FLEX M
Engineered

Modular Receiver

MAGNETEK
E N R A N G E

Your New Radio Receiver

Thank you for your purchase of Magnetek's Enrange® brand Flex M Radio Remote Equipment Control. Magnetek has set a whole new standard in radio-remote performance, dependability, and value with this line of modular receivers.

If your product ever needs modification or service, please contact one of our representatives at the following locations:

U.S. Service Information

For questions regarding service or technical information contact:
 1.866.MAG.SERV
(1.866.624.7378).

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TABLE OF CONTENTS

PRODUCT MANUAL SAFETY INFORMATION

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products and adjustable frequency drives, and industrial braking systems for overhead material handling applications. This manual has been prepared by Magnetek to provide information and recommendations for the installation, use, operation and service of Magnetek's material handling products and systems (Magnetek Products). Anyone who uses, operates, maintains, services, installs or owns Magnetek Products should know, understand and follow our instructions and safety recommendations in this manual for Magnetek Products.

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists and lifting devices:

- Instructions, manuals, and safety warnings of the manufacturers of the equipment where the radio system is used,

- Plant safety rules and procedures of the employers and the owners of facilities where the Magnetek Products are being used,

- Regulations issued by the Occupational Health and Safety Administration (OSHA),

- Applicable local, state or federal codes, ordinances, standards and requirements, or

- Safety standards and practices for the overhead material handling industry.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users and operators of the Magnetek Products to know, understand and follow all of these requirements. It is the responsibility of the owner of the Magnetek Products to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use Magnetek Products prior to becoming familiar with and being trained in these requirements.**

WARRANTY INFORMATION

FOR INFORMATION ON MAGNETEK'S PRODUCT WARRANTIES BY PRODUCT TYPE, PLEASE VISIT WWW.MAGNETEKMH.COM.

WARNINGS and CAUTIONS

Throughout this document WARNING and CAUTION statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.

WARNING – A warning highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in injury or death of personnel, or long term physical hazards. Warnings are highlighted as shown below:

⚠ **WARNING**

CAUTION – A caution highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in damage to, or destruction of equipment, or loss of functional effectiveness. Cautions are highlighted as shown below:

⚠ **CAUTION**

WARNINGS and CAUTIONS SHOULD NEVER BE DISREGARDED.

The safety rules in this section are not intended to replace any rules or regulations of any applicable local, state, or federal governing organizations. Always follow your local lockout and tagout procedure when maintaining any radio equipment. The following information is intended to be used in conjunction with other rules or regulations already in existence. It is important to read all of the safety information contained in this section before installing or operating the Radio Control System.

1.0: CRITICAL INSTALLATION CONSIDERATIONS

⚠️ **WARNING**

PRIOR TO INSTALLATION AND OPERATION OF THIS EQUIPMENT, READ AND DEVELOP AN UNDERSTANDING OF THE CONTENTS OF THIS MANUAL AND THE OPERATION MANUAL OF THE EQUIPMENT OR DEVICE TO WHICH THIS EQUIPMENT WILL BE INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

ALL EQUIPMENT MUST HAVE A MAINLINE CONTACTOR INSTALLED AND ALL TRACKED CRANES, HOISTS, LIFTING DEVICES AND SIMILAR EQUIPMENT MUST HAVE A BRAKE INSTALLED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

AN AUDIBLE AND/OR VISUAL WARNING MEANS MUST BE PROVIDED ON ALL REMOTE CONTROLLED EQUIPMENT AS REQUIRED BY CODE, REGULATION, OR INDUSTRY STANDARD. THESE AUDIBLE AND/OR VISUAL WARNING DEVICES MUST MEET ALL GOVERNMENTAL REQUIREMENTS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

FOLLOW YOUR LOCAL LOCKOUT TAGOUT PROCEDURE BEFORE MAINTAINING ANY REMOTE CONTROLLED EQUIPMENT. ALWAYS REMOVE ALL ELECTRICAL POWER FROM THE CRANE, HOIST, LIFTING DEVICE OR SIMILAR EQUIPMENT BEFORE ATTEMPTING ANY INSTALLATION PROCEDURES. DE-ENERGIZE AND TAGOUT ALL SOURCES OF ELECTRICAL POWER BEFORE TOUCH-TESTING ANY EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

THE DIRECT OUTPUTS OF THIS PRODUCT ARE NOT DESIGNED TO INTERFACE DIRECTLY TO TWO STATE SAFETY CRITICAL MAINTAINED FUNCTIONS, I.E., MAGNETS, VACUUM LIFTS, PUMPS, EMERGENCY EQUIPMENT, ETC. A MECHANICALLY LOCKING INTERMEDIATE RELAY SYSTEM WITH SEPARATE POWER CONSIDERATIONS MUST BE PROVIDED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH OR DAMAGE TO EQUIPMENT.

1.1 GENERAL

Radio controlled material handling equipment operates in several directions. Cranes, hoists, lifting devices and other material handling equipment can be large, and operate at high speeds. Quite frequently, the equipment is operated in areas where people are working in close proximity to the material handling equipment. **The operator must exercise extreme caution at all times**. Workers must constantly be alert to avoid accidents. The following recommendations have been included to indicate how careful and thoughtful actions may prevent injuries, damage to equipment, or even save a life.

1.2 PERSONS AUTHORIZED TO OPERATE RADIO CONTROLLED EQUIPMENT

Only properly trained persons designated by management should be permitted to operate radio controlled equipment.

Radio controlled cranes, hoists, lifting devices and other material handling equipment should not be operated by any person who cannot read or understand signs, notices and operating instructions that pertain to the equipment.

Radio controlled equipment should not be operated by any person with insufficient eyesight or hearing or by any person who may be suffering from a disorder or illness, is taking any medication that may cause loss of equipment control, or is under the influence of alcohol or drugs.

1.3 SAFETY INFORMATION & RECOMMENDED TRAINING FOR OPERATORS

Anyone being trained to operate radio controlled equipment should possess as a minimum the following knowledge and skills before using the radio controlled equipment.

<u>The operator should</u>:

- have knowledge of hazards pertaining to equipment operation

- have knowledge of safety rules for radio controlled equipment

- have the ability to judge distance of moving objects

- know how to properly test prior to operation

- be trained in the safe operation of the radio receiver as it pertains to the crane, hoist, lifting device or other material handling equipment being operated

- have knowledge of the use of equipment warning lights and alarms

- have knowledge of the proper storage space for a radio control receiver when not in use

- be trained in transferring a radio control receiver to another person

- be trained how and when to report unsafe or unusual operating conditions

- test the receiver emergency stop and all warning devices prior to operation; testing should be done on each shift, without a load

- be thoroughly trained and knowledgeable in proper and safe operation of the crane, hoist, lifting device, or other material handling equipment that utilizes the radio control

- know how to keep the operator and other people clear of lifted loads and to avoid "pinch" points

- continuously watch and monitor status of lifted loads

- know and follow cable and hook inspection procedures

- know and follow the local lockout and tagout procedures when servicing radio controlled equipment

- know and follow all applicable operating and maintenance manuals, safety procedures, regulatory requirements, and industry standards and codes

<u>The operator shall not</u>:

- lift or move more than the rated load

- operate the material handling equipment if the direction of travel or function engaged does not agree with what is indicated on the controller

- use the crane, hoist or lifting device to lift, support or transport people

- lift or carry any loads over people

- operate the crane, hoist or lifting device unless all persons, including the operator, are and remain clear of the supported load and any potential pinch points

- operate a crane, hoist or lifting device when the device is not centered over the load

- operate a crane, hoist or lifting device if the chain or wire rope is not seated properly in the sprockets, drum or sheave

- operate any damaged or malfunctioning crane, hoist, lifting device or other material handling equipment

- change any settings or controls without authorization and proper training

- remove or obscure any warning or safety labels or tags

- leave any load unattended while lifted

- leave power on the radio controlled equipment when the equipment is not in operation

- operate any material handling equipment using a damaged controller because the unit may be unsafe

- operate manual motions with other than manual power

- operate radio controlled equipment when low battery indicator is on

⚠ **WARNING**

THE OPERATOR SHOULD NOT ATTEMPT TO REPAIR ANY RADIO CONTROLLER. IF ANY PRODUCT PERFORMANCE OR SAFETY CONCERNS ARE OBSERVED, THE EQUIPMENT SHOULD IMMEDIATELY BE TAKEN OUT OF SERVICE AND BE REPORTED TO THE SUPERVISOR. DAMAGED AND INOPERABLE RADIO CONTROLLER EQUIPMENT SHOULD BE RETURNED TO MAGNETEK FOR EVALUATION AND REPAIR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

1.4 PRE-OPERATION TEST

At the start of each work shift, or when a new operator takes control of the crane, operators should do, as a minimum, the following steps before making lifts with any crane or hoist:

Test all warning devices.

Test all direction and speed controls.

Test the receiver emergency stop.

2.0 FLEX M RECEIVER INSTALLATION

+---+
| ⚠ **WARNING** |
| |
| BEFORE OPERATING THE RECEIVER FAMILIARIZE YOURSELF WITH ALL |
| SAFETY INFORMATION IN THIS MANUAL, APPROPRIATE MANUAL |
| SUPPLEMENTS AND ANY OTHER LOCAL, STATE, OR FEDERAL RULES OR |
| REGULATIONS ALREADY IN EXISTENCE. FAILURE TO FOLLOW THIS |
| WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE |
| TO EQUIPMENT. |
+---+

2.1 PRE-INSTALLATION

1. Transmitter and receiver access code and channel must match before the system will communicate.
2. Be aware of other radio channels in the surrounding area - set your system to a unique channel.
3. Make sure that your equipment is working properly in manual mode prior to system installation.
4. Make sure the power to the receiver is the correct voltage.
5. Disconnect equipment power prior to system installation.

2.2 MECHANICAL DRAWINGS
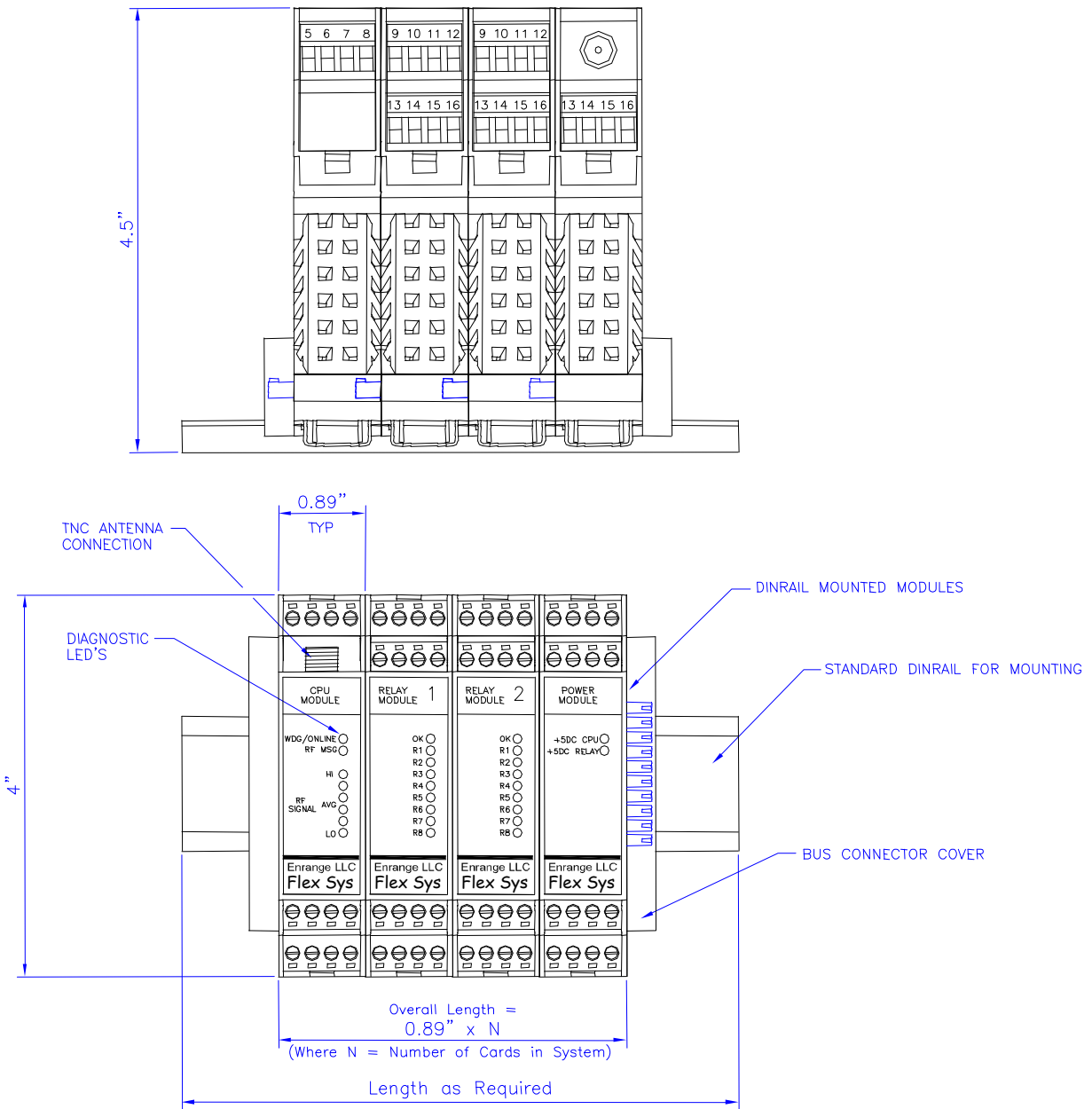
TYPICAL MECHANICAL LAYOUTS
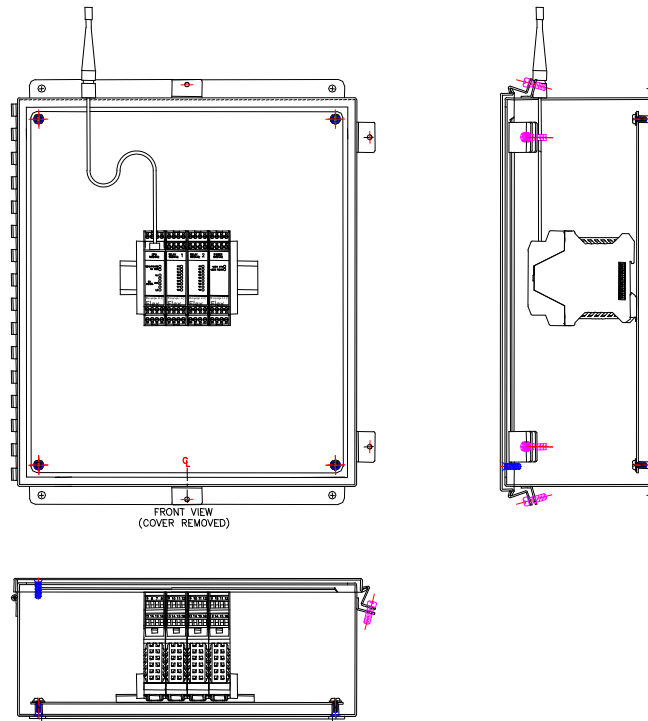

Figure 1: Mechanical Layout

Figure 2: Example of Flex M Mounted in an Enclosure

2.3 INSTALLATION

1. **Be sure to mount the receiver antenna in direct line-of-sight of the operator and free from all obstructions.**
2. Do not mount the receiver near high levels of electric noise, such as an unshielded variable frequency drive, as it may cause minor interference. When mounting the Flex M near unshielded variable frequency drive, **Magnetek typically recommends that the Flex M and all antenna cable routing be mounted a minimum of 24 inches from all unshielded variable frequency drives and cables**.
3. Allow adequate room for mounting the receiver. Make sure to allow a minimum of 5" between the connector and nearest surface to allow for cable harness connections.
4. For best reception and to help protect connectors from moisture and water damage, mount the receiver in an upright position. Mount with back flush against a flat surface to protect vents from spray.
5. If obstructions cannot be cleared, or the unit must be mounted inside a metal enclosure, the remote antenna should be used (see Figure 2)
6. Do not enclose the antenna in steel. For the best reception, keep all metal objects away from the antenna. **Consult the factory for more information regarding your application.**
7. The supply power to the Flex M system must have a master disconnect and should be fused.
8. The Flex M modules are installed on a 35mm din rail. To install the individual modules on the din rail, hook the bottom of the module on the din rail and swing the top of the module to the rail until a click is heard or felt.
9. After the modules are placed on the rail, they are slid together so they nest together.   Rail clamps are suggested to prevent the module bundle from sliding freely on the rail.
10. **Modules MUST be installed so that the RF/CPU module is on the left end of the rail and the power supply module is on the right end of the rail.**

Note: Magnetek strongly recommends the use of external fuses and circuit disconnects for all Flex Modules. Consult factory for more information.

2.4 REMOVAL

1. To remove modules from the rail for service, first ensure all power to the Flex M modules has been turned off and proper lockout/tagout procedures have been followed.
2. Remove one end rail clamp and un-nest the module that you wish to remove by separating it from the others on the rail.
3. Use a slotted screwdriver to lift the exposed metal tab/ring on the top of the module. Swing the module down away from the top tab/ring and unhook from the rail.
4. The PCB from any module can be removed from its housing by pressing in both tabs first (tabs are on the front and back sides of the housing); then the top housing and PCB can be removed from the lower housing (see figure below for details).

Notes:
In order to set dip switches the top along with the printed circuit board need to be removed from the base enclosure. Press in the tabs as shown below to remove the printed circuit board
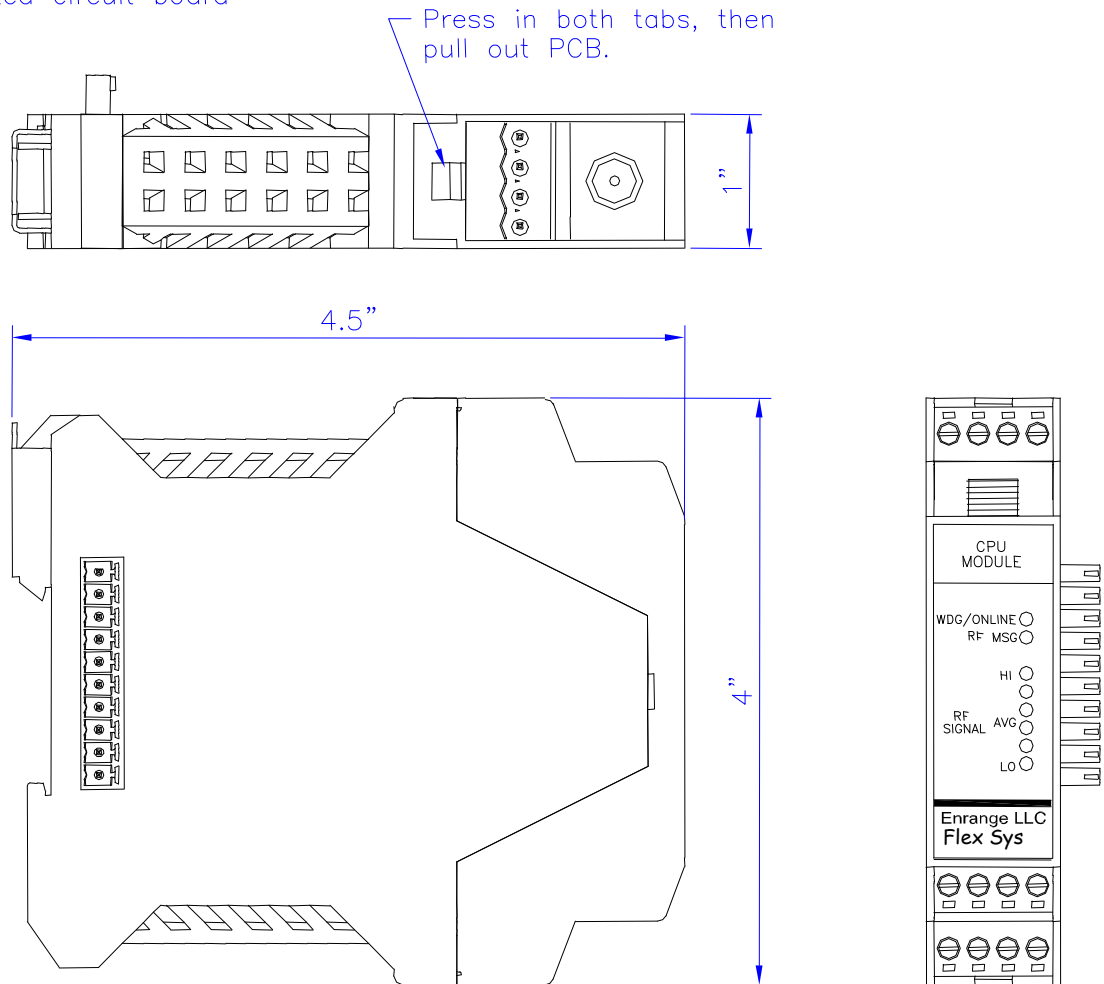
Press in both tabs, then pull out PCB.

1"

4.5"

4"

CPU
MODULE

WDG/ONLINE
RF MSG

HI

RF
SIGNAL AVG

LO

Enrange LLC
Flex Sys

Figure 3: Flex M Housing Removal Detail

3.0 NORMAL OPERATION

During the operation of the receiver, following the LED indicators will allow observation of the status of the Flex M receiver.

3.1 POWER SUPPLY MODULE

When the Flex M system has power supplied, the two LEDs on the power supply module should be lit and solid.
+5Vdc CPU – indicates that +5Vdc power is going to the CPU
+5Vdc RELAY – indicates that +5Vdc power is going to the RELAY modules

3.2 RF/CPU MODULE

When the Flex M system is supplying power to the RF/CPU module, there is a series of LEDs that will indicate the RF/CPU module's status.

WDG/ONLINE LED:
- Solid indicates RF communication with transmitter
- 1 Blink indicates normal operating WDG
- 2 Blinks indicates RF communication loss with transmitter
- 3 Blinks indicates read/write error to an attached Flex M module

RF MSG LED:
- Fast Blinks indicates radio frequency messages received (typical is 4 to 10 messages per second). This confirms communication between transmitter and receiver
- 3 Steady Blinks indicates read/write error to an attached Flex M module
- 4 Steady Blinks indicates an internal radio error

RF SIGNAL LED – measures the strength of the RF communication signal from the transmitter

3.3 RELAY MODULE(S)

When the Flex M system is supplying power to the Relay module, there is an LED that indicates the power and communication status of the Relay module.

OK LED – Solid indicates module communication with system is good
- 3 Blinks indicates read/write error to attached CPU

Additionally, there are 8 LEDs labeled 1 through 8 on the Relay module. When the LED is on, this indicates that the relay is closed/activated.

3.4 SERIAL COMMUNICATION MODULE(S)

When the Flex M system is supplying power to the Serial Communication module, there is an LED that indicates the power and communication status of the Serial Communication module.

OK LED – Solid indicates module communication with system is good
- 3 Blinks indicates read/write error to attached CPU

Additionally, there are 8 LEDs labeled 1 through 8 on the Serial Communication module.

When LED number 3 is blinking, this indicates that the Serial Communication Card is communicating with the attached drive.

When LED number 5 is on steady, this indicates there is a serial communication time-out error.   The serial communication was inactive for 1 second.   See Section 6: Troubleshooting for additional information.

When LED number 6 is on steady, this indicates that the Serial Communication is in test mode. See Section 6: Troubleshooting for additional information.

When LED number 7 is on steady, this indicates that the CPU module is sending a drive forward command.

When LED number 8 is on steady, this indicates that the CPU module is sending a drive reverse command.

3.5 ANALOG I/O MODULE(S)

When the Flex M system is supplying power to the Analog I/O module, there is an LED that indicates the power and communication status of the Relay module.

OK LED – Solid indicates module communication with system is good
- 3 Blinks indicates read/write error to attached CPU

Additionally, there are 8 LEDs labeled 1 through 8 on the Analog I/O module. When the LED is on, this indicates that the module is sending/receiving a signal on that input or output.

LED1 = Analog Output 1 is Active (non zero)
LED2 = Analog Output 2 is Active (non zero)
LED3 = Analog Output 3 is Active (non zero)
LED4 = Analog Output 4 is Active (non zero)
LED5 = Analog Input 1 is Active (non zero)
LED6 = Analog Input 2 is Active (non zero)
LED7 = Analog Input 3 is Active (non zero)
LED8 = Analog Input 4 is Active (non zero)

3.6 DIGITAL INPUT MODULE(S)

When the Flex M system is supplying power to the Digital Input module, there is an LED that indicates the power and communication status of the Relay module.

OK LED – Solid indicates module communication with system is good
- 3 Blinks indicates read/write error to attached CPU

Additionally, there are 8 LEDs labeled 1 through 8 on the Digital Input module. When the LED is on, this indicates that the module is receiving a signal/input at that input.

LED1 = Digital Input 1 is active (non zero)
LED2 = Digital Input 2 is active (non zero)
LED3 = Digital Input 3 is active (non zero)
LED4 = Digital Input 4 is active (non zero)
LED5 = Digital Input 5 is active (non zero)
LED6 = Digital Input 6 is active (non zero)
LED7 = Digital Input 7 is active (non zero)
LED8 = Digital Input 8 is active (non zero)

(Inputs 9-12 do not have a viewable LED)

4.0 FLEX MODULE TYPES

The Flex M system comprises of a RF/CPU module and a power supply module with application-specific add-on cards in-between the CPU module and power supply module.

4.1 FLEX RF/CPU MODULE

The Flex RF/CPU Module is the main module that receives radio signals from a paired transmitter and interprets those signals into the appropriate response from the attached I/O modules. There is one RF/CPU module in the Flex M System.
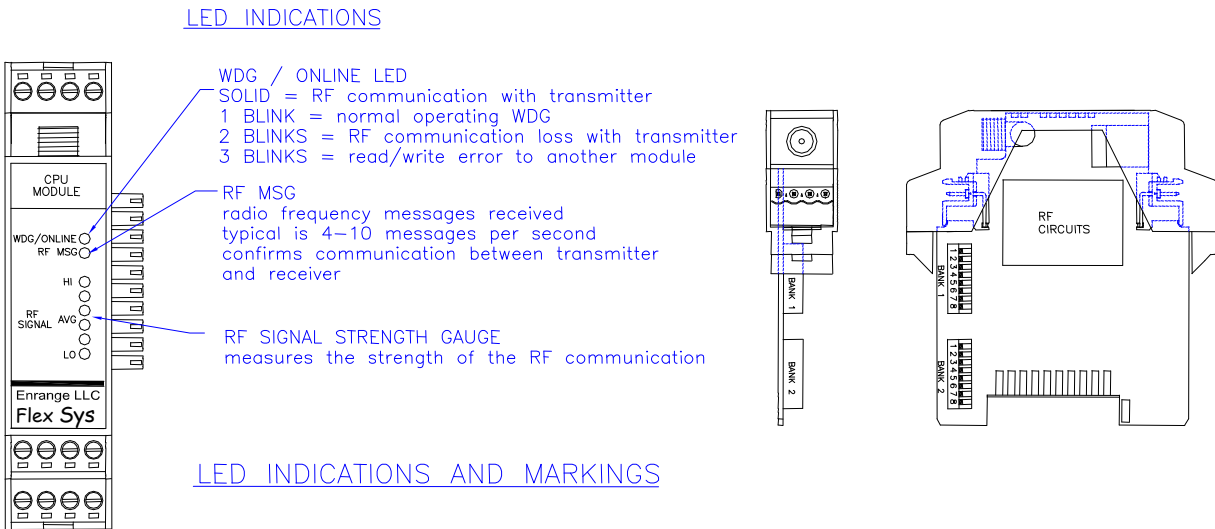

Figure 4: RF/CPU Module Detail View
(For all RF/CPU modules except 900MHz 1W(25-02-074-807E) & 900MHz 200mW(25-02-074-815E))
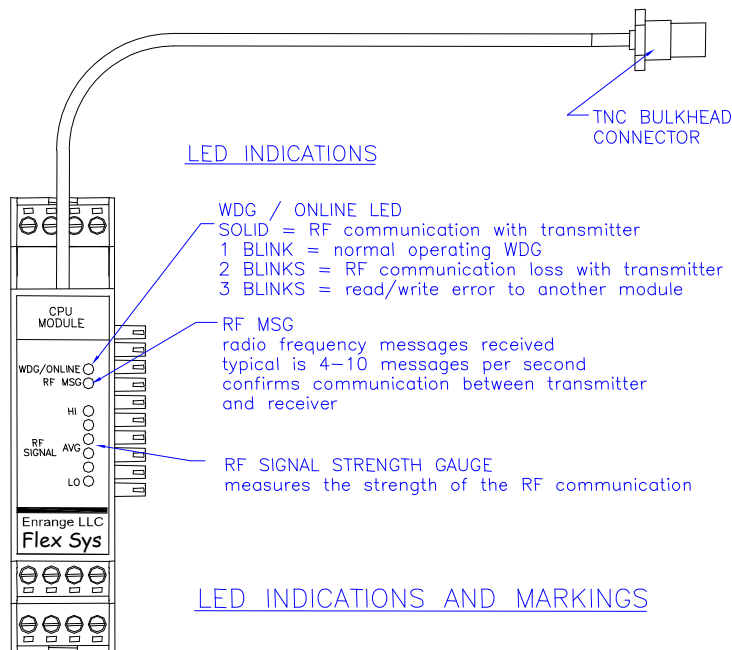
Figure 5: High Power RF/CPU Module Detail View

(For RF/CPU modules 900MHz 1W(25-02-074-807E) & 900MHz 200mW(25-02-074-815E) only)

The dip switches are used to set the channel and to set relay output type. The dip switches can be accessed by removing the module from the rail (see Section 2.4 for details on how to remove the modules from the rail). After removing the RF/CPU module from the din rail, press in the tabs to release the PCB from the housing (see Section 2.4 for details) and set the dip switches as necessary for the Flex M system utilized (Section 5.0 details switch settings for each Flex system). There are no wires to attach to the RF/CPU module aside from either an antenna or an RF Cable on the TNC antenna connection.

RF/CPU MODULE OPTIONS	
900MHz Part 15 RF/CPU Module	25-02-074-800E
900MHz 1W RF/CPU Module	25-02-074-807E
900MHz 200mW RF/CPU Module	25-02-074-815E
433MHz Part 15, version 2 RF/CPU Module	25-02-074-816E
2.4GHz 50mW RF/CPU Module	25-02-074-818E
2.4GHz 125mW RF/CPU Module	25-02-074-818E

NOTE: The high power RF/CPU Module 25-02-074-807E draws up to 1300mA of power when in use. It requires high current power supply module 25-02-074-810E to perform properly.

4.2 FLEX M POWER SUPPLY MODULE

The Flex M Power Supply Module converts the supply power to 5VDC power for all the attached Flex M modules. This power module has a maximum output supply current of 1000mA.   There is one Power Supply Module in the Flex M system.
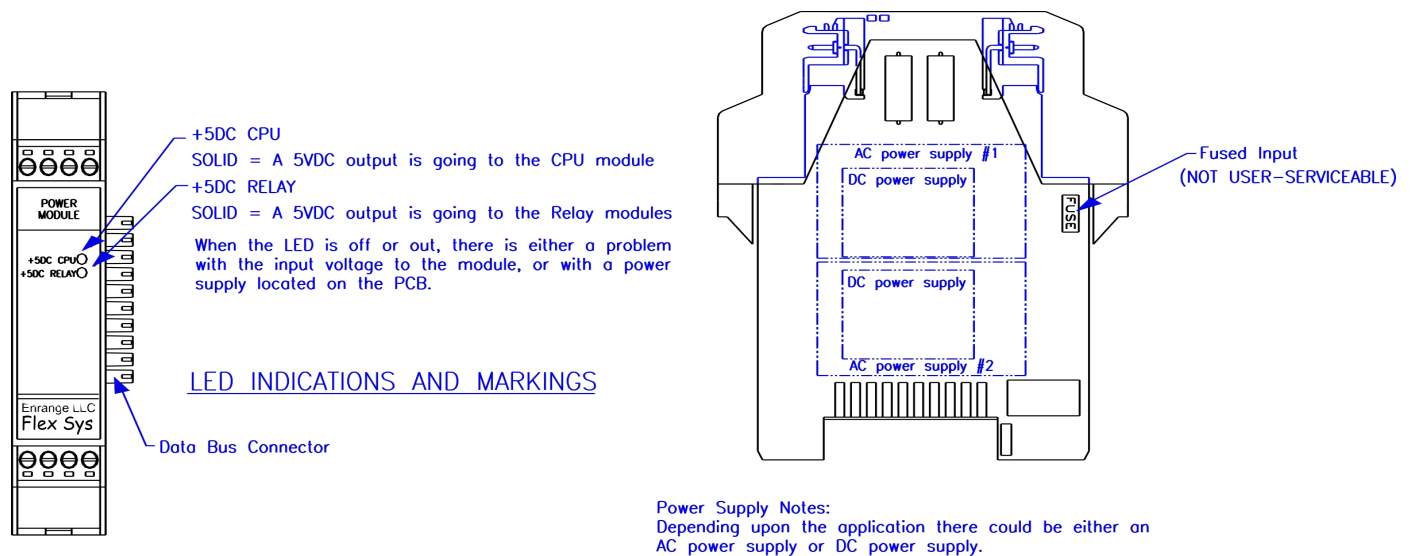
Figure 6: Power Supply Module Detail View
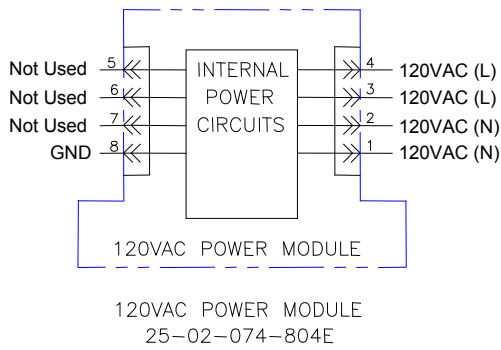
Figure 7: Typical 120VAC Power Wiring
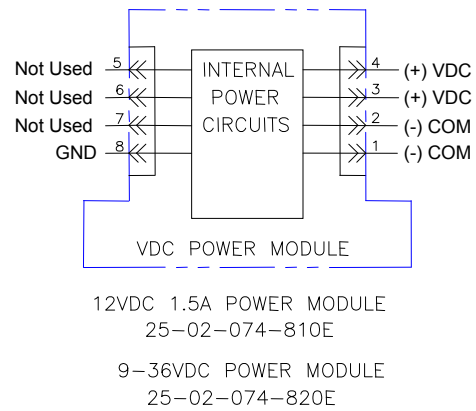
Figure 8: Typical VDC Power Wiring

Notes:

1. Although the power module has built-in protection, Magnetek strongly recommends the use of external fuses and circuit disconnects for all Flex modules.
2. The built-in fuse is not user serviceable but can be checked if troubleshooting. To check the fuse, remove the power module from the din rail as described in Section 2.3. After removing the module from the din rail, press in the tabs as noted above to remove the PCB from the housing. The fuse is location is shown in the PCB view above. Use a multimeter to check for continuity across the fuse. If the fuse is blown, contact Magnetek to send the module in for service.
3. The total system Current Consumption should not exceed the Maximum Output Supply Current of the power supply module. If additional supply current is required, contact the factory for a custom solution.

POWER SUPPLY MODULE OPTIONS			
Description	Minimum Transformer Power Rating	Max Output Current	Part Number
120VAC Power Supply Module	15VA	1000mA	25-02-074-804E
9-18 VDC @1.5A Power Supply Module	25VA	1500mA	25-02-074-810E
9-36VDC Power Supply Module	15VA	1000mA	25-02-074-820E

4.3 FLEX M RELAY MODULE

The Flex M Relay module allows the control of high current power (up to 5A) for attached equipment through 8 relay outputs. Four relays have a common power input and four relays have individually separate power inputs. The relay module number is set by the rotary switch located on the lower left corner of the board.
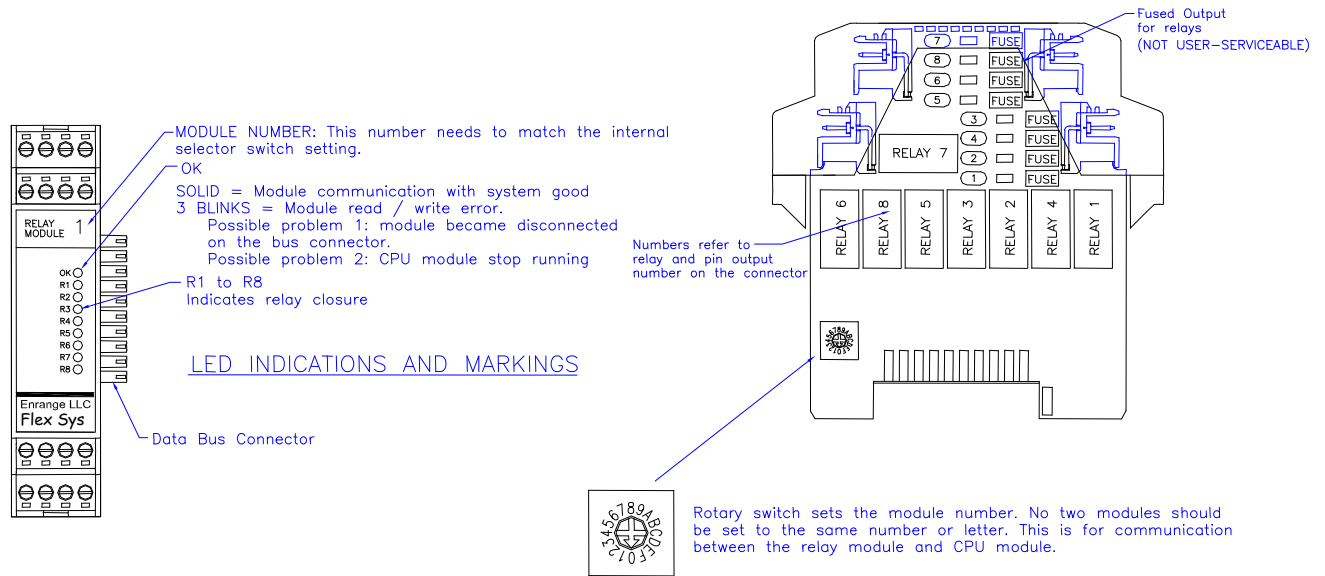
Figure 9: Relay Module Detail View
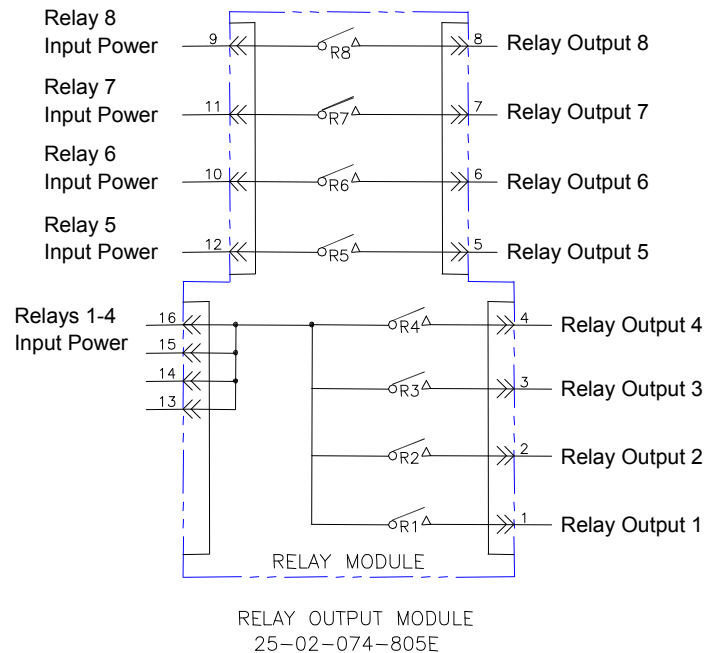
Figure 10: Typical Relay Wiring

4.4 FLEX M SERIAL COMMUNICATION MODULE

The Flex M Serial Communication module allows the communication via RS-232, RS-485/422 Full or Half Duplex and CAN-BUS 2.0B to any attached equipment supporting one of those specifications. The Serial Communications module number is set by the rotary switch located on the lower left corner of the board.
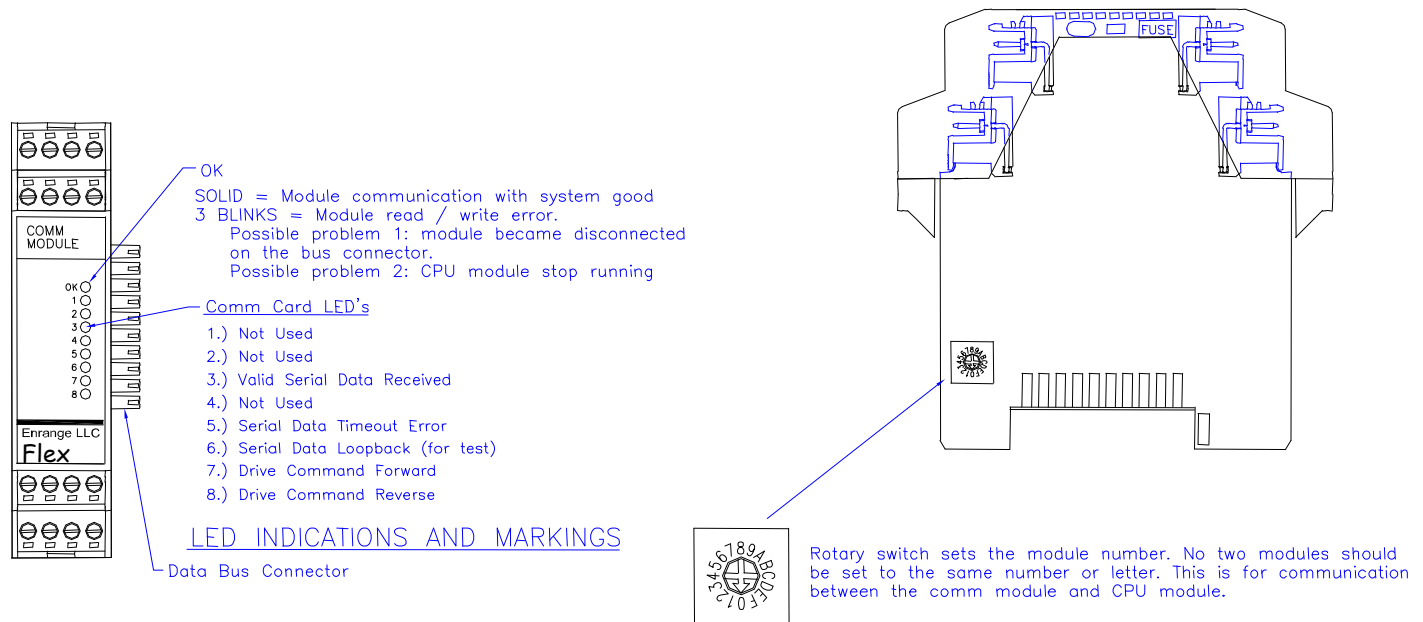
Figure 11: Serial Communications Module Detail View
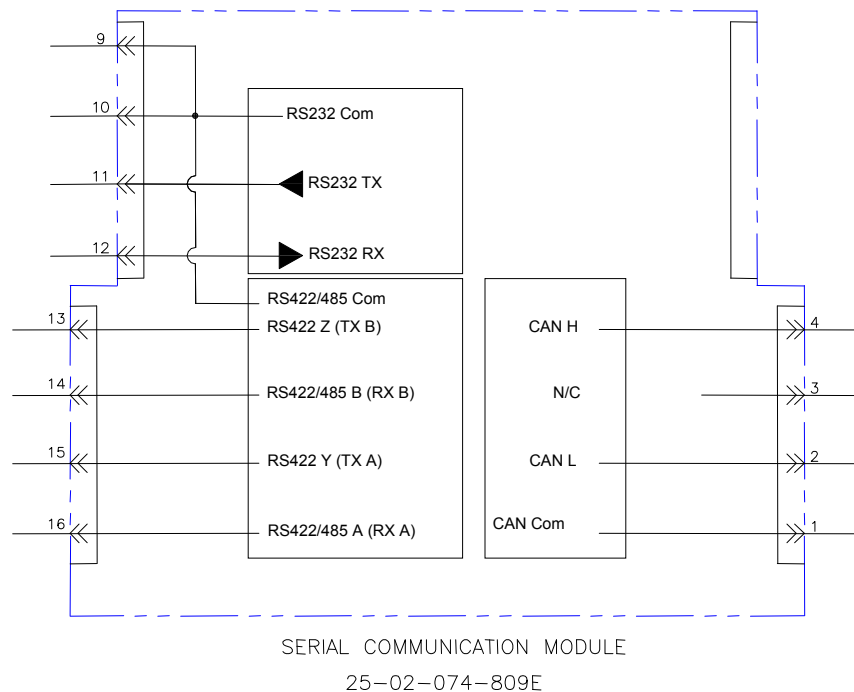
Figure 12: Typical Serial Communications Module Wiring

4.5 FLEX M ANALOG I/O MODULE

Outputs: The four analog output signals are able to send voltage signals from 0 to +/-10Vdc, at an 8bit resolution. These outputs are for reference voltage only, so each one can only supply 20mA of current. The outputs share a common ground reference, which is isolated from the Flex M system ground and any additional I/O card output ground. These outputs can be preconfigured at the factory for different voltage ranges (ex. 0-5Vdc, or 3-6-9Vdc).

Inputs: The four analog input signals are able to receive voltage signals from 0 to +10Vdc, at an 8bit resolution. The input impedance is 20K for these inputs. The inputs share a common ground reference, which is shared with the Flex M system ground.
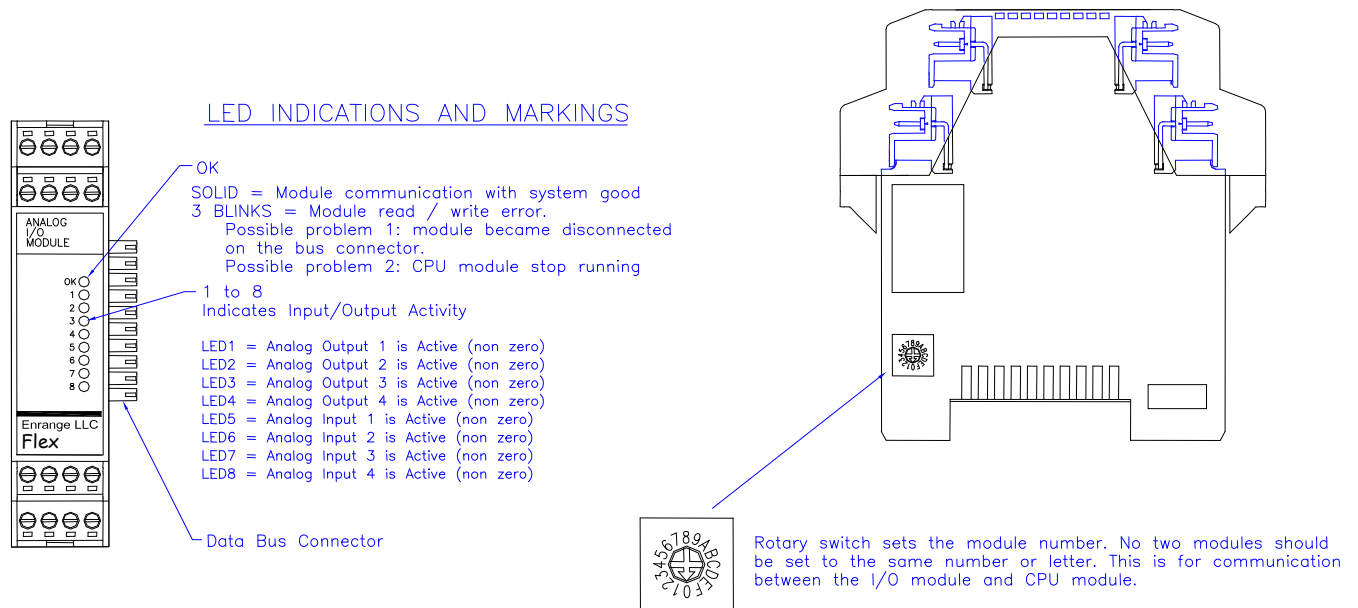
Figure 13: Analog I/O Module Detail View
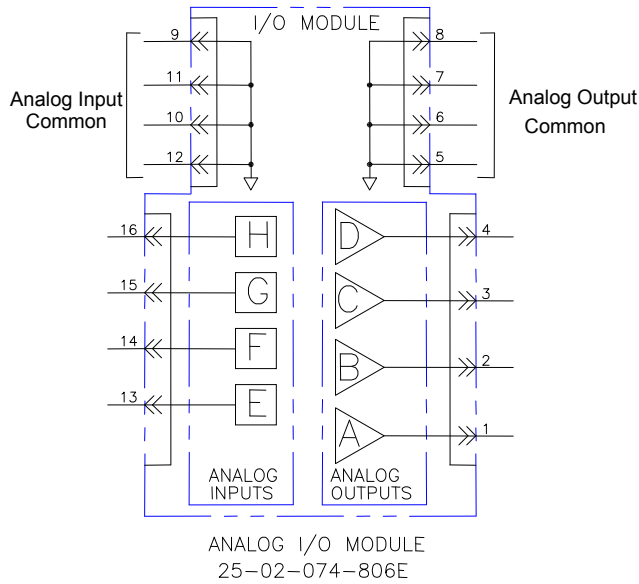
Figure 14: Typical Analog I/O Wiring

4.6 FLEX M DIGITAL INPUT MODULE

The Flex M Digital Input module allows the reading of twelve digital signals (12-24Vdc). Custom DC voltage inputs are available upon request. The 12-24Vdc power is not supplied by the card, so a separate power supply needs to be installed to power inputs. The digital input module number is set by the rotary switch located on the lower left corner of the board.
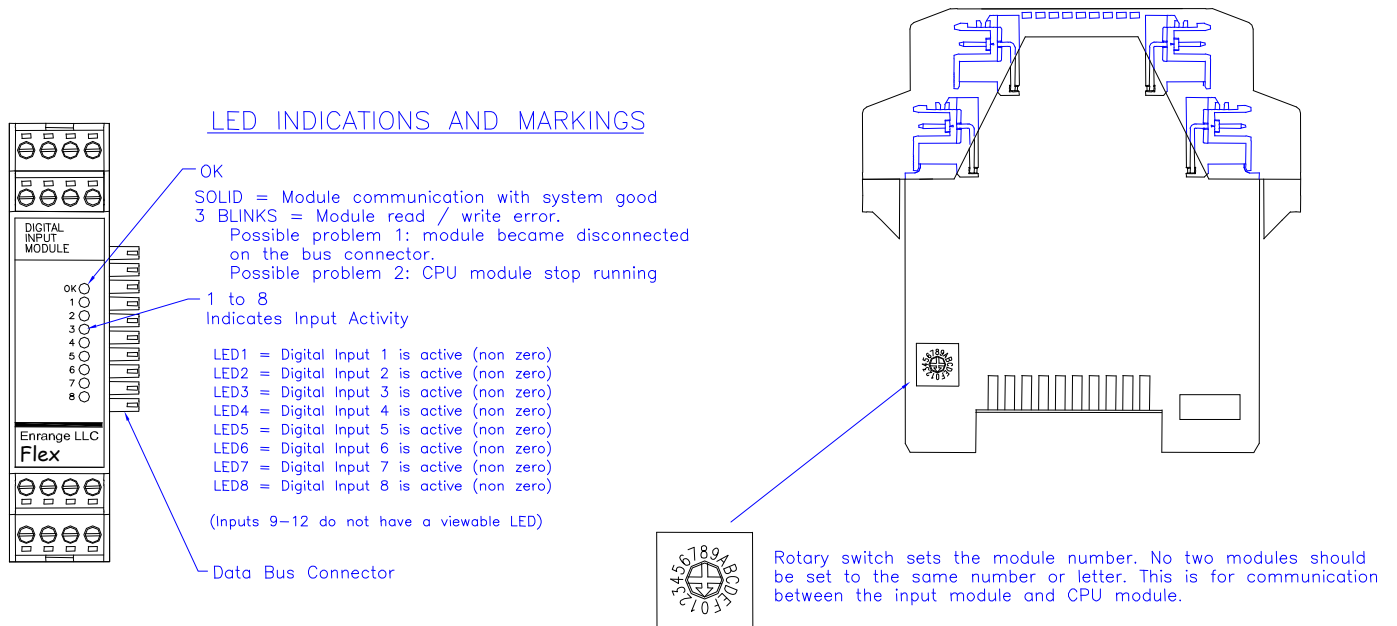
Figure 15: Digital Input Module Detail View

GND Reference for inputs 1-6   9

Input 6   11

GND Reference for inputs 1-6   10

Input 5   12

Input 1   16

Input 2   15

Input 3   14

Input 4   13

8   GND Reference for inputs 7-12

7   GND Reference for inputs 7-12

6   Input 8

5   Input 7

4   Input 12

3   Input 11

2   Input 10

1   Input 9

INTERNAL CIRCUITS

DIGITAL INPUT MODULE

DIGITAL INPUT MODULE
25-02-074-808E (12-24VDC)
25-02-074-817E (50-75VDC)
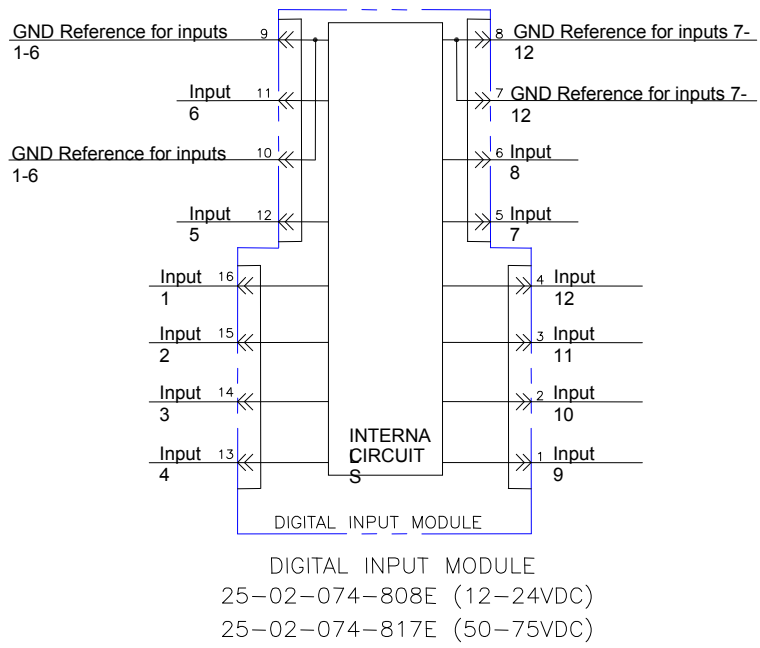
Figure 16: Typical Digital Input Module Wiring

5.0 RECEIVER CHANNEL CONFIGURATION SETTINGS (BANK 2 ON RF/CPU MODULE)

The channel can be set on the RF/CPU module via the Bank 2 dip switches. The following shows the channels or protocols available for each RF/CPU Module option.

NOTE: See section 2.4 for instructions on how to remove the CPU/RF module from the din rail and how to remove the PCB from the module housing.

5.1 CHANNEL DIP SWITCH SETTINGS FOR 900MHZ PART 15 RF/CPU MODULE (25-02-074-800E)

BANK 2
SWITCH POSITIONS

CHANNEL	SW4	SW5	SW6	SW7	SW8
A (902.30 Mhz)	DOWN	DOWN	DOWN	UP	DOWN
B (904.10 Mhz)	UP	DOWN	DOWN	UP	DOWN
C (904.30 Mhz)	DOWN	UP	DOWN	UP	DOWN
D (905.10 Mhz)	UP	UP	DOWN	UP	DOWN
E (905.50 Mhz)	DOWN	DOWN	UP	UP	DOWN
F (905.70 Mhz)	UP	DOWN	UP	UP	DOWN
G (906.60 Mhz)	DOWN	UP	UP	UP	DOWN
H (908.70 Mhz)	UP	UP	UP	UP	DOWN
I (908.90 Mhz)	DOWN	DOWN	DOWN	DOWN	UP
J (909.10 Mhz)	UP	DOWN	DOWN	DOWN	UP
K (910.10 Mhz)	DOWN	UP	DOWN	DOWN	UP
L (910.70 Mhz)	UP	UP	DOWN	DOWN	UP
M (911.00 Mhz)	DOWN	DOWN	UP	DOWN	UP
N (911.20 Mhz)	UP	DOWN	UP	DOWN	UP
O (912.00 Mhz)	DOWN	UP	UP	DOWN	UP
P (914.20 Mhz)	UP	UP	UP	DOWN	UP
Q (914.40 Mhz)	DOWN	DOWN	DOWN	UP	UP
R (914.60 Mhz)	UP	DOWN	DOWN	UP	UP
S (914.80 Mhz)	DOWN	UP	DOWN	UP	UP
T (915.80 Mhz)	UP	UP	DOWN	UP	UP
U (917.40 Mhz)	DOWN	DOWN	UP	UP	UP
V (923.20 Mhz)	UP	DOWN	UP	UP	UP
W (927.00 Mhz)	DOWN	UP	UP	UP	UP
X (927.30 Mhz)	UP	UP	UP	UP	UP

RF CIRCUITS

BANK 1

BANK 2

BANK 2

1 2 3 4 5 6 7 8

5.2 CHANNEL DIP SWITCH SETTINGS FOR 900MHZ @ 1W RF/CPU MODULE (25-02-074-807E) AND 900MHZ @ 200MW RF/CPU MODULE (25-02-074-815E)

BANK 2
SWITCH POSITIONS

CHANNEL	SW4	SW5	SW6	SW7	SW8
1	UP	UP	UP	UP	UP
2	DOWN	UP	UP	UP	UP
3	UP	DOWN	UP	UP	UP
4	DOWN	DOWN	UP	UP	UP
5	UP	UP	DOWN	UP	UP
6	DOWN	UP	DOWN	UP	UP
7	UP	DOWN	DOWN	UP	UP
8	DOWN	DOWN	DOWN	UP	UP
9	UP	UP	UP	DOWN	UP
10	DOWN	UP	UP	DOWN	UP
11	UP	DOWN	UP	DOWN	UP
12	DOWN	DOWN	UP	DOWN	UP
13	UP	UP	DOWN	DOWN	UP
14	DOWN	UP	DOWN	DOWN	UP
15	UP	DOWN	DOWN	DOWN	UP
16	DOWN	DOWN	DOWN	DOWN	UP
17	UP	UP	UP	UP	DOWN
18	DOWN	UP	UP	UP	DOWN
19	UP	DOWN	UP	UP	DOWN
20	DOWN	DOWN	UP	UP	DOWN
21	UP	UP	DOWN	UP	DOWN
22	DOWN	UP	DOWN	UP	DOWN
23	UP	DOWN	DOWN	UP	DOWN
24	DOWN	DOWN	DOWN	UP	DOWN
25	UP	UP	UP	DOWN	DOWN
26	DOWN	UP	UP	DOWN	DOWN
27	UP	DOWN	UP	DOWN	DOWN
28	DOWN	DOWN	UP	DOWN	DOWN
29	UP	UP	DOWN	DOWN	DOWN
30	DOWN	UP	DOWN	DOWN	DOWN
31	UP	DOWN	DOWN	DOWN	DOWN
32	DOWN	DOWN	DOWN	DOWN	DOWN

900MHz FHSS

BANK 2

1 2 3 4 5 6 7 8
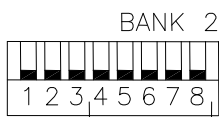
Note: Each channel consists of 50+ frequencies within 902 - 928 MHz. During operation, all available frequencies will be used by a "Frequency Hopping" protocol.

5.3 CHANNEL DIP SWITCH SETTINGS FOR 433MHZ PART 15, VERSION 2 RF/CPU MODULE (25-02-074-816E)

BANK 2
SWITCH POSITIONS

CHANNEL		SW4	SW5	SW6	SW7	SW8
1	(433.000 Mhz)	DOWN	DOWN	DOWN	DOWN	DOWN
2	(433.050 Mhz)	DOWN	DOWN	DOWN	DOWN	UP
3	(433.100 Mhz)	DOWN	DOWN	DOWN	UP	DOWN
4	(433.150 Mhz)	DOWN	DOWN	DOWN	UP	UP
5	(433.200 Mhz)	DOWN	DOWN	UP	DOWN	DOWN
6	(433.250 Mhz)	DOWN	DOWN	UP	DOWN	UP
7	(433.300 Mhz)	DOWN	DOWN	UP	UP	DOWN
8	(433.350 Mhz)	DOWN	DOWN	UP	UP	UP
9	(433.400 Mhz)	DOWN	UP	DOWN	DOWN	DOWN
10	(433.450 Mhz)	DOWN	UP	DOWN	DOWN	UP
11	(433.500 Mhz)	DOWN	UP	DOWN	UP	DOWN
12	(433.550 Mhz)	DOWN	UP	DOWN	UP	UP
13	(433.600 Mhz)	DOWN	UP	UP	DOWN	DOWN
14	(433.650 Mhz)	DOWN	UP	UP	DOWN	UP
15	(433.700 Mhz)	DOWN	UP	UP	UP	DOWN
16	(433.750 Mhz)	DOWN	UP	UP	UP	UP
17	(433.800 Mhz)	UP	DOWN	DOWN	DOWN	DOWN
18	(433.850 Mhz)	UP	DOWN	DOWN	DOWN	UP
19	(433.900 Mhz)	UP	DOWN	DOWN	UP	DOWN
20	(433.950 Mhz)	UP	DOWN	DOWN	UP	UP
21	(434.000 Mhz)	UP	DOWN	UP	DOWN	DOWN
22	(434.050 Mhz)	UP	DOWN	UP	DOWN	UP
23	(434.100 Mhz)	UP	DOWN	UP	UP	DOWN
24	(434.150 Mhz)	UP	DOWN	UP	UP	UP
25	(434.200 Mhz)	UP	UP	DOWN	DOWN	DOWN
26	(434.250 Mhz)	UP	UP	DOWN	DOWN	UP
27	(434.300 Mhz)	UP	UP	DOWN	UP	DOWN
28	(434.350 Mhz)	UP	UP	DOWN	UP	UP
29	(434.400 Mhz)	UP	UP	UP	DOWN	DOWN
30	(434.450 Mhz)	UP	UP	UP	DOWN	UP
31	(434.500 Mhz)	UP	UP	UP	UP	DOWN
32	(434.550 Mhz)	UP	UP	UP	UP	UP

433MHz

BANK 2

1 2 3 4 5 6 7 8

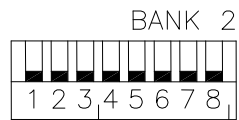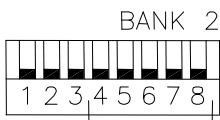**5.4 CHANNEL DIP SWITCH SETTINGS FOR 2.4GHZ @ 50MW RF/CPU MODULE (25-02-074-818E) AND 2.4GHZ @ 125MW RF/CPU MODULE (25-02-074-819E)**

BANK 2
SWITCH POSITIONS

CHANNEL	SW4	SW5	SW6	SW7	SW8
1	DOWN	DOWN	DOWN	DOWN	DOWN
2	UP	DOWN	DOWN	DOWN	DOWN
3	DOWN	UP	DOWN	DOWN	DOWN
4	UP	UP	DOWN	DOWN	DOWN
5	DOWN	DOWN	UP	DOWN	DOWN
6	UP	DOWN	UP	DOWN	DOWN
7	DOWN	UP	UP	DOWN	DOWN
8	UP	UP	UP	DOWN	DOWN
9	DOWN	DOWN	DOWN	UP	DOWN
10	UP	DOWN	DOWN	UP	DOWN
11	DOWN	UP	DOWN	UP	DOWN
12	UP	UP	DOWN	UP	DOWN
13	DOWN	DOWN	UP	UP	DOWN
14	UP	DOWN	UP	UP	DOWN
15	DOWN	UP	UP	UP	DOWN
16	UP	UP	UP	UP	DOWN
17	DOWN	DOWN	DOWN	DOWN	UP
18	UP	DOWN	DOWN	DOWN	UP
19	DOWN	UP	DOWN	DOWN	UP
20	UP	UP	DOWN	DOWN	UP
21	DOWN	DOWN	UP	DOWN	UP
22	UP	DOWN	UP	DOWN	UP
23	DOWN	UP	UP	DOWN	UP
24	UP	UP	UP	DOWN	UP
25	DOWN	DOWN	DOWN	UP	UP
26	UP	DOWN	DOWN	UP	UP
27	DOWN	UP	DOWN	UP	UP
28	UP	UP	DOWN	UP	UP
29	DOWN	DOWN	UP	UP	UP
30	UP	DOWN	UP	UP	UP
31	DOWN	UP	UP	UP	UP
32	UP	UP	UP	UP	UP

2.4GHz FHSS

BANK 2

1 2 3 4 5 6 7 8
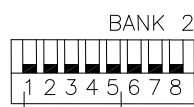
Note: Each channel consists of 43+ frequencies within 2.4GHz range. During operation, all available frequencies will be used by a "Frequency Hopping" protocol.

5.5 CHANNEL DIP SWITCH SETTINGS FOR 433MHZ TELE RF/CPU MODULE (25-02-074-816E)

#	CHANNEL	FREQUENCY	BANK 2 SWITCH POSITIONS				
			SW1	SW2	SW3	SW4	SW5
01	AK01	(439.8 Mhz)	UP	DOWN	DOWN	DOWN	DOWN
02	AK02	(439.6 Mhz)	DOWN	UP	DOWN	DOWN	DOWN
03	AK03	(439.4 Mhz)	UP	UP	DOWN	DOWN	DOWN
04	AK04	(439.2 Mhz)	DOWN	DOWN	UP	DOWN	DOWN
05	AK05	(439.0 Mhz)	UP	DOWN	UP	DOWN	DOWN
06	AK06	(438.8 Mhz)	DOWN	UP	UP	DOWN	DOWN
07	AK07	(438.6 Mhz)	UP	UP	UP	DOWN	DOWN
08	AK08	(438.4 Mhz)	DOWN	DOWN	DOWN	UP	DOWN
09	AK09	(438.2 Mhz)	UP	DOWN	DOWN	UP	DOWN
10	AK10	(438.0 Mhz)	DOWN	UP	DOWN	UP	DOWN
11	AK11	(437.8 Mhz)	UP	UP	DOWN	UP	DOWN
12	AK12	(437.6 Mhz)	DOWN	DOWN	UP	UP	DOWN
13	AK13	(437.4 Mhz)	UP	DOWN	UP	UP	DOWN
14	AK14	(437.2 Mhz)	DOWN	UP	UP	UP	DOWN
15	AK15	(437.0 Mhz)	UP	UP	UP	UP	DOWN
16	AK16	(436.8 Mhz)	DOWN	DOWN	DOWN	DOWN	UP
17	AK17	(436.6 Mhz)	UP	DOWN	DOWN	DOWN	UP
18	AK18	(436.4 Mhz)	DOWN	UP	DOWN	DOWN	UP
19	AK19	(436.2 Mhz)	UP	UP	DOWN	DOWN	UP
20	AK20	(436.0 Mhz)	DOWN	DOWN	UP	DOWN	UP
21	AKA00	(433.125 Mhz)	UP	DOWN	UP	DOWN	UP
22	AKA01	(433.325 Mhz)	DOWN	UP	UP	DOWN	UP
23	AKA02	(433.525 Mhz)	UP	UP	UP	DOWN	UP
24	AKA03	(433.725 Mhz)	DOWN	DOWN	DOWN	UP	UP
25	AKA04	(433.925 Mhz)	UP	DOWN	DOWN	UP	UP
26	AKA05	(434.125 Mhz)	DOWN	UP	DOWN	UP	UP
27	AKA06	(434.325 Mhz)	UP	UP	DOWN	UP	UP
28	AKA07	(434.525 Mhz)	DOWN	DOWN	UP	UP	UP
29	AKA08	(434.725 Mhz)	UP	DOWN	UP	UP	UP

BANK 2

1 2 3 4 5 6 7 8

433MHz TELE

5.6 FCC STATEMENTS

Compliance Statement (Part 15.19)
This device complies with Part 15 of FCC rules.
Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance should void the user's authority to operate the equipment.

This portable transmitter with its antenna complies with FCC's RF exposure limits for general population/uncontrolled exposure.

6.0 TROUBLESHOOTING

⚠️ **WARNING**

THE OPERATOR SHOULD NOT ATTEMPT TO REPAIR ANY RADIO CONTROLLER. IF ANY PRODUCT PERFORMANCE OR SAFETY CONCERNS ARE OBSERVED, THE EQUIPMENT SHOULD IMMEDIATELY BE TAKEN OUT OF SERVICE AND BE REPORTED TO THE SUPERVISOR. DAMAGED AND INOPERABLE RADIO CONTROLLER EQUIPMENT SHOULD BE RETURNED TO MAGNETEK FOR EVALUATION AND REPAIR. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

6.1 TROUBLESHOOTING TABLE

Problems	Possible Reasons	Suggestions
Receiver will not turn on, +5VDC CPU/RELAY LEDs on Power Supply Module do not light up	Supplied voltage is out of the acceptable range	Ensure the voltage is 120VAC nominal
	Internal fuse has blown on power supply module	Contact the factory for repair
	Internal Power supply on PCB has a problem	Contact the factory for repair
Receiver will not respond to the transmitter	WDG/Online LED on CPU/RF module is blinking 2 times (communication loss with transmitter), and RF MSG LED does not blink.	Make sure the receiver and transmitter unit are both within range. Also verify that the transmitter is still on.
	WDG/Online LED on CPU/RF module is blinking 1 time (normal operating WDG), RF MSG LED does not blink and RF Signal strength LEDs are indicating a signal strength.	Make sure the receiver and transmitter unit have the same access code.
	WDG/Online LED on CPU/RF module is blinking 1 time (normal operating WDG), RF MSG LED does not blink and RF Signal strength LEDs are indicating an erratic signal.	Make sure the receiver and transmitter are both set to the same channel.
	WDG/Online LED on CPU/RF module is blinking 3 times, read/write error with relay modules	Make sure that the modules are securely put together; if the problem persists, contact factory for repair.
	The antenna on the receiver is missing, damaged, or improperly installed.	Inspect the antenna on the receiver for damage and try to place the antenna in a location that is visible when operating the equipment at all times.

Problems	Possible Reasons	Suggestions
Receiver responds to the transmitter inconsistently	The transmitter is going in and out of range (transmitter and receiver are on the edge of the transmission range)	Move the transmitter and the receiver closer together
		Relocate the receiver antenna to where it is in more line of sight with the transmitter
	The antenna and/or cable on the receiver is damaged, or improperly installed.	Inspect the antenna on the receiver for damage and try to place the antenna in a location that is visible when operating the equipment at all times.
Drive Connected to Serial Communication Card does not respond	LED #6 is lit up, module is wired in test mode (drive connection is being simulated)	Ensure wiring of the drive(s) to the Serial communication card is correct
The MLC (Master) Relay turns off during normal operation	The transmitter powered down due to inactivity.	Extend the inactivity timeout setting for the transmitter.
	The transmitter powered down due to low batteries	Replace the transmitter's batteries.
	The RF/Message LED stops blinking for more than 3 seconds, followed by the MLC Relay turning off.	Radio interference; change the system's channel setting.
	The RF/Message LED stopped and the MLC Relay turned off together within 1 sec, possibly when engaging or disengaging another relay that is driving a contactor.	CPU module is resetting. Install snubbers across the coils of all contactors to reduce transient voltages. Ensure that the power module has a stable power source.
	The serial data timeout error LED (LED #5) on the serial communication card is lit. Drive serial communication is inactive or was inactive for more than 1 sec. MLC Relay turned off together when LED is lit.	Error is reset when transmitter issues a start command. Inspect serial communication wiring to ensure there are no breaks, poor connections or damage to the wiring.

6.2 ASSEMBLY AND REPLACEMENT PARTS

Description	Part Number
900MHz Part 15 RF/CPU Module	25-02-074-800E
900MHz @ 1W RF/CPU Module	25-02-074-807E
900MHz @200mW RF/CPU Module	25-02-074-815E
433MHz Part 15, version 2 RF/CPU Module	25-02-074-816E
2.4GHz @50mW RF/CPU Module	25-02-074-818E
2.4GHz @125mW RF/CPU Module	25-02-074-819E
120VAC Power Supply Module	25-02-074-804E
12VDC @ 1.5A Power Supply Module	25-02-074-810E
9-36VDC Power Supply Module	25-02-074-820E
Relay Module (8 Mechanical relay outputs)	25-02-074-805E
Serial Communication (RS232, RS485, CAN 2.0b) Module	25-02-074-809E
Analog I/O Module (4 0 to +/-10VDC Outputs and 4 0 to +10VDC Inputs)	25-02-074-806E
Digital Input Module (12 12-24VDC Inputs)	25-02-074-808E
Digital Input Module (12 50-75VDC Inputs)	25-02-074-817E
915MHz Antenna Kit (20' Cable, Antenna and Bracket)	178-01377-0330
915MHz Antenna Kit (20' Cable, 10' Cable, Antenna & Bracket)	178-01377-2330
915MHz Antenna Kit (40' Cable, Antenna and Bracket)	178-01377-0320
915MHz Antenna Kit (40' Cable, 10' Cable, Antenna & Bracket)	178-01377-2320
2.4GHz Antenna Kit (20' Cable, Antenna and Bracket)	178-01377-0430
2.4GHz Antenna Kit (20' Cable, 10' Cable, Antenna & Bracket)	178-01377-2430
2.4GHz Antenna Kit (40' Cable, Antenna and Bracket)	178-01377-0420
2.4GHz Antenna Kit (40' Cable, 10' Cable, Antenna & Bracket)	178-01377-2420
400MHz Antenna Kit (20' Cable, Antenna and Bracket)	178-01377-0530
400MHz Antenna Kit (20' Cable, 10' Cable, Antenna & Bracket)	178-01377-2530
400MHz Antenna Kit (40' Cable, Antenna and Bracket)	178-01377-0520
400MHz Antenna Kit (40' Cable, 10' Cable, Antenna & Bracket)	178-01377-2520
NEMA 4 Enclosure, Steel (16"x14"x6") for Flex M RX, mounted	20-101-0031E
Module Replacement Plugs	01-300-0031E
Arc Suppressor/Snubbers	20-680-0000E

7.0 NOTES: