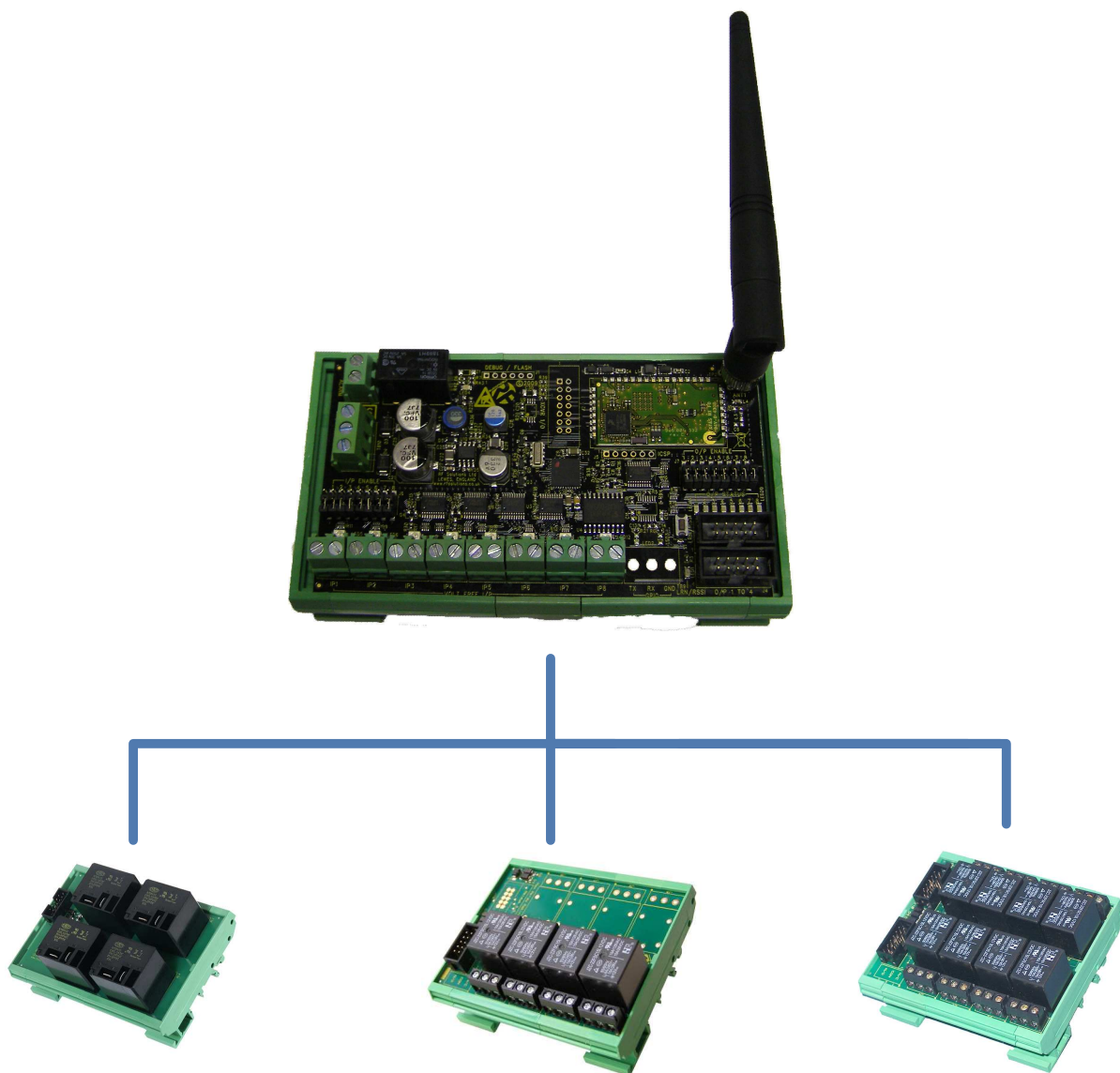




325 Bidirectional Radio Telemetry System



- Up to 4000m range
- 8 Telemetry channels per Module
- Relay Output Option 5A @240Vac
- Secure RF protocol
- Auto 'Watchdog' ensures Reliability
- Signal fail alarm output
- DIN rail Mounting
- Signal Strength Meter incorporated
- Secure auto acknowledgement of all switch inputs
- Operates at 868mHz 500mW

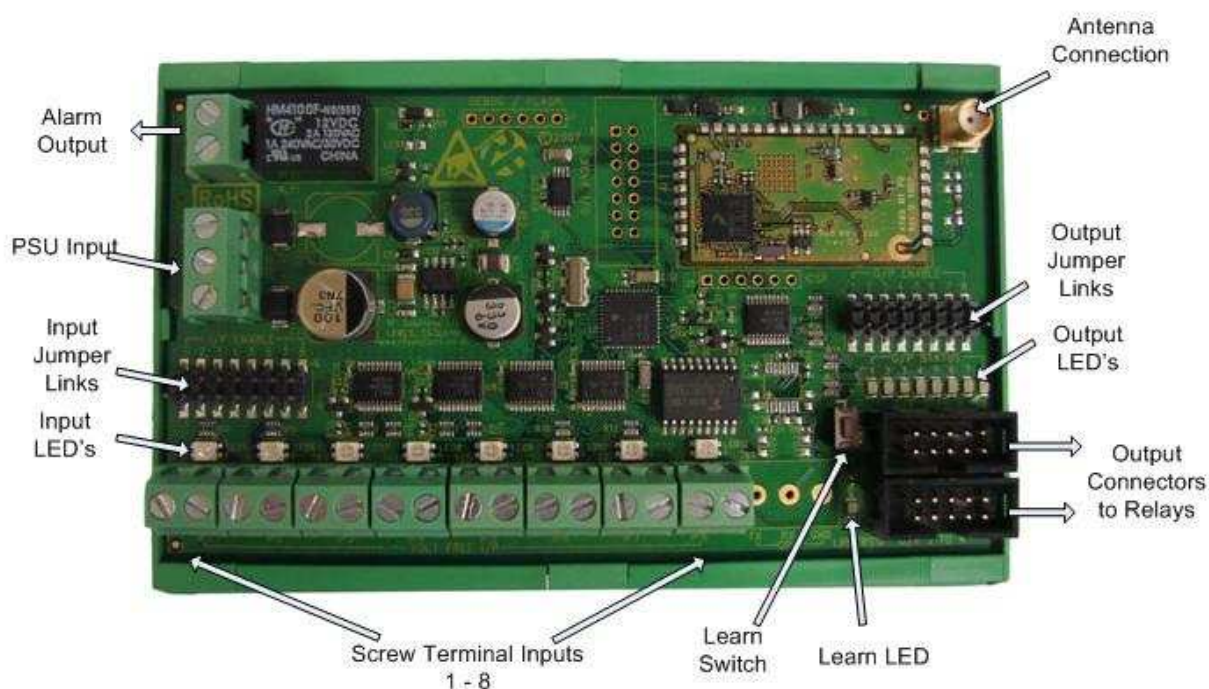


325 Bidirectional Radio Telemetry System

The 325 Telemetry System provides a reliable Transceiver based industrial Remote Switch with up to 4000 metres range. Two or more 325 modules may be combined to provide a simple or complex network of radio switching.

Each unit is supplied ready to operate, with connections to power and switch inputs via screw terminals. The outputs connect directly to one of several relays modules switching up to 30A @240Vac per channel.

1.0 Hardware Overview



1.1 Hardware Features

| Title | Ident on Module | Data Direction | Format | Function |
|----------------------------|------------------|----------------|----------------------|---|
| Power Input | +12 or +24V, GND | Input | 3 way Screw Terminal | Connect GND and either 12V or 24V not both! |
| Input Enable Jumper Links | IP ENABLE 1 – 8 | N/A | (2 x 8) Pin header | Link Fitted: Input Active, Channel enabled to transmit. Link Not Fitted: Input Deactivated. |
| Inputs 1-8 | I/P 1 – I/P 8 | Input | 2 way Screw Terminal | Create a short across the two terminals using a switch to send a signal. |
| Input status LEDs | I/P LEDs: 1 – 8 | N/A | Dual Colour LEDs | When a given LED is lit this corresponding channel is in one of the following states: Red = Input enabled, transmission unconfirmed Green = Input enabled and previous transmission confirmed Off = Input Disabled: input not enabled. |
| Output Enable jumper links | OP ENABLE 1 – 8 | N/A | (2 x 8) Pin header | Link Fitted: Channel ON Link Not Fitted: Channel OFF Jumper links provided to enable or disable each channel |



325 Bidirectional Radio Telemetry System

| | | | | |
|---|--------------------|--------|----------------------|---|
| Outputs 1-8 | IDC 1 – 2 | Output | 10 way IDC headers. | Output channels 1-8. May be used to connect external relay modules Open Collector outputs 500mA per channel |
| Output status LEDs | OP LEDs: 1 – 8 | N/A | Red LEDs | This LED bank shows the state of the 325 outputs, when a given LED is on the corresponding output number is enabled. |
| Learn Switch / Received Signal Strength Indicator | LRN/RSSI (S1) | - | Push Switch | Used to marry one 325 Module to another. Also used to enter Signal Strength Test Mode to display Received RF Signal strength. |
| Signal Fail Alarm Output | ALARM | Output | 2 way screw terminal | Changeover Relay output Normal Operation: Relay is Active Alarm Condition : Relay drops out |
| Learn LED | LRN/RSSI (LED1) | - | Red LED | Signify Learn procedure |

2.0 System Overview

The 325 is a transceiver based module on which all channels are auto-acknowledged. Each 325 Module also runs a “watchdog” transmission which periodically sends out a signal to all other 325 Modules to check that all are synchronised. In the event of a signal failure the 325 module has an inbuilt alarm relay, this relay will drop out if any signal is lost or a channel is not acknowledged.

Each 325 Module has 8 input and 8 output channels. These are ‘enabled’ on each module by connecting a link on the circuit board. (If the link is not set then the input/output is disabled)

When two or more 325 Modules are paired together the 8 i/p channels on each module are automatically mapped to the 8 o/p channels on the other 325 module(s). However the user must ensure that only one of each of the inputs is enabled on one of the 325 Modules. I.e. if i/p1 is enabled on the first 325 Module then it cannot be enabled on any of the other 325 modules within a network;the same applies to the outputs as well

This creates an 8 channel telemetry network where any input on any 325 Module can trigger any output on another 325 Module with a maximum of 8 channels.

3.0 System Configuration



There are 3 steps to setting up a system:

1. Pair together all the 325 modules within the network, (max=8) this is known as the ‘Learn Process’.
2. Enable Specific Inputs at the transmitting 325 module
3. Enable Matching Outputs for at the receiving 325 Module

Step 1: Learning 325 Modules:

1. Connect power to each 325 Module to be learnt.
2. Enter ‘Learn Mode’ on each 325 Module by pressing the learn switch for 2 seconds. Learn Mode is indicated by the Learn LED being illuminated



325 Bidirectional Radio Telemetry System

3. When all modules are in learn mode, press the learn switch on the first one for a second time; This 325 Module will then 'learn' all the other 325 Modules in learn mode. This is shown by the learn LED Flashing. For each module that is learnt into this 325 module it will turn on an output status lamp, up to a maximum of 8.

Each of the remote modules that have been learnt will flash their input status lamps on and off green.

4. Wait for the learn LED to stop flashing on this 325 module, when it has, this 325 will have completed learning – check the to see that all the remote modules have been learnt by confirming that they are all flashing their green input status lamps. The number of learnt modules will be indicated on this 325's output status lamps.

1 learn = 1 output status lamp on and one remote module which should be flashing its green input status lamps on and off.

5. Learn is complete for this 325 module (this module will now need to be reset by removing and re-applying the power)
6. Press the learn button on each 325 module that is flashing it's green input status lamps on and off
7. Repeat steps 3 - 5 for each 325 module in the system,
8. To exit learn mode on each module remove power.

Note: If two 325Modules are already learnt the learn process will simply relearn again overwriting the old learns.





325 Bidirectional Radio Telemetry System

Step 2: Enable an Input:

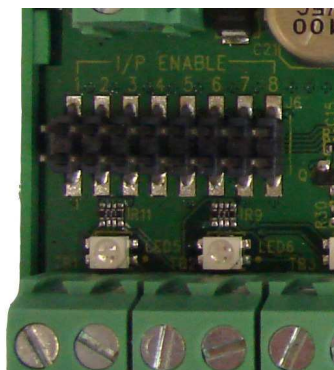
To Enable an **Input** on a 325 Module insert the 'I/P Enable' jumper link against the chosen input number,

Once enabled this input will be monitored and transmitted by the 325 Module.

LED Indication

The corresponding Input LED Status will indicate;

- Red** = Input enabled, transmission unconfirmed
- Green** = Input enabled and previous transmission confirmed
- Off** = input not enabled



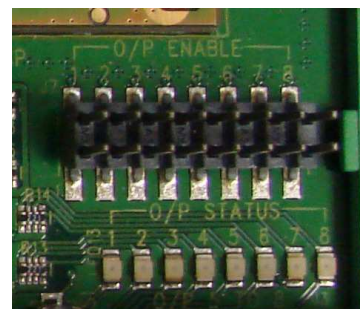
Step 3: Enable an Output:

To Enable a matching output on the 'receiving' 325 Module insert the 'O/P Enable' jumper link against the chosen Output number

LED Indication

The corresponding Input LED Status will indicate;

- Red** = Output enabled and active i.e. associated connected relay channel is energised.
- Off** = Output not enabled or associated connected relay channel is not energised



Note: When the 325 module is powered up it briefly displays which output channels are enabled on the output status lamps

Ready to Operate!

The 325 Telemetry system is now ready for use.

Outputs that have been enabled will follow their matching enabled input status!

Output Relay modules can be connected to the required output connectors (please see below).

Notes:

When setting up a 325 system it is important to remember the following rules:

1. If you enable a channel as an input on a module, you cannot enable that channel as an output on the same module.
2. If you enable a channel as an input on a module, you cannot enable that channel as an input on any other module.
3. If you enable a channel as an output on a module it cannot be enabled as an output on any other module.
4. Inputs and outputs are enabled by connecting the relevant Enable Jumper Links

Tip: for complex systems sketch the system out showing which inputs and outputs are valid on each 325Module



325 Bidirectional Radio Telemetry System

Return 325 Module to Factory Default state (Erase):

This process erases all pairing information from a given module

1. Connect Power to the 325 Module to be return to Factory Default.
2. Press and hold the Learn Switch for >6 seconds.
3. The module will return to factory learn state; all input LEDs will flash Red/Green, output channel LEDs and connected relay channels will toggle on/off.
4. Repeat for all modules in a system

Checking Signal Strength in your chosen installation location (RSSI Mode):

Each 325 Module can display the Received Signal Strength (RSSI) to indicate how reliable the Radio signal is. The eight input status LEDs will light according to the signal level. An acceptable signal could be considered as at least 4 Green LED's illuminated.

To enter RSSI Mode:

Note: No more than two modules can be in this mode at one time.

1. Remove power from ALL 325 Modules
2. Choose two 325 modules
3. Hold down the learn button on the first 325 module and apply power
4. All input and output status lamps will turn on red, the 325 module is now in RSSI mode
5. Release the learn button, the 325 module will turn off its output status lamps and indicate the received signal strength on its input status lamps (table below shows strengths)
6. Repeat steps 3, 4 and 5 for the second 325 module.
7. Signal strength mode can be toggled between receive test mode and transmit test mode pressing the learn button.
8. Set one 325 modules in each mode (transmit/receive) and use the table below to check the strength.
9. To resume normal operation, on a specific 325 module, remove and re-apply power.

| Received Signal Strength Indication | |
|---|--------------------------|
| RF measurement levels are refreshed each second with 4-levels indicated on the Input Channel Status Lamps as follows: | |
| Input Channel Status Lamps | Received Signal Strength |
| All red | < -87dBm |
| 4 green and 4 red | Between -87 and -82dBm |
| 6 green and 2 red | Between -82 and -77dBm |
| All lamps green | > -77dBm |

Alarm output

The alarm output relay is ACTIVE (short circuit) in normal operation. In alarm condition or on power loss the Relay will drop out (open circuit).

Alarm condition will be if any of the following situations occur:

1. Acknowledgement of an enabled input channel state change is not received within 30 seconds of the transmission.
2. An Auto Watchdog signal is not received by a unit in a 1 and a half minute time period.
3. An enabled output channel state is not refreshed within 1 and a half minutes





325 Bidirectional Radio Telemetry System

Connecting output Modules to the 325

A range of Relay output modules are available which can be plugged into the 325 via the 2 IDC header connectors. Relay output module options are shown in section 4.

Connecting an Antenna

The 325 has a board mounted SMA socket; an SMA antenna is provided.

Range

Note :Range stated is optimum, direct line of sight. In worst conditions this can be reduced by upto 50%

The antenna position directly controls the system range. Keep it clear of metal in the area. The best position by far, is protruding from the top of the product. This is often not desirable for practical or ergonomic reasons and thus a compromise may be needed. If an external antenna is used then try to keep it away from other metal items, and in particular large items like transformers, batteries, PCB tracks and earth planes.

Note that the space around the antenna is as important as the antenna itself. All radio systems are dependant on a radio signal being received through airspace.

The range quoted is the optimal in direct line of sight without obstacles and in good atmospheric conditions.

Range is affected by many things, for example local environmental conditions, atmospheric conditions, interference from other radio transmitters. In very worse case applications the range quoted may be dramatically reduced.



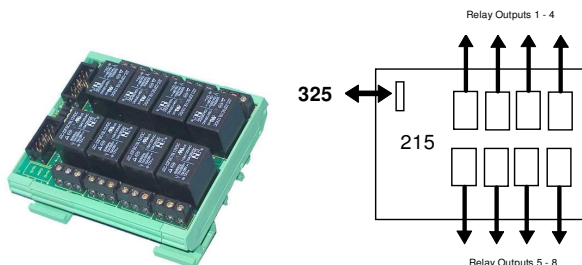


325 Bidirectional Radio Telemetry System

5.0 Accessories

'215' Relay Output Module

- Connects to IDC headers for all outputs
- 8 relay switches rated 230Vac at 5A
- Each relay provides 'input' and 'normally open' screw terminals



Dimensions: Within DIN Rail: 93 x 82 mm (PCB: 90 x 72mm)

Storage Temperature: -10 to +70° Celsius.

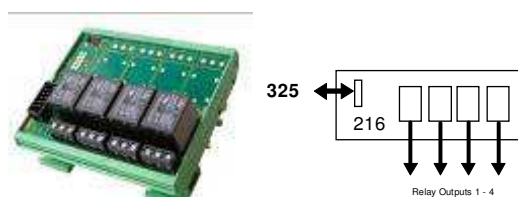
Operating Temperature: 0 to +55° Celsius.

| Electrical Characteristics | Min | Typical | Max | Units |
|---|-------------------------------|---------|-----|-------|
| Supply Voltage | From 325 module | | | |
| Relay* output Rating Type HRS1KH3-12 | Max rating is 3A/220VAC/30VDC | | | |

*The relay contacts in this unit are for functional use only and must not be used for isolation purposes.

'216' Relay Output Module

- Connects to IDC header
- 4 relay outputs rated at 230Vac, 12A peak and 5A continuous current rating.
- 'Normally open' and 'normally closed' screw terminals.



Dimensions: Within DIN Rail: 135 x 82 mm (PCB: 132 x 72mm)

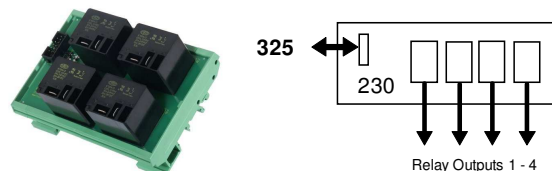
Storage Temperature: -10 to +70° Celsius. Operating Temperature: 0 to +55° Celsius.

| Electrical Characteristics | Min | Typical | Max | Units |
|--|-----------------|---------|-----|-------|
| Supply Voltage | From 325 module | | | |
| Relay* output Rating (type KB12) at 230Vac | | 5 | 12 | A |

*The relay contacts in this unit are for functional use only and must not be used for isolation purposes

'230' Relay Output Module

- Connects to IDC header
- 4 relay (type K7SFA12) outputs rated for up to 30A at 230Vac.
- Each relay provides 'input' and 'normally open' Spade Terminals.



Dimensions: Within DIN Rail: 115 x 82 mm (PCB: 109 x 72mm)

Storage Temperature: -10 to +70° Celsius. Operating Temperature: 0 to +55° Celsius.

| Electrical Characteristics | Min | Typical | Max | Units |
|-------------------------------|-----------------|---------|-----|-------|
| Supply Voltage | From 325 module | | | |
| Relay output Rating @ 230Vac* | | | 30 | A |
| @ 12Vdc | | | 20 | A |

*The relay contacts in this unit are for functional use only and must not be used for isolation purposes



325 Bidirectional Radio Telemetry System

Enclosure / Power Supply

- IP67 Insulation Class 2
- DIN Rails mounted on Steel Plate
- 12Vdc 1A PSU incorporated accepts 110-240Vac (5A Fused)



Dimensions

| | |
|-------------------|-------------------|
| External | 315 x 235 x 130mm |
| Internal | 300 x 220 x 120mm |
| DIN Rail length 1 | 285mm |
| DIN Rail length 2 | 180mm |

| Part No | Description |
|---------------|---|
| ENC-DA3 | DIN Rail Enclosure Assembly, Two Mounting Rails, 12Vdc PSU Fitted |
| PSU12V1AIN-IP | Power Supply 110-240Vac input, 12Vdc 1A Output |

6.0 Technical Specifications

Dimensions: Within DIN Rail: 325: 112 x 82 mm (PCB: 109 x 72mm)

Storage Temperature: -10 to +155° C

Operating Temperature: -0 to +55° Celsius.

| Electrical Characteristics | Min | Typical | Max | Units |
|---|-----|---------|-----|-------|
| Supply Voltage: 12V Supply | 10 | 12 | 16 | V |
| Supply Voltage: 24V Supply | 21 | 24 | 30 | V |
| Antenna Output Lead Impedance | | 50 | | Ohms |
| Minimum input activation time to trigger transmission | | 100 | | ms |
| Current Characteristics (12V) | | | | |
| Transmit Current | 78 | 122 | 160 | mA |
| Receive Current | 17 | 19 | 25 | mA |
| Current Characteristics (24V) | | | | |
| Transmit Current | 10 | 12 | 13 | mA |
| Receive Current | 35 | 60 | 70 | mA |
| Alarm Output: Maximum Load | | | | |
| Relay | | | 2 | A |
| Voltage | | | 30 | V |



325 Bidirectional Radio Telemetry System

7.0 Troubleshooting

The 325 Module has some inbuilt diagnostics functions and error checking. This section should enable you to troubleshoot a system if you are having problems.

Error Signal: An Input LED is flashing RED on/off.

Problem: The same input is enabled on more than one 325 modules in a system

Solution: Check all of your input enable jumper links in your system to make sure that none are repeated.

Error Signal: An Output LED is flashing RED on/off.

Problem: The same output is enabled on more than one 325 module in a system.

Solution: Check all of your output enable jumper links in your system to make sure that none are repeated.

Other Solutions:

1. Remove all enable links on all 325 modules and re-setup the system (see page4)

Error Signal: An Output LED and Input LED is flashing RED on/off.

Problem: The same input and output is enabled on the 325 module.

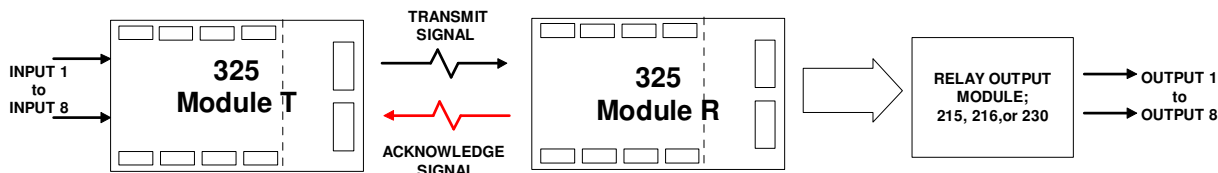
Solution: Check all of your input/output enable jumper links on the module to make sure that none are repeated.



325 Bidirectional Radio Telemetry System

8.0 Application Examples

5.1 One to one – One 325 transmitting to another 325



Configure 325 Module T as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Input Enable Links | Connected | Connected | Connected | Connected | Connected | Connected | Connected | Connected |
| Output Enable Links | Open | Open | Open | Open | Open | Open | Open | Open |

Configure 325 Module R as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Input Enable Links | Open | Open | Open | Open | Open | Open | Open | Open |
| Output Enable Links | Connected | Connected | Connected | Connected | Connected | Connected | Connected | Connected |

Operation

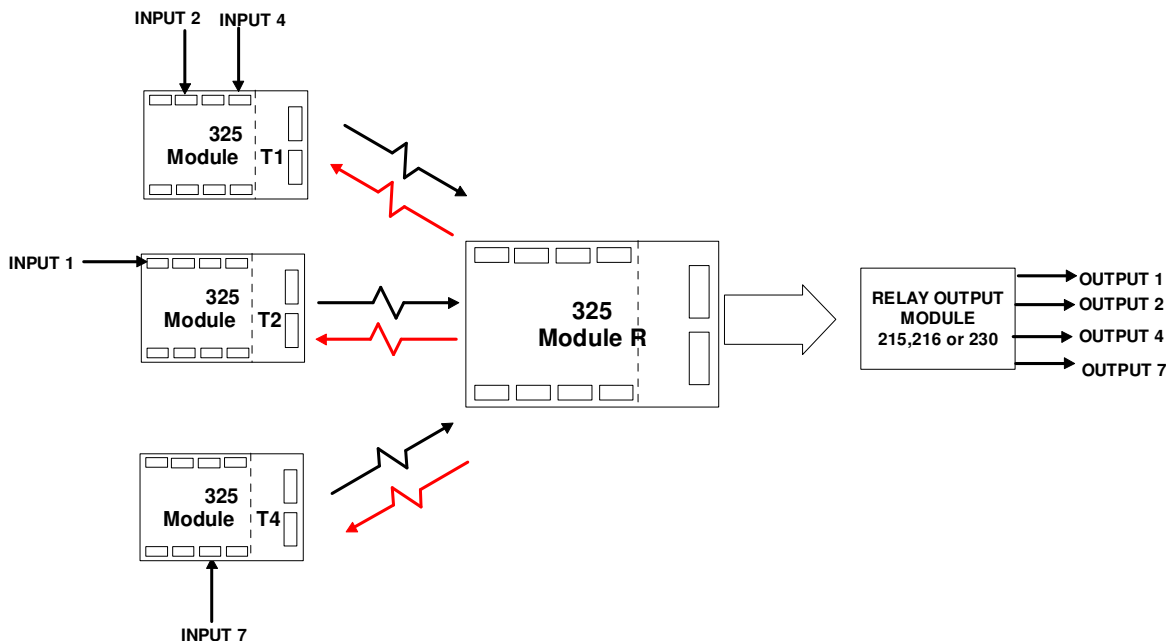
The following outputs on Module R will follow the inputs on Module T

| Module T Inputs | Module R Outputs |
|-----------------|------------------|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |



325 Bidirectional Radio Telemetry System

5.2 Many to One – Multiple 325's transmitting to a single 325



Configure 325 Module T1 as follows:

| | | | | | | | | |
|---------------------|----------|-----------|------|-----------|------|------|------|------|
| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Input Enable Links | Open | Connected | Open | Connected | Open | Open | Open | Open |
| Output Enable Links | All Open | | | | | | | |

Configure 325 Module T2 as follows:

| | | | | | | | | |
|---------------------|-----------|------|------|------|------|------|------|------|
| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Input Enable Links | Connected | Open | Open | Open | Open | Open | Open | Open |
| Output Enable Links | All Open | | | | | | | |

Configure 325 Module T4 as follows:

| | | | | | | | | |
|---------------------|----------|------|------|------|------|------|-----------|------|
| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Input Enable Links | Open | Open | Open | Open | Open | Open | Connected | Open |
| Output Enable Links | All Open | | | | | | | |

Configure 325 Module R as follows:

| | | | | | | | | |
|---------------------|-----------|-----------|------|-----------|------|------|-----------|------|
| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Input Enable Links | All Open | | | | | | | |
| Output Enable Links | Connected | Connected | Open | Connected | Open | Open | Connected | Open |





325 Bidirectional Radio Telemetry System

Operation

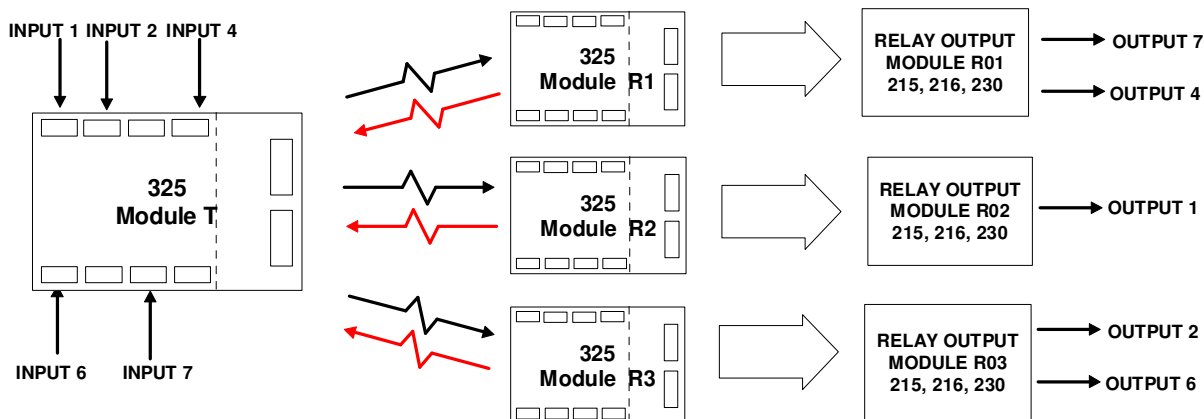
The following outputs on Module R will follow the inputs on Module T

| Module T Inputs | Module R Outputs |
|--------------------|---------------------|
| T2 Input 1 | 1 |
| T1 Input 2 | 2 |
| T1 Input 4 | 4 |
| T4 Input 7 | 7 |



325 Bidirectional Radio Telemetry System

5.3 One to Many – One transmitter board sending to multiple receiver boards.



Configure 325 Module T as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|-----------|------|-----------|------|-----------|-----------|------|
| Input Enable Links | Connected | Connected | Open | Connected | Open | Connected | Connected | Open |
| Output Enable Links | All Open | | | | | | | |

Configure 325 Module R1 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|----------|------|------|-----------|------|------|-----------|------|
| Input Enable Links | All Open | | | | | | | |
| Output Enable Links | Open | Open | Open | Connected | Open | Open | Connected | Open |

Configure 325 Module R2 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|------|------|------|------|------|------|------|
| Input Enable Links | All Open | | | | | | | |
| Output Enable Links | Connected | Open | Open | Open | Open | Open | Open | Open |

Configure 325 Module R3 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|----------|-----------|------|------|------|-----------|------|------|
| Input Enable Links | All Open | | | | | | | |
| Output Enable Links | Open | Connected | Open | Open | Open | Connected | Open | Open |





325 Bidirectional Radio Telemetry System

Operation

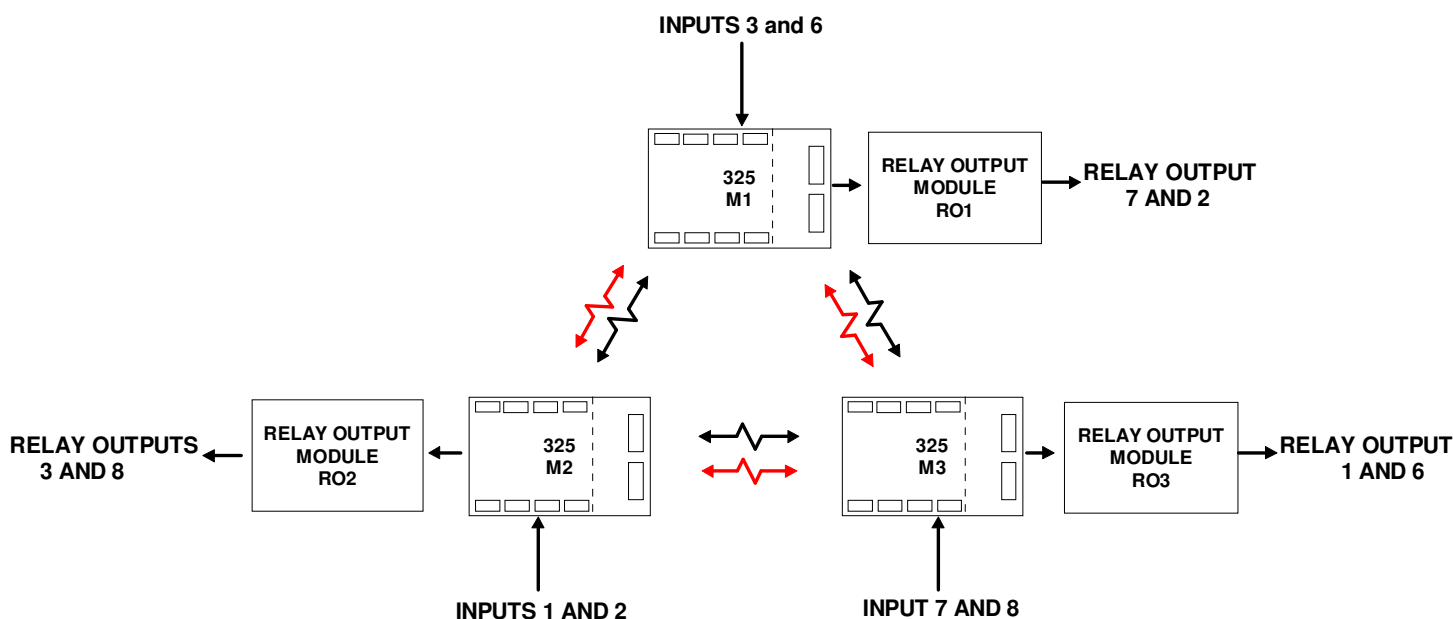
The following outputs on Module R will follow the inputs on Module T

| Module T Inputs | Module R Outputs |
|--------------------|---------------------|
| 1 | R2 Output 1 |
| 2 | R3 Output 2 |
| 4 | R1 Output 4 |
| 6 | R3 Output 26 |
| 7 | R1 Output 7 |



325 Bidirectional Radio Telemetry System

5.4 Many to Many (Network) – Multiple 325s transmitting to Multiple 325 receivers



Configure 325 Module M1 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|------|-----------|-----------|------|------|-----------|-----------|------|
| Input Enable Links | Open | Open | Connected | Open | Open | Connected | Open | Open |
| Output Enable Links | Open | Connected | Open | Open | Open | Open | Connected | Open |

Configure 325 Module M2 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|-----------|-----------|------|------|------|------|-----------|
| Input Enable Links | Connected | Connected | Open | Open | Open | Open | Open | Open |
| Output Enable Links | Open | Open | Connected | Open | Open | Open | Open | Connected |

Configure 325 Module M3 as follows:

| Link No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|-----------|------|------|------|------|-----------|-----------|-----------|
| Input Enable Links | Open | Open | Open | Open | Open | Open | Connected | Connected |
| Output Enable Links | Connected | Open | Open | Open | Open | Connected | Open | Open |





325 Bidirectional Radio Telemetry System

Operation

The following outputs will follow the inputs;

| Module Inputs | Module Outputs |
|---------------|----------------|
| M2 Input 1 | M3 Output 1 |
| M2 Input 2 | M1 Output 2 |
| M1 Input 3 | M2 Output 3 |
| M1 Input 6 | M3 Output 6 |
| M3 Input 7 | M1 Output 7 |
| M3 Input 8 | M2 Output 8 |

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