



*Manufacturers of Process  
Controls and Instrumentation*

# ***Instruction Manual***

Model: *MTS-XXX*

Function: *Modular Telemetry System*

- Module:
- XXX=8DI: 8-Channel Digital Input*
  - XXX=8DO: 8-Channel Digital Output*
  - XXX=4AI: 4-Channal Analog Input*
  - XXX=4AO: 4-Channel Analog Output*
  - XXX=PWR: Power Distribution*
  - XXX=RAD: Radio Communication*
  - XXX=4DIO: 4-Channel Digital Input & Output*

Input:  (8) Dry Contact  
 \_\_\_\_\_

Serial #: \_\_\_\_\_

(If special or required)

For Technical Assistance And Questions Call  
USA: (231) 788-2900 CANADA: (905) 660-5336

## **Restocking Policy**

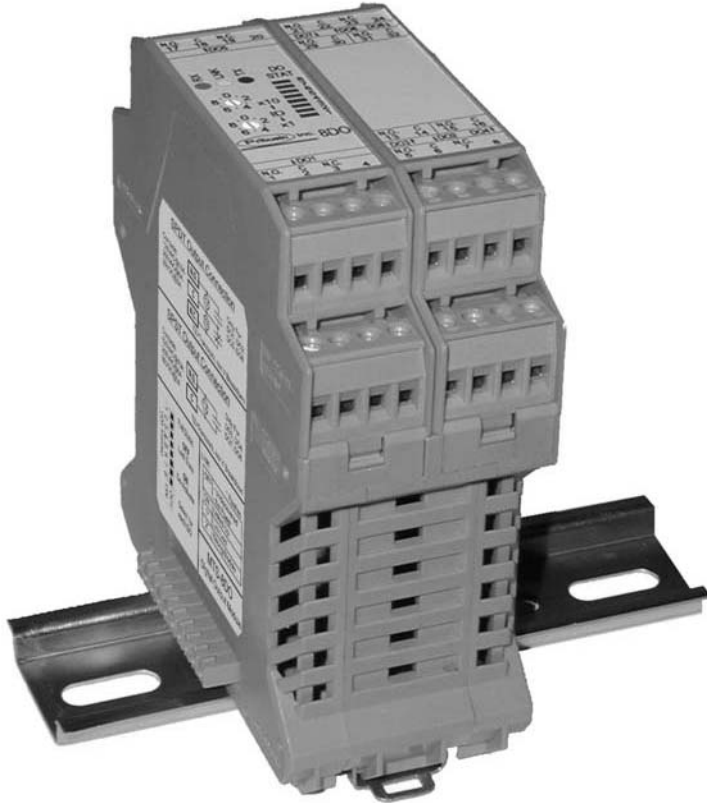
**All product returned to Pribusin Inc. in prime condition (not damaged, scratched or defaced in any way) within seven (7) months from the original date of shipment is subject to a 50% restocking charge. All product must be accompanied by a Return Authorization number (RA number) which must be obtained from Pribusin Inc. prior to returning any product.**

**After seven (7) months from the original date of shipment, products cannot be returned for restocking.**

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### Function:

The MTS-4DIO is a 4 channel digital input and output module. It provides bidirectional digital input and output capability for an MTS series telemetry system. There are 4 digital inputs (wet or dry) and 4 Digital outputs (form 'A' Relay contacts). The MTS-4DIO communicates with another MTS-4DIO module.

Each input can be configured as a dry or wet contact input. An adjustable ON/OFF delay can be invoked to provide hysteresis. The input status of each channel is indicated individually. While an input is in its ON or OFF delay mode the indicator flashes.

Relay outputs can be configured to go into a predetermined state during communication fail events.

Deployment and installation is as simple as plugging the needed I/O modules into the communications module and assigning unique module ID's. Power and communication for the modules are provided through an integral bus.

### Standard Features:

- 4 Digital Inputs & 4 Digital Outputs (Relay Contacts)
- Inputs Individually Selectable as Dry or Wet Contacts
- Selectable Fault Condition State for Digital Outputs
- Input & Output Status Indication
- Adjustable On/Off Delay For Input Hysteresis
- Integrated Power & Data Bus Reduces Wiring
- Modular Design Provides Maximum Flexibility
- No Programming Required - Easy to Configure
- Microprocessor Controlled for High Accuracy
- Power: 24 VDC (From Integrated Bus)
- Easy Future Expansion

### Configuration:

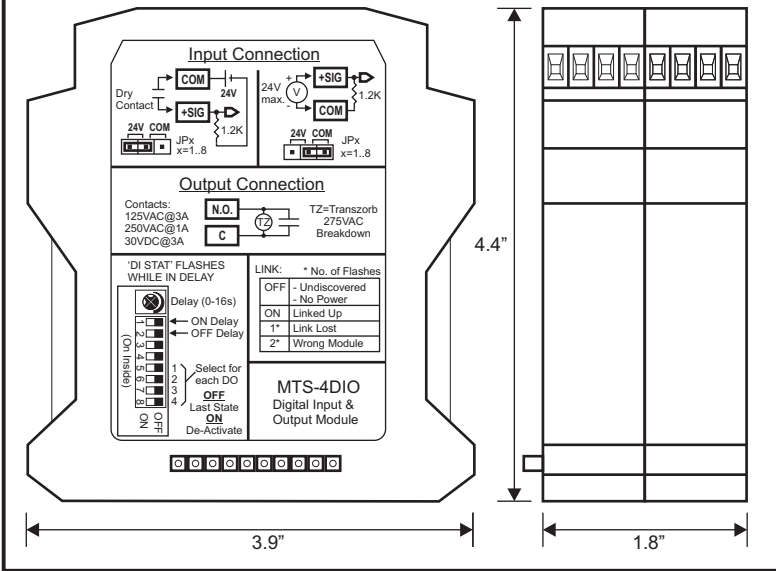
The MTS-4DIO module must be paired up with another MTS-4DIO module. Both modules must be set to the same ID with the ID Selector Switches. Each input can be selected as 'Dry Contact' input or 'DC Signal' input with jumpers JP1-JP4. An ON/OFF delay can be imposed from 0-16 seconds to filter out nuisance signals or noise.

### Specifications:

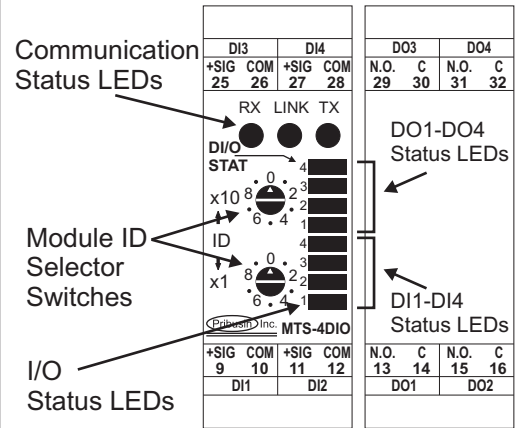
- Inputs: 4 Dry Contact (24V excitation from Module) or 4 DC Signal (0-24VDC max.)
- Input Impedance: 1200 ohms
- Reverse Polarity Protection (Input): Yes
- Outputs: 4 SPST Relay Contacts
- Contact Rating: 125VAC/3A; 250VAC/1A; 30VDC/3A
- Contact Arc Suppression: Yes (MOV)
- Power Consumption: 0.5VA (All I/O Open)  
4.8VA (All I/O Closed)

# MTS-4DIO

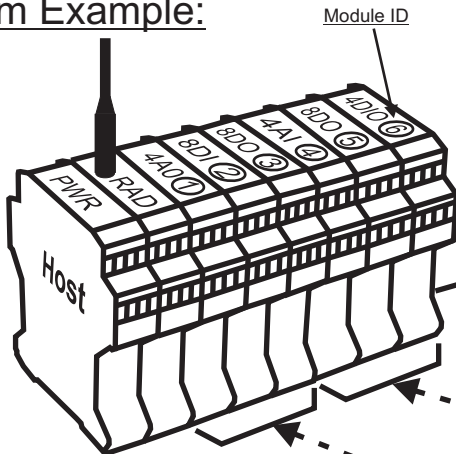
## Module Dimensions:



## Top View:



## System Example:



- Each Input module must have an Output module counterpart
- Each module pair uses the same module ID
- One host radio module can communicate with up to 99 remote radio modules
- Module pairs may be arranged to exchange signals either from Host-to-Remote or Remote-to-Host

Part No.	Description
MTS-RAD	Wireless Communication Interface
MTS-4DIO	4 Digital Inputs & 4 Digital Outputs
MTS-8DI	8 Digital Inputs
MTS-8DO	8 Digital Outputs
MTS-4AI	4 Analog Inputs
MTS-4AO	4 Analog Outputs
MTS-1FI	1 Frequency/Pulse Input
MTS-1FO	1 Frequency/Pulse Output
MTS-PWR	24VDC Power Module

## Manufactured By:

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## **MTS-4DIO Functional Description:**

The MTS-4DIO is an 4-channel digital input **and** 4-channel digital output module. It reads the input status of its 4 inputs and transmits it via an MTS communications module to its counterpart, another MTS-4DIO digital output module. It then receives the 4 inputs from its counterpart module and passes them to its 4 outputs. Both modules must be set to the same module ID to allow them to communicate.

Inputs can be configured as *dry contacts* or 0-24VDC on-off signals (also known as *wet contacts*). Power and communication signal connections are achieved via the integral connector at the bottom of the module. Assembling a stack of several MTS modules on a DIN Rail and sliding them together is all that is required to interconnect I/O modules with a communications or power module.

### **Input Types:**

Each of the 4 inputs can be configured individually to be either a *dry contact* or *wet contact*. 4 jumpers on the inside of the module select between *dry contact* (24V position) and *wet contact* (COM position) input type.

Dry Contact Input: If an input is configured as a *dry contact* the MTS-4DIO provides 24VDC excitation on the COM terminal of the input. The +SIG terminal is used as the return signal. A closed contact will produce a current flow of approximately 20mA from COM to +SIG.

Wet Contact Input: If an input is configured as a *wet contact* the MTS-4DIO sinks a voltage signal from 0-24VDC at the +SIG terminal through a 1.2K $\Omega$  to the COM terminal. A voltage input between 0 and 1 VDC is considered an open input. A voltage input from 5-24VDC is considered a closed input.

### **Input Indication:**

Each of the 4 inputs has its own status indicator. If the input is open then the indicator is off; if the input is closed then the indicator is on. A flashing indicator means that the input is currently in transition mode and is being delayed by either the ON delay or OFF delay setting.

### **Input Delay (Hysteresis):**

The MTS-4DIO has selectable hysteresis settings for both ON (input closing) and OFF (input opening). A selected hysteresis setting affects all 4 inputs collectively. The hysteresis is implemented by a selector DIP switch that activates the function and a trim-pot that selects the amount of hysteresis. The trim-pot adjusts the input hysteresis from 1-16 seconds. The same trim-pot value is used for both ON and OFF hysteresis.

If an input is changing state and the new state has the input hysteresis function activated, the status indicator for that input will flash for the length of time selected by the trim-pot. Once the hysteresis delay has expired the status indicator will go solid.

### **Output Contacts:**

Each of the 4 outputs is a separate relay with SPST contacts. All relays are normally de-energized and become energized when the corresponding input on the MTS-4DIO module closes.

### **Output Indication:**

Each of the 4 outputs has its own status indicator. If the output is off and the relay is de-energized the indicator for that output is off. If the output is on and the relay is energized the indicator for that output is on.

### **Output Fail Status:**

In the event of a communications failure between the MTS-4DIO and its counterpart module, each of the 4 relay outputs can be configured to either remain in its last state or be forced into its de-energized state.

### **Output delay Due To Input Delay (Hysteresis):**

The outputs of the MTS-4DIO may be delayed by a hysteresis setting on the counterpart MTS-4DIO module. The MTS-4DIO has selectable hysteresis settings for both ON (input closing) and OFF (input opening). If hysteresis is active on the counterpart MTS-4DIO, the outputs on the local MTS-4DIO will not change state until the hysteresis delay on the counterpart MTS-4DIO has expired. See above for more details on input hysteresis configuration.

# MTS-4DIO Installation:

## Physical Mounting:

The MTS-4DIO module easily snaps onto standard 35mm top-hat style DIN rail for mounting. Each module has a 10-position interconnect bus near the base that provides power and inter-module communication. Once modules are snapped onto the DIN rail they simply slide together and connect via their integrated interconnect bus. See figure 1 below for an illustration.

To remove a module, slide it off the end of the DIN rail or insert a screwdriver into the slot of the retaining clamp at the base of the module and push the screwdriver towards the module – now lift it out.

**WHEN ASSEMBLING A STACK OF MODULES OR ADDING OR REMOVING A MODULE MAKE SURE POWER TO THE WHOLE STACK IS OFF.**

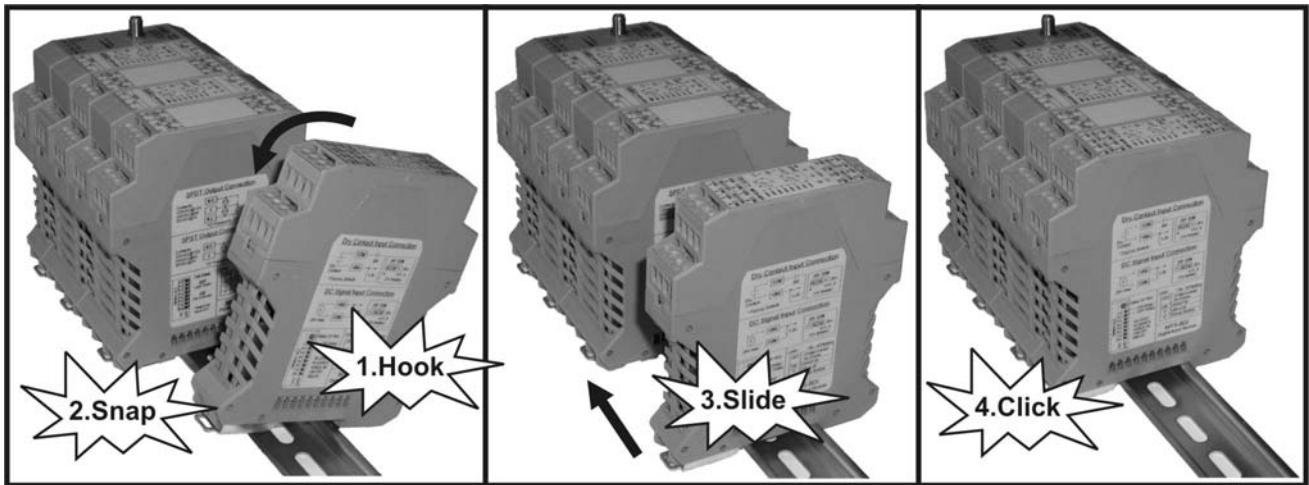


Figure 1

## Signal Wiring:

To facilitate easy installation, all terminals are plug-in style and can be removed for wiring purposes. Figure 2a shows the arrangement of the various inputs.

**WARNING: MORE THAN ONE LIVE CIRCUIT – SEE DIAGRAM.**

**AVERTISSEMENT: PLUS QU'UN CIRCUIT SOUS TENSION – VOIR LE DIAGRAM**

**WARNING: EXPLOSION HAZARD. DO NOT DISCONNECT WHILE CIRCUIT IS LIVE OR UNLESS THE ARE IS KNOW TO BE FREE OF IGNITIBLE CONCENTRATIONS OF FLAMMABLE GASES OR VAPORS.**

**AVERTISSEMENT: RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.**

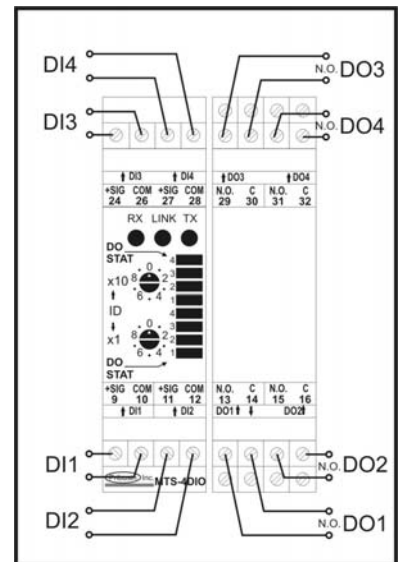


Figure 2a

### Signal Wiring (cont'd):

Figure 2b shows how inputs of the same type (Dry or Wet) can make use of a common return wire. Use any of the COM terminals to connect to the common side of all input contacts or signals and the individual +SIG terminals to connect to the individual signal sources.

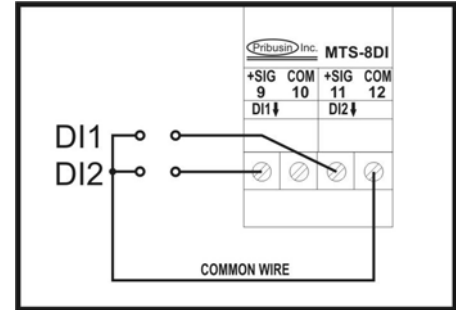


Figure 2b

Figure 3a shows the typical input wiring for an input that is configured as a Dry Contact. The COM terminal is connected internally to the +24V supply to provide the excitation for the Dry Contact.

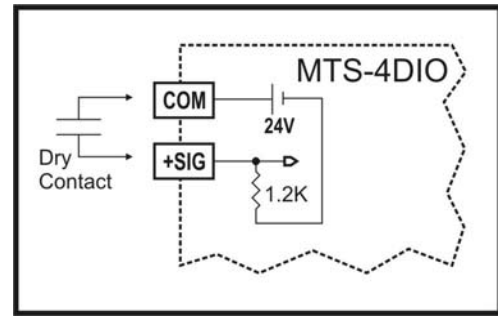


Figure 3a

Figure 3b shows the typical input wiring for an input that is configured as a Wet Contact. The COM terminal is connected internally to the system common.

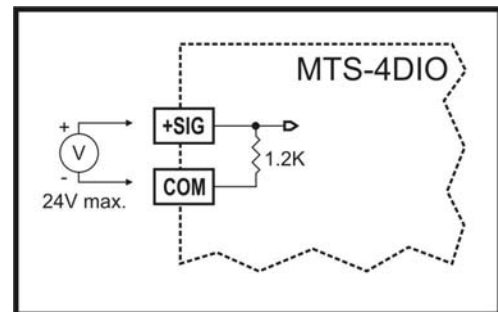


Figure 3b



## MTS-4DIO Configuration:

To configure some functions of the MTS-4DIO it may be necessary to remove the circuit board and cover assembly from the enclosure body. When doing so, make sure that you adequately protect yourself against static electricity buildup by wearing proper grounding straps.

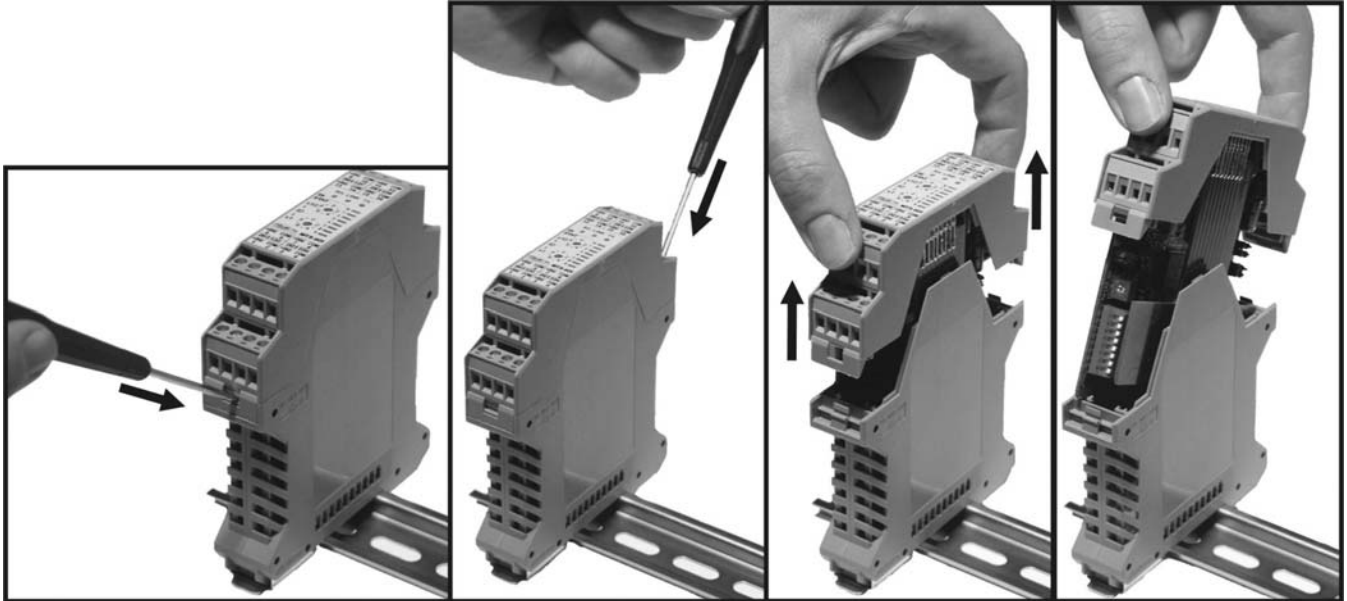


Figure 4

Figure 4 shows how to open the MTS enclosure. **Before proceeding, make sure all power is turned off to the MTS stack.** Using a small screwdriver, push in the two locking tabs on either side of the MTS just below the lower terminal plug. This unlocks the cover. Gently pull on the cover away from the enclosure body until the circuit board is free of the enclosure. Make the necessary adjustments and replace the cover and board assembly in the same orientation as it was removed. Be sure not to accidentally rotate the assembly by 180° when re-inserting it into the enclosure body. When inserting the lower end of the circuit board(s), make sure the board(s) slides into the guide-rails on the inside of the enclosure. Gently push on the top cover until it is firmly seated and the locking tabs click in place.

### Input Configuration:

Each input can be configured as a *Dry Contact* or a *Wet Contact* input. A jumper on the circuit board inside the enclosure determines the type for each input. Each jumper has two positions: 24V and COM. The 24V position is for a *Dry Contact* input and the COM position is for the *Wet Contact* input.

Figure 5 shows the location of these jumpers. The upper right corner of Figure 4 shows two jumpers enlarged. DI1 is in the 24V position (Dry Contact) and DI2 is in the COM position (Wet Contact).

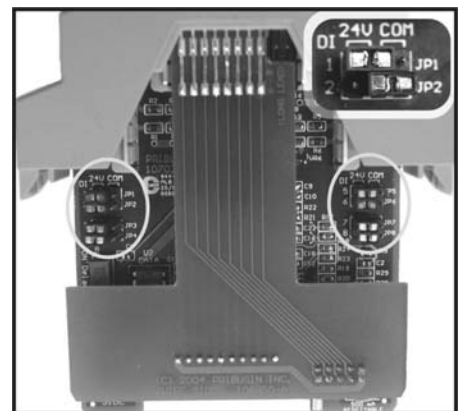
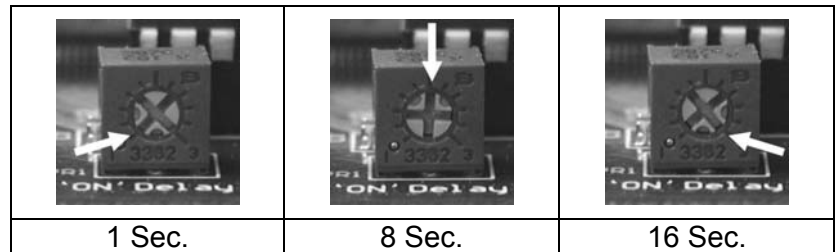


Figure 5

**Input Configuration (cont'd):**

Hysteresis can be added to all inputs in the form of ON Delay and OFF Delay. A trim-pot is used to adjust the amount of delay from 1-16 seconds. Two DIP switches are then used to enable the ON and OFF delay. The delay amount set by the trim-pot is the same for both the ON and OFF delay.



If the ON Delay is active and an input changes state to ON, the indicator light for that input will flash for the amount of time determined by the delay trim-pot. Once the delay has expired, the input indicator will go solid ON and the module now recognizes the input as ON. Similarly, if the OFF Delay is active and an input changes state to OFF, the indicator light for that input will flash for the amount of time determined by the delay trim-pot. Once the delay has expired, the input indicator will go solid OFF and the module now recognizes the input as OFF.

Hysteresis	SW1	SW2	
No Delays	UP	DOWN	
ON Delay	DOWN	UP	
OFF Delay	UP	DOWN	
ON & OFF Delay	DOWN	DOWN	

**Output Fail State Configuration:**

In the event of a communications failure between the MTS-4DIO and its counterpart MTS-4DIO module, each of the 4 relay outputs can be configured to either remain in its last state or be forced into its de-energized state. The last four of the eight DIP switches (SW5..SW8) controls the fail status of one output relay (DO1..DO4). With a DIP switch in the UP position the corresponding relay will remain at its last state indefinitely until communications is restored or the power to the module is interrupted. With a DIP switch in the DOWN position the corresponding relay will be forced to the de-energized state until communications is restored.

Output Fail State	SWx (x=5..8)	
Last State	UP	
De-Energize	DOWN	

**Module ID:**

An MTS system consists of at least two ‘stacks’ of modules – one host stack and one or more remote stacks. Each stack consists of a communications module and one or more I/O modules. Each I/O module must be assigned a Module ID before it will be recognized in a stack. Module ID’s allow multiple I/O modules to share the common communications module.

MTS modules always operate in pairs - one input module is paired up with one output module. These two modules are assigned the same Module ID so that they can communicate with one another from one stack to the other. These two modules are also the *only two* modules in an MTS system that have that particular Module ID. One module is part of the host stack and the other module is part of a remote stack.

Module ID’s in a stack of MTS modules do not have to be consecutive but must be unique – there cannot be two modules with the same Module ID in one stack. Module ID’s range from 1-99 and are set using the two rotary switches on the top of each I/O module. One switch is for the 1’s digit and the other for the 10’s digit of the Module ID. Figure 6 shows some examples of Module ID’s.

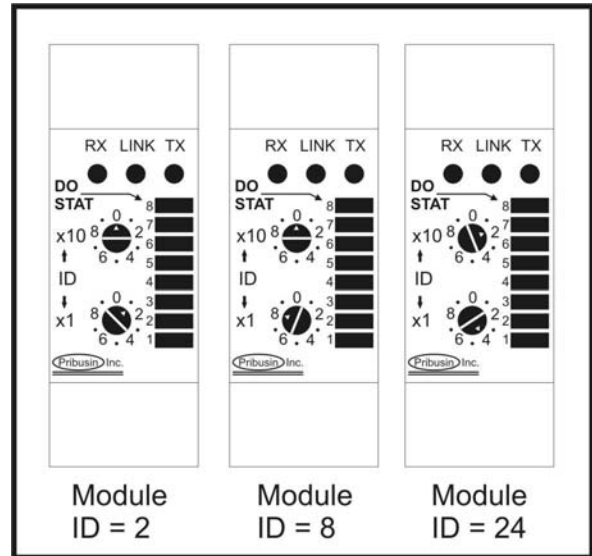


Figure 6

Figure 7 shows a typical MTS system consisting of one Host Stack and two Remote Stacks.

Module ID’s in a system do not have to be consecutive (Module ID’s 4 & 5 are not present).

Only two modules can have the same Module ID: one of them is an input module, the other is an output module. Input and output modules may be located on either the Host or Remote stacks depending on which way the signal is intended to be sent.

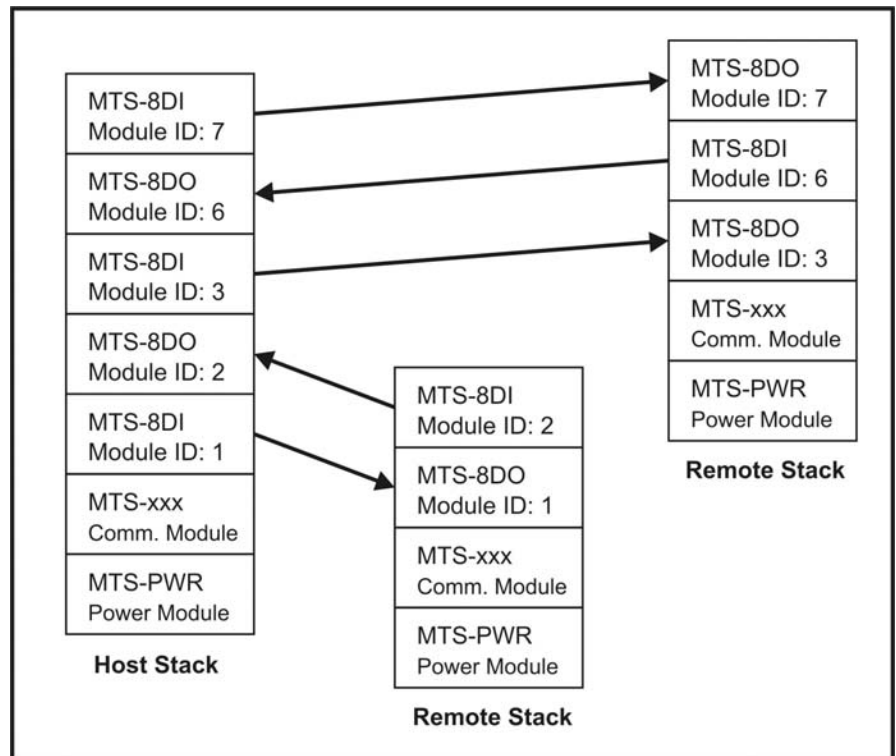


Figure 7

## MTS-4DIO Operation:

When an MTS system is first powered on, there is a brief time of inactivity (approx. 30 seconds) while the Communication Modules discover which I/O modules are present in their stack. After the discovery period is over, the modules on the Host Stack will begin communicating with their counter part modules on a Remote Stack. Communication occurs one module at a time and in numerical order for all Module ID's present on the Host Stack. A careful observer can witness this by the TX (transmit) and RX (receive) lights on each module.

### Link Status Light:

Once two modules have communicated for the first time, they illuminate their Link lights to indicate that the modules have found each other and that a successful data exchange has taken place. This Link light will remain in a solid on state while communication between the two modules continues to be successful.

The Link light will flash when there is a problem with the communication between the two modules. Several flashing sequences indicate the nature of the problem.

Link Status	Description
Off	Undiscovered or No Power
On	Linked with other Module
1 Flash	Link with other Module Lost
2 Flashes	Linked with Wrong Module Type

A **single flash** indicates that the module has lost communication with its counterpart module. Reasons for this include, but are not limited to:

Problem	Check
'Other Stack' lost Power	<ul style="list-style-type: none"> <li>• Verify power on 'Other Stack'</li> <li>• Check other Modules - Not likely if another Module from the 'Other Stack' is still communicating with a Module from 'This Stack'</li> </ul>
Communication Module Bad on 'This Stack'	<ul style="list-style-type: none"> <li>• Check other Modules on 'This Stack' – Not Likely if any are still linked and communicating</li> </ul>
Bad counter-part I/O Module on 'Other Stack'	<ul style="list-style-type: none"> <li>• Check TX/RX Lights on Module on 'Other Stack'</li> </ul>
Bad I/O Module on 'This Stack'	<ul style="list-style-type: none"> <li>• Check TX/RX Lights on Module on 'This Stack'</li> </ul>

The above table describes some scenarios that could result in lost communication. For further assistance please contact your local representative or Pribusin Inc.

A **double flash** indicates that the module is trying to communicate with a counter-part module that is not the correct input or output type. Examples of this are: 1) an analog module tries to communicate with a digital module or 2) an input module tries to communicate with another input module. This is most likely the result of improperly assigned Module ID's. Check all Module ID's carefully and make sure that modules with the same ID are the correct pair (one input and one output) and that they are of the same type (both digital or analog, but not mixed).

## MTS System Overview:

This section describes the concept and operation of a typical MTS system. The example below uses two remote sites, labeled 'Remote 1' and 'Remote 2'. Following are important points to note when designing or installing an MTS system:

- Every MTS system has one Host Stack and one or more Remote Stacks
- Each stack consists of at least one power module (MTS-PWR), one communications module (MTS-xxx, see table below for xxx), and one or more I/O modules
- I/O modules are always paired (one input module and one output module)
- One module of each pair (either input module or output module) **MUST** be on the Host Stack
- Each module pair **MUST** use the same Module ID
- Modules may be arranged to send their signals from Host-to-Remote or Remote-to-Host depending on which stack the input and output modules are located

Figure 8 shows a typical two remote system with a mixture of I/O modules arranged in ways so that some modules send signals from the Host Stack to the Remote Stacks while other modules send signals from a Remote Stack back to the Host Stack.

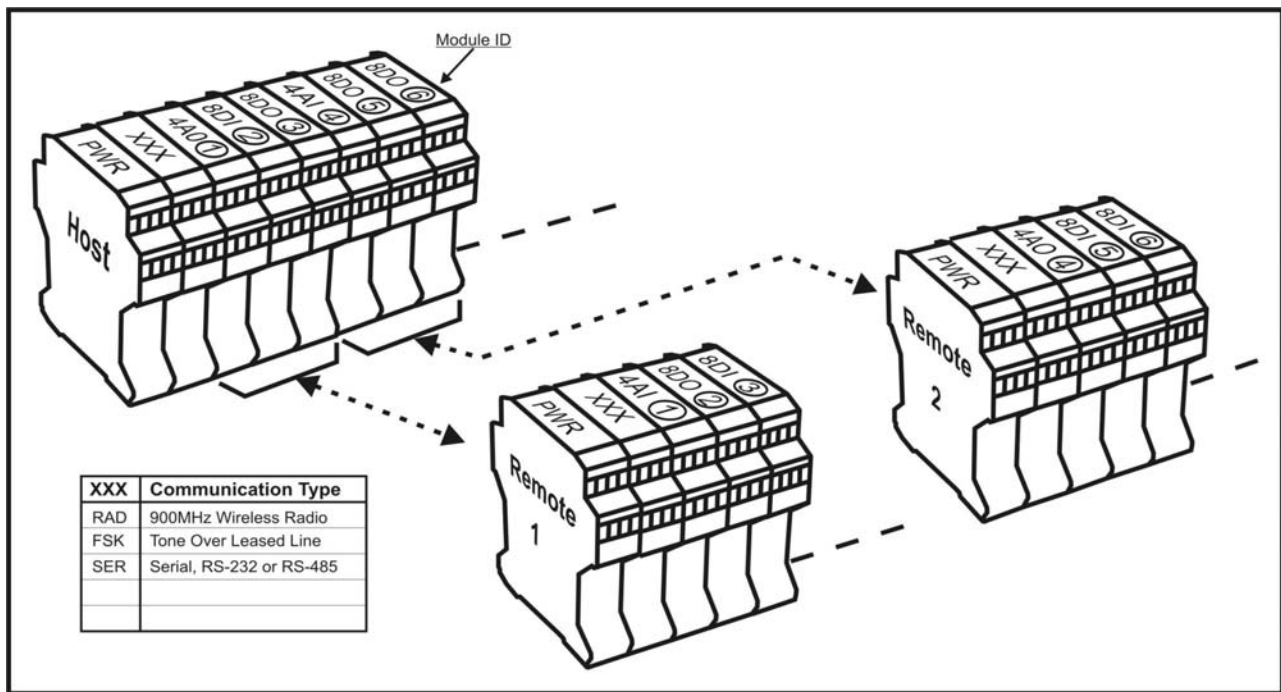


Figure 8

This table shows the modules that are currently available. Check our website at [www.pribusin.com](http://www.pribusin.com) or with your local representative for the latest list of available modules.

Model No.	Description
MTS-RAD	900MHz Wireless Comm. Module
MTS-8DI	8 Channel Digital Input Module
MTS-4DIO	4 Channel Digital Input & Output Module
MTS-8DO	8 Channel Digital Output Module
MTS-4AI	4 Channel Analog Input Module
MTS-4AO	4 Channel Analog Output Module
MTS-PWR	24VDC Power Module