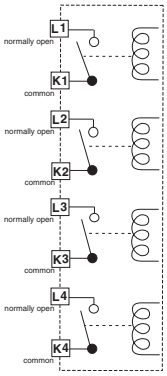
Four Mechanical Relays, Form A

FMHA - [J] A A A - A _ _ _



Note:
Not 60730 compliant.

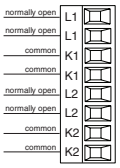
- 5A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20mA at 24V minimum load
- 125 VA pilot duty @ 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- For use with ac or dc
- See Quencharc note (page 4)



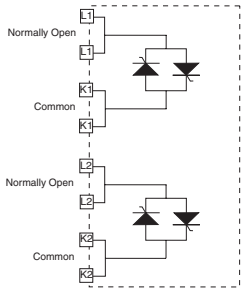
Output Connections (cont.)

*Dual 10A Solid-State Relays, Form A

FMHA - [K] A A A - A _ _ _



- 10A at 20 to 264V~ (ac) maximum resistive load
- 10A per output at 240V~ (ac), max. 20A per card at 122°F (50°C), max. 12A per card at 149°F (65°C)
- Opto-isolated, without contact suppression
- Maximum off state leakage of 105µA
- Output does not supply power
- Do not use on dc loads.
- Requires two slots



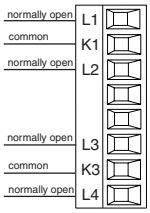
***Note:**
This module requires 2 slots, therefore it cannot be placed in slot 3 or 6.

Note:
Not 60730 compliant.

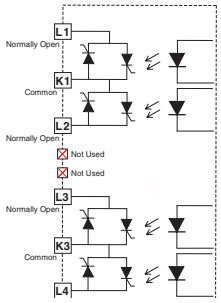
Output Connections (cont.)

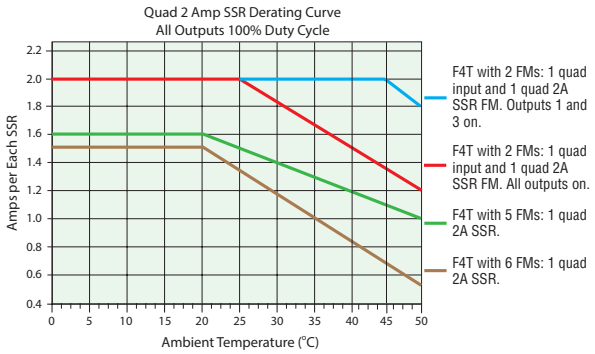
Four 2A Solid-State Relays, Form A

FMHA - [L] A A A - A _ _ _



- 2A at 20 to 264V~ (ac) maximum resistive load
- 50 VA 120/240V~ (ac) pilot duty
- Optical isolation, without contact suppression
- Maximum off state leakage of 105µA
- Output does not supply power.
- Do not use on dc loads.
- N.O., COM, N.O wiring (shared common) between each set of outputs.
- See derating curve below for maximum current output.

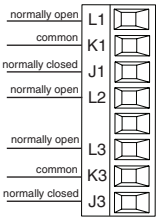




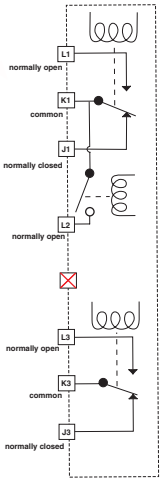
Output Connections (cont.)

3 Mechanical Relays, 2 Form C, 1 Form A

FMHA - [B] A A A - A _ _ _



- 5A at 24 to 240V~ (ac) or 30V ⎓ (dc) maximum resistive load
- 125 VA pilot duty 120/240V~ (ac) 25 VA at 24V~ (ac)
- Output does not supply power
- Form A relay shares common with one Form C relay.
- See Quencharc note (page 4)



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
- Call: +1 (507) 494-5656 from 7 a.m. to 5 p.m. Central Standard Time (CST)

Symbol	Explanation
CE	Unit is compliant with European Union directives. See Declaration of Conformity for further details on directives and standards used for compliance.
CSA	Unit has been reviewed and approved by CSA International for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: www.csa-international.org
c UL us	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
F (PTII)	±2.34	0	1343	0	1343	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				
Input Type	Max Error @ 25 Deg C	Accuracy Range		Units
		Low	High	
Thermistor, 5k range	±5	0	5000	Ohms
Thermistor, 10k range	±10	0	10000	Ohms
Thermistor, 20k range	±20	0	20000	Ohms
Thermistor, 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 CE since 1996.

Declares that the following products:

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

Model Numbers: FMLA-(LAJ, LCJ, LEJ, MAJ, MCJ, MEJ, YEB[1])A-A(A[1],F[1],B[1],G[1])**XX**
FMMA-**X**(A[1],C[1],E,F[1],K)(A[1],C[1],H,J,K)A-A(A[1],F[1],B[1],G[1])**XX**
FMHA-(R[1],P[1],C[1],F[1],B[1],J,K,L[1])AAA-A(A[1],F[1],B[1],G[1])**XX**
[1]FMCA-**X**AAA-A(A[1],F[1],B[1],G[1])**XX**; **Note: X[1] = Any letter or number**

Classification: FMLA, 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.

2004/108/EC Electromagnetic Compatibility Directive

EN 61326-1 **2006** **Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class B Emissions).**

2006/95/EC Low-Voltage Directive

EN 61010-1:2010 ED3 **Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements**
All FM's in all bases are compliant with this standard.

EN 60730-1:2011
EN 60730-2-9:2010 **Automatic electrical controls for household and similar use – Particular requirements for temperature sensing controls.**
[1]Compliant output options. When in EZ-ZONE® CC Base. 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.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
Name of Authorized Representative

Winona, Minnesota, USA
Place of Issue

Director of Operations
Title of Authorized Representative

July 2014
Date of Issue

Signature of Authorized Representative

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Your Authorized Watlow Distributor

TOTAL CUSTOMER SATISFACTION 3 Year Warranty