F4T/D4T Flex Module
Quick Start Guide
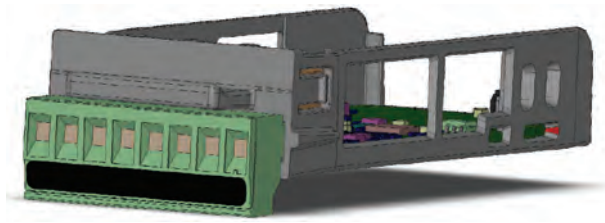
High Density Input/Output Modules
FMHA-_ _ _ _-_ _ _ _

WATLOW
Powered by Possibility

TOTAL
CUSTOMER
SATISFACTION
3 Year Warranty

ISO 9001
Registered Company
Winona, Minnesota USA

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/D4T High Density (HD) Flex Modules and associated wiring.

Product Overview

Flex modules serve as the interface between real-world devices and the F4T/D4T 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.

Available F4T/D4T Literature and Resources

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 base, flex module wiring and troubleshooting.
F4T Setup and Operations User Guide, part number: 0600-0093-0000	Explains how to configure and operate the device for an application using Composer software as well as the user interface (touch screen). Includes detailed descriptions of all device features and parameter settings.
D4T Installation and Troubleshooting User Guide, part number: 0600-0107-0000	Provides detailed specifications and information regarding mounting the base, flex module wiring and troubleshooting.
D4T Setup and Operations User Guide, part number: 0600-106-0000	Explains how to configure the datalogger for an application using the user interface and Composer software. Includes detailed descriptions of all data logger features and parameter settings.

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 device power.
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 F4T/D4T from the rear) insert the module into 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 recon-nect the terminal block to the correct module.
9. Restore power to the F4T/D4T.

Note:

If the flex module is a replacement with the same part number and slot position, the F4T/D4T uses it immediately when powered up. Otherwise, use Composer software to configure the F4T/D4T to ex-pect 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.

F M H A - _ _ _ A - A _ _ _
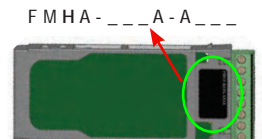
Wiring

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

CAUTION: ⚠

To prevent damage to the F4T/D4T, do not connect wires to unused terminals.

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.
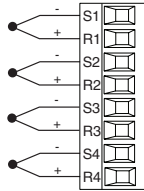
Note:

Wire size and torque for screw terminations:
- 0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)
- 0.57 Nm (5.0 lb.-in.) torque

Input Connections

Thermocouple   FM**HA** - [**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.)

RTD   FM**HA** - [**R**] A A A - A _ _ _
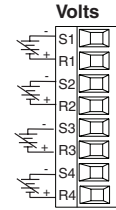

2-wire RTD
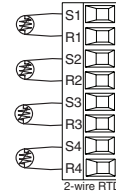
- Platinum, 100 and 1kΩ @ 32°F (0°C) calibration to DIN curve (0.00385 Ω/Ω/°C)
- RTD excitation current of 0.09mA typical. Each ohm of lead resistance may affect the reading by 2.55°C for a 100Ω platinum sensor or 0.25°C for a 1kΩ sensor (see table to right)

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**HA** - [**R**] A A A - A _ _ _

Volts   **Milliamps**

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

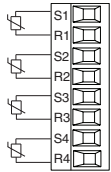**Potentiometer**   FM [**M, L**] A - [**C, L, Y, R**] _ _ A - A _ _ _
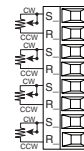
- Potentiometer: 0 to 1.2kΩ

Input Connections (cont.)

Thermistor   FM**HA** - [**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 ºC	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: $1 / T = A + B In(R) + C (In(R))^3$			

Six Digital Inputs   FM**HA** - [**C**] A A A - A _ _ _
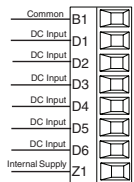
- Voltage
  - Max. input 36V at 3mA
  - Input inactive when ≤ 2V
  - Input active when ≥ 3V at 0.25mA

Voltage Input

common

Dry Contact

- Dry Contact
  - Input inactive when ≥ 500Ω
  - Input active when ≤ 100Ω
  - Max. short circuit 13mA
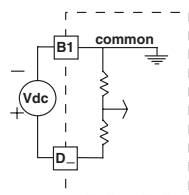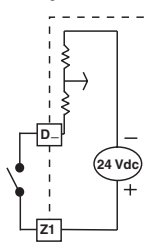
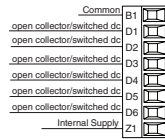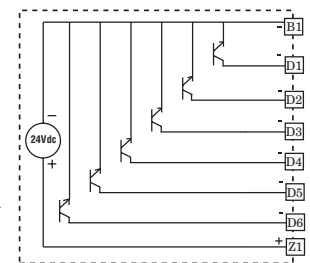## Output Connections
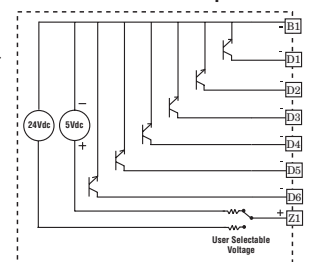### Six Digital Outputs   FM**HA** - [**C**] A A A - A _ _ _

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
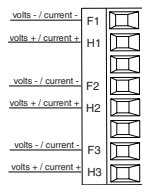- Do not connect outputs in parallel
- * Safety Extra Low Voltage

Switched DC

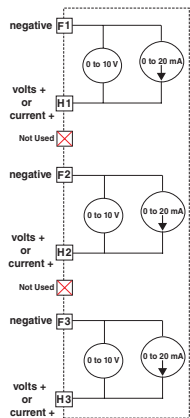- User selectable voltage, 5V⎓ (dc) at 130mA or 19 to 22V⎓ (dc) at 80mA

Open Collector Outputs

24Vdc

Switched DC Outputs

24Vdc   5Vdc
User Selectable Voltage

Output Connections (cont.)

Tri-Process/Retransmit Outputs FMHA - [F] A A A - A _ _ _

volts - / current - F1
volts + / current - H1

volts - / current - F2
volts + / current - H2

volts - / current - F3
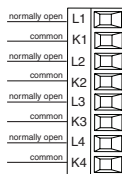volts + / current - H3

- 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
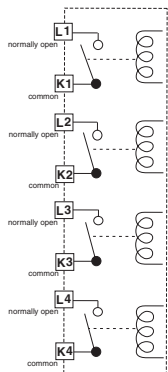- Output may be used as retransmit or control

negative F1
0 to 10 V   0 to 20 mA
volts + or current + H1
Not Used ☒

negative F2
0 to 10 V   0 to 20 mA
volts + or current + H2
Not Used ☒

negative F3
0 to 10 V   0 to 20 mA
volts + or current + H3

Four Mechanical Relays, Form A FMHA - [J] A A A - A _ _ _

normally open L1
common K1
normally open L2
common K2
normally open L3
common K3
normally open L4
common K4

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.
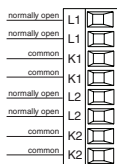- For use with ac or dc
- See Quencharc note (page 4)

normally open L1
K1 common
normally open L2
K2 common
normally open L3
K3 common
normally open L4
K4 common

Output Connections (cont.)

*Dual 10A Solid-State Relays, Form A FMHA - [K] A A A - A _ _ _

normally open L1
normally open L1
common K1
common K1
normally open L2
normally open L2
common K2
common K2

- 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

L1
L1
Normally Open
K1
Common
K1
L2
L2
Normally Open
K2
Common
K2
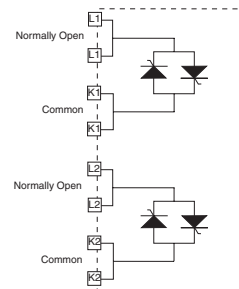
*Note:
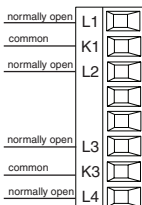This module requires 2 slots, therefore it cannot be placed in slot 3 or 6.

Note:
Not 60730 compliant.

---

9 10
11 12

Output Connections (cont.)

Four 2A Solid-State Relays, Form A FMHA - [L] A A A - A _ _ _

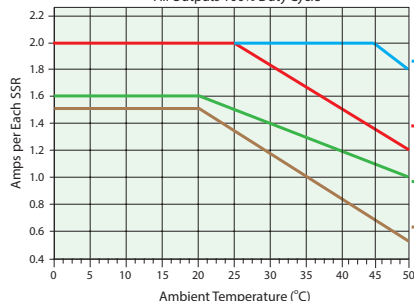normally open L1
common K1
normally open L2

normally open L3
common K3
normally open L4

- 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.

L1
Normally Open
K1
Common
L2
Normally Open
Not Used ☒
Not Used ☒
L3
Normally Open
K3
Common
L4
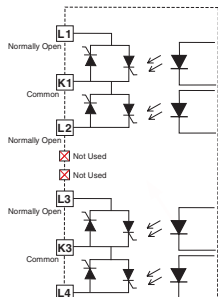
Quad 2 Amp SSR Derating Curve
All Outputs 100% Duty Cycle

Amps per Each SSR (y-axis: 0.4 to 2.2)
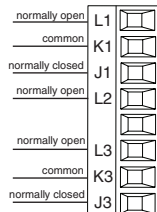Ambient Temperature (°C) (x-axis: 0 to 50)

F4T/D4T with 2 FMs: 1 quad input and 1 quad 2A SSR FM. Outputs 1 and 3 on.

F4T/D4T with 2 FMs: 1 quad input and 1 quad 2A SSR FM. All outputs on.

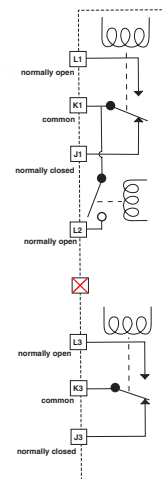F4T/D4T with 5 FMs: 1 quad 2A SSR.

F4T/D4T with 6 FMs: 1 quad 2A SSR.

Output Connections (cont.)

3 Mechanical Relays, 2 Form C, 1 Form A FMHA - [B] A A A - A _ _ _

normally open L1
common K1
normally closed J1
normally open L2

normally open L3
common K3
normally closed J3

- 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)

L1
normally open
K1
common
J1
normally closed
L2
normally open
☒
L3
normally open
K3
common
J3
normally closed

Warranty

F4T/D4T 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.

(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
UL c 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   ISO 9001since 1996.
1241 Bundy Blvd.
Winona, MN 55987 USA

Declares that the following products:
Designation: **Series EZ-ZONE® Flex Modules**
Model Numbers: FMLA-(LAJ, LCJ, LEJ, MAJ, MCJ, MEJ, YEB[1])A[1]-A[1](A[1],F[1],B[1],G[1])X[1]X[1]
                     FMMA-X[1](A[1],C[1],E,F[1],K)(A[1],C[1],H,J,K)A[1]-A[1](A[1],F[1],B[1],G[1])X[1]X[1]
                     FMHA-(R[1],P[1],C[1],F[1],B[1],J,K,L[1])A[1]A[1]A[1]-A[1](A[1],F[1],B[1],G[1]) X[1]X[1]
                     [1]FMCA-XAAA-A(A,F,B,G)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, F4T or D4T**
                     Bases; Modules are IP10 when properly installed.
Rated Voltage and   Relay, SSR or No-Arc Control outputs 24 to 240 V– (ac) 50/60 Hz,
Frequency: Switched DC, Process and communications: low voltage SELV
Rated Power   See manual for de-rating at increased temperatures.
Consumption: No-arc relays 15A 1.C, Dual SSR module 1.C 10A each output, Mechanical relay
                     5A 125 VA, 25 VA at 24 V– (ac) 1.B, Discreet SSR 1/2A 1.C 20VA, Quad SSR 1.C
                     1.5A 50 VA, Hex I/O ELV 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, Series F4T or Series D4T** Base enclosure that they have useful function. Modules were tested
as parts of these systems for compliance with the following directives.

                     2014/30/EU Electromagnetic Compatibility Directive
EN 61326-1:2013   **Electrical equipment for measurement, control and laboratory use – EMC**
                     requirements (Industrial Immunity, Class B Emissions).

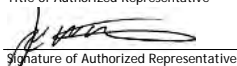   ***2014/35/EU Low-Voltage Directive***
EN 61010-1:2010   **Safety Requirements of electrical equipment for measurement, control and**
All options compliant **laboratory use. Part 1: General requirements**
EN 60730-1:2011   **Automatic electrical controls for household and similar use – Particular**
EN 60730-2-9:2010   **requirements for temperature sensing controls.**
[1]Food Service   Only certain output options comply with 60730 spacing and dielectric
Compliant options.   requirements, see order information for compatible models.

                     Compliant with 2011/65/EU RoHS2 Directive

        Per 2012/19/EU W.E.E.E Directive   Please Recycle Properly.

        See the Declarations of Conformity for **Watlow EZ-ZONE® CC, Series F4T and Series D4T** models for further
                     details on standards used for compliance.

Joe Millanes   Winona, Minnesota, USA
Name of Authorized Representative   Place of Issue

Directory of Operations   April 20, 2016
Title of Authorized Representative   Date of Issue

Signature of Authorized Representative