Intech INSTRUMENTS LTD

Intech Micro
2400-A16

Z1363



Installation Guide.

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Intech Micro 2400-A16

Up to 16 Universal Analogue Inputs.
4 Dedicated Digital Inputs.
2 Analogue 4~20mA Outputs.
2 Relay Outputs.

Features.



CE Z1363

- Up to 16 Isolated Universal Analogue Inputs, with Plug In Terminals.
- Each Input Individually Selected & Scaled.
- Resolution RTD 0.01, TC 0.1.
- Isolated Input for RTD, T/C, mA, mV, V, & Pulse/Digital:
  - ◊ RTD: Pt100/Pt1000, -200~320°C to -200~800°C.
  - ◊ T/C: B, E, K, J, N, R, S, T, with CJC.
  - ◊ mA: 0~20mA, 0~2.5mA.
  - ◊ mV: -25~25mV to -200~200mV.
  - ◊ V: 0~1V to 0~15V.
  - ◊ Meter Pulses and Frequency: Max speed 2500Hz.
- Low cost Non-Isolated RTD Pt100/Pt1000 only Inputs also available.
- Four Dedicated Digital, Isolated, Optocoupler Inputs:
  - ◊ State or Count.
  - ◊ Max speed 8000Hz.
- Two Analogue, Isolated, 4~20mA Outputs.
- Two Digital, Isolated, Relay Outputs.
- Comms Ports:
  - ◊ Port 1: Isolated RS422/RS485 or Ethernet TCP/IP (option).
  - ◊ Port 2: Isolated RS232/RS485.
  - ◊ Port 3: USB programming port via **XU-USB** programming key.
- Cost Effective Radio Installation.
- Cost Effective PC or PLC AI Expansion.
- Clock/Reset Drive up to Four **2400-M-R** / **2100-M** input expansion.
- Selectable Baud Rates.
- Integral MODBUS Bridge to MicroScan data: 256 analogue (words), and 128 digital (bits).
- Embedded protocols, Auto Detecting:
  - ◊ MicroScan ASCII,
  - ◊ Modbus RTU,
  - ◊ Modbus TCP.
- Average comms message, RS232, RS422, RS485, Ethernet = 100msec.
- 4 messages required to read all inputs.
- Internal memory refresh rate for all channels = 4 secs.
- Interface for **2400-R2** (16 & 32 Relay output expansion).
- Easy Programming.
- Programmable Station Number.
- Programmable Relay States - NO or NC.
- Comms Failure Time-out Using Relay 2.
- Comms TXE Delay Programming.
- Programming Information Retained on Power Down.
- Universal AC/DC Power Supply (three options to select).
- Compact 35mm DIN Rail Mounting.
- Easy to Install.
- Low Cost.

Product Liability. This information describes our products. It does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to on-going research and development, designs, specifications, and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data are always specified by their average values and are based on Standard Calibration Units at 25C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.
Warning: These products are not designed for use in, and should not be used for patient connected applications. In any critical installation an independent fail-safe back-up system must always be implemented.

Description.

This station has all the friendly features of a monitoring station. The Isolated Universal Analogue Inputs are software programmable using the user friendly **MicroScan v5.1** or **Station Programmer** software.
Each input can be configured for any of the following inputs: RTD Pt100/Pt1000, Thermocouple, mA, mV, V & Pulse/Digital. There is a convenient wide choice of spans plus Custom spans can be configured also. The accuracy does not alter when changing spans. The analogue inputs on the 2400-A16 can be expanded up to 76 using the **2400-M-R** / **2100-M** Input Multiplexers.

Ordering Information.

All 2400-A16 stations come standard (Default ex factory calibration) with:

All Input Channels Configured to RTD Pt100 0~100°C.
4 Dedicated Digital Inputs.
2 Analogue 4~20mA Outputs.
2 Relay Outputs.
RS485 or RS232 on Comms Port 2.

ITEM	*CODE*			*DESCRIPTION*
SERIES	**2400-A16-**			
Input Channel Options	**I16-**			16 Isolated Universal Input Channels.
	I12-			12 Isolated Universal Input Channels.
	I8-			8 Isolated Universal Input Channels.
	I8N8-			8 Isolated Universal Input + 8 Non-Isolated RTD Pt100/Pt1000 Channels.
	I4N12-			4 Isolated Universal Input + 12 Non-Isolated RTD Pt100/Pt1000 Channels.
Comms Options (Port 1)		**485-**		Port 1 Fitted with RS422/RS485 Comms.
		NET-		Port 1 Fitted with Ethernet TCP/IP Comms.
Power Supply Options			**H**	85~265Vac, 95~370Vdc.
			M	24~48Vac, 17~72Vdc.
			L	10~30Vdc.

Ordering Examples.

2400-A16-I16-485-L: 2400-A16 with 16 Isolated Universal Input Channels, RS422/RS485 Comms, 10~30Vdc Power Supply.

2400-A16-I16-NET-H: 2400-A16 with 16 Isolated Universal Input Channels, Ethernet TCP/IP Comms, 85~265Vac Power Supply.

2400-A16 Parts:	
2400-A16 Input Boards:	
2400-A16-NC-H: 2400-A16-NC-M: 2400-A16-NC-L:	2400-A16 with no Inputs, 85~265Vac, 95~370Vdc Power Supply. 2400-A16 with no Inputs, 24~48Vac, 17~72Vdc Power Supply. 2400-A16 with no Inputs, 10~30Vdc Power Supply.
2400-A16 Input Cards:	
2400-IIC: 2400-NIC:	Isolated Universal Input Card for 2400-A16. Non-Isolated RTD Pt100/Pt1000 Input Card for 2400-A16.
RS232 Cable:	
2400-RS232:	Optional 5m RS232 cable for the 2400-A16 (Comms Port 2).
XU-USB:	USB Programming Key for programming 2400-A16 using Station Programmer software. (Same Key as used for programming XU Series transmitters and Z-2400-Sleeper). Note: 2400-A16 can also be programmed via the Comms Ports using MicroScan v5.1 software.

Other 2400 Models Include:

2400-IS: Isolated Auto-Detecting USB/RS232 to RS485/422/232 Converter.
2400-M-R: Field Station with up to 16 Non-Isolated RTD Pt100/Pt1000 Inputs, 4 Digital Inputs, 2 Relay Outputs and 2 Analogue 4~20mA Outputs.
2400-R2: 16 Channel Relay Output Expander.
2400-RB: Wireless Base/Remote for RS485/422/232 Comms.
2400-TCP: Wireless Base only for Ethernet TCP/IP Comms.
2400-Sleeper: Wireless Battery Option for 2 Universal Inputs.

2400-A16 Input Specifications.

Inputs 1~16 Specifications:	Analogue or Digital.
Inputs 1~16 Analogue Specifications:	16 Individually Isolated Universal or Non-Isolated RTD Analogue Inputs.
Input Resolution	16 Bits, 50,000 Steps Average (some ranges may differ).
Input Isolation	2500Vac for 1 minute between All Input Channels.
Voltage Input Specifications:	
Input Impedance	>500KΩ on all ranges.
mV Maximum Over-range	3Vdc Continuous.
V Maximum Over-range	24Vdc Continuous.
mV Range	-200~200mV.
V Range	0~1V, 0~15V.
Accuracy	0.1% FSO Max.
Linearity and Repeatability	0.1% FSO Max.
Channel Separation	0.001% Max.
Ambient Drift	0.003%/°C FSO Typical.
Noise Immunity (CMRR)	160dB Tested @ 300Vrms 50Hz.
RF Immunity	1% effect FSO Typical.
Current Input Specifications:	
Minimum Recommended Span	0~1mA (gives 1000 steps on output).
Input Impedance	45Ω.
Maximum Over-range	Protected by PTC Up to 24Vdc Max.
mA Range	0~20mA (4~20mA).
Accuracy	0.1% FSO Max.
Linearity and Repeatability	0.1% FSO Max.
Channel Separation	0.001% Max.
Ambient Drift	0.003%/°C FSO Typical.
Noise Immunity (CMRR)	160dB Tested @ 300Vrms 50Hz.
RF Immunity	1% effect FSO Typical.
Thermocouple (T/C) Input Specifications:	
Thermocouple Types	B, E, J, K, N, R, S, T.
Input Impedance	>500KΩ.
T/C Lead Resistance	100Ω Max.
Cold Junction Compensation.	-10~60°C.
CJC Drift	0.02°C/°C For Installation Upright.
Accuracy	0.1% of FSO ±1°C Typical.
Sensor Fail	Upscale or Downscale Selectable (Upscale Default).
Type B Range	0~1800°C (30~3270°F).
Type E Range	-200~800°C (-320~1470°F).
Type J Range	-200~1000°C (-320~1830°F).
Type K Range	-200~1300°C (-320~2370°F).
Type N Range	-200~1300°C (-320~2370°F).
Type R Range	0~1700°C (30~3090°F).
Type S Range	0~1700°C (30~3090°F).
Type T Range	-200~400°C (-320~750°F).
RTD Input Specifications:	
Pt100 RTD Type	3 Wire Pt100 RTD DIN 43760:1980 Standard Input.
Pt1000 RTD Type	3 Wire Pt1000 RTD Standard Input.
Sensor Current	0.6mA Continuous.
Lead Wire Resistance	Pt100: 10Ω/wire Max.
	Pt1000: 5Ω/wire Max.
	0.1% FSO Offset Error per Ω of Lead Resistance.
Sensor Fail	Upscale or Downscale Selectable (Upscale Default).
Ambient Drift	0.003°C/°C Typical.
Accuracy	0~300°C ±0.1°C.
	0~850°C ±0.3°C, Isolated Channels Only.
Resolution	0.01°C for -200~250°C, (-140~210°F).
	0.1°C for -200~850°C (-320~1560°F), Isolated Channels Only.
Inputs 1~16 Pulses & Frequency:	Meter Pulses, Frequency, Counter or On/Off State Inputs.
Input Type	Clean Contact, Open Contact - NPN, PNP.
Frequency Range	0~2500Hz.
Frequency Resolution	0.1Hz.
Fast Counter Range	0~2500Hz.
Maximum Amplitude	0~5Vdc
Debounce	0~50Hz Max.
Counter Register Output	32bit.

Dedicated Digital Input 1~4 Specifications:		4 Opto Isolated Digital Inputs with LED Indication On Each Input.
Applications		Meter Pulses, Frequency, Counter or On/Off State Inputs.
Functions		Up Count On Each Pulse.
Input Voltage		5~30Vdc.
Threshold		4.6V typical.
Load	@ 5V	1.1mA per Channel.
	@ 24Vdc	7.0mA per Channel.
Counter Register Output		32bit.
Frequency Range		0~8000Hz.
Frequency		Debounce 5msec.
Debounce Counter Range		0~100Hz.

2400-A16 Output Specifications.

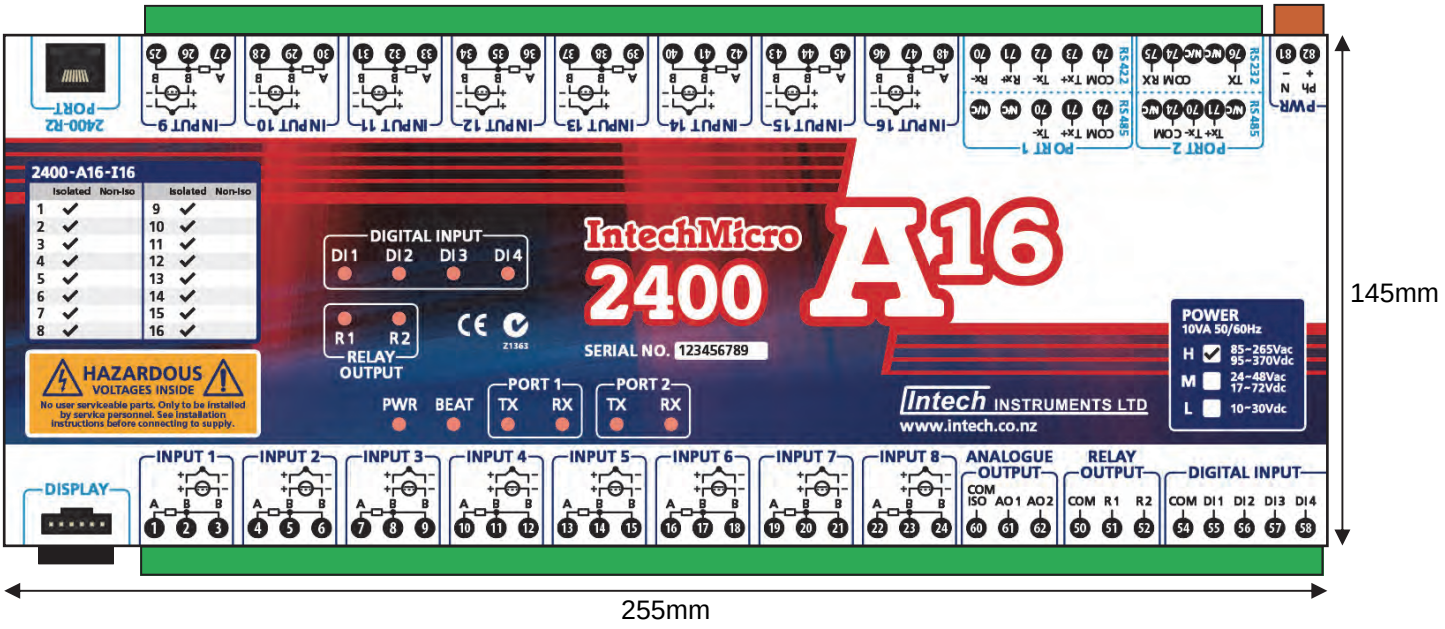
Dual Analogue Outputs Source:		2 Isolated Analogue Outputs (not isolated from each other).
mA Range		4~20mA Only.
Resolution		12bit, 4096 steps.
Output Drive		500Ω Max @ 24V Supply.
Relay Outputs:		2 Isolated Relays with LED Indication On Each Output.
Functions		2 on Board Controllers (16 with 2400-R2), can be used as Set Point (SV), Switching Differential, Auto/Manual, Manual Output Setting, Dual Action Control, Single Action Control, Heat/Cool, Cool Only, Heat Only.
Contact Material		Gold Clad Silver.
Relay Ratings		30Vdc, 3A Max.
Approved to Standard		UL.

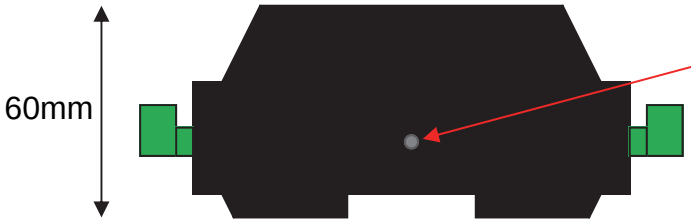
2400-A16 General Specifications.

Comms Ports:		
Port 1		RS422/RS485.
Port 2		RS232/RS485.
Ethernet TCP/IP Port (optional)		Lantronix XPort® (Replaces Comms Port 1).
Data Rate		9600 (MicroScan), 19200, 57600 or 115200 baud.
Parity bit		Even or None (MicroScan).
Protocols		ASCII. Std (MicroScan), Modbus RTU/TCP Auto Detect.
Power Options:		10VA.
Factory set:	H	85~265Vac, 95~370Vdc.
	M	24~48Vac, 17~72Vdc.
	L	10~30Vdc (recommend 1A power supply).
Safety Compliance		
EMC Emissions		EN55022-A.
EMC Immunity		EN50082-1.
Safety		EN60950.
Mains isolation		250Vac.
Isolation test voltages:		
Mains to output		3000Vac, 50Hz.
Mains to earth		1500Vac, 50Hz.
General Specifications:		
Accurate to		≤ ±0.01%/°C FSO typical.
Linear Repeatability		≤ ±0.01%/°C FSO typical.
Ambient drift		≤ ±0.01%/°C FSO typical.
Isolation Test Voltages		Between Input and Output: 3750Vac for 1min.
Response Time		400msec Typical (10~90% 300msec Typical).
Noise Immunity		125dB CMRR Average (2.0kVdc Limit).
RF immunity		< 1% effect FSO typical.
Operating temperature		0~60°C.
Storage temperature		-20~80°C.
Operating humidity		5~85% RH max.
Housing:		Material ABS Inflammability V0 (UL94).
Mounting		35mm symmetrical DIN rail.
Dimensions		L=255, W=145, H=60mm.
Weight		0.9kg Includes Packaging.

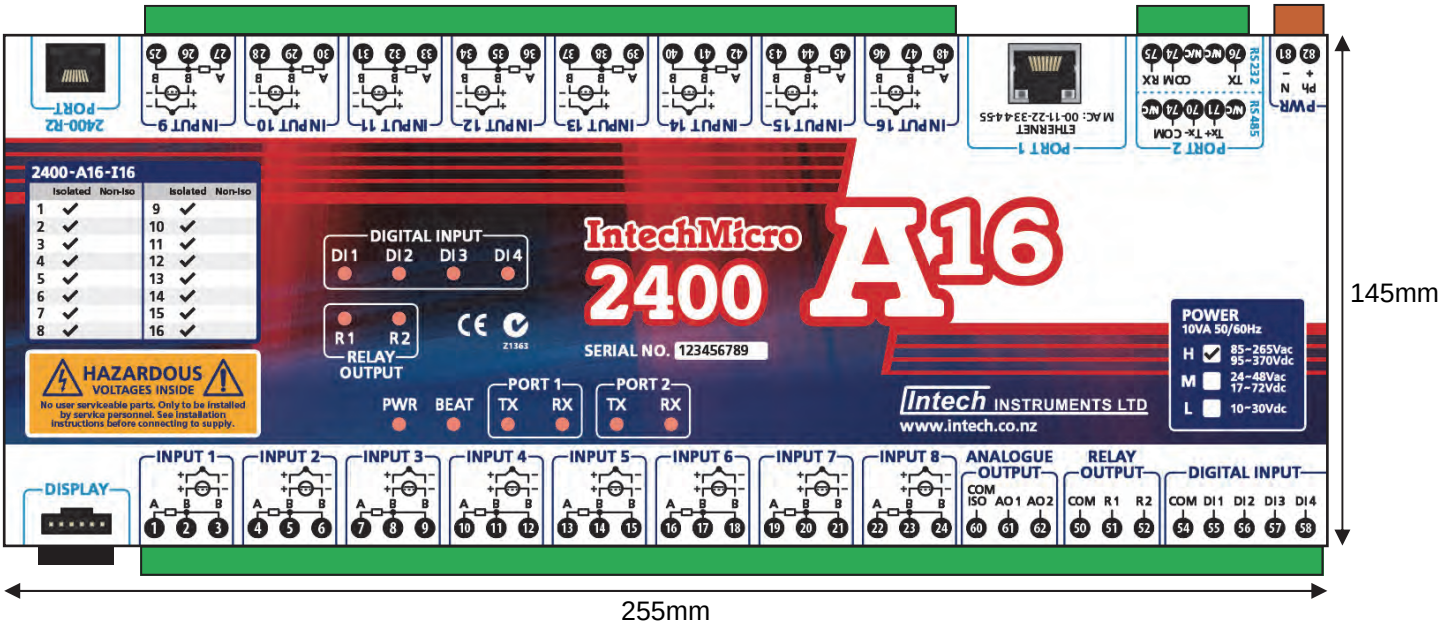
Note: The 2400-A16 is °C and °F selectable. This selection affects all temperature readings.

2400-A16-485 Terminals and Layout & Dimensions.





2400-A16-NET Terminals and Layout & Dimensions.



2400-A16 LED Descriptions.

LED Name	LED Functions
PWR	On indicates Power is Applied.
BEAT	Heart Beat. Continual Flashing indicates the Station is healthy.
TX Port 1~2	Active when station is transmitting serial data.
RX Port 1~2	Active when station is receiving serial data.
Relay Output R1~R2	Indicates when their respective output relay is energised.
Digital Input D1~D4	Indicates when their respective input is energised, or counting.

Input and Output Connection Diagrams.

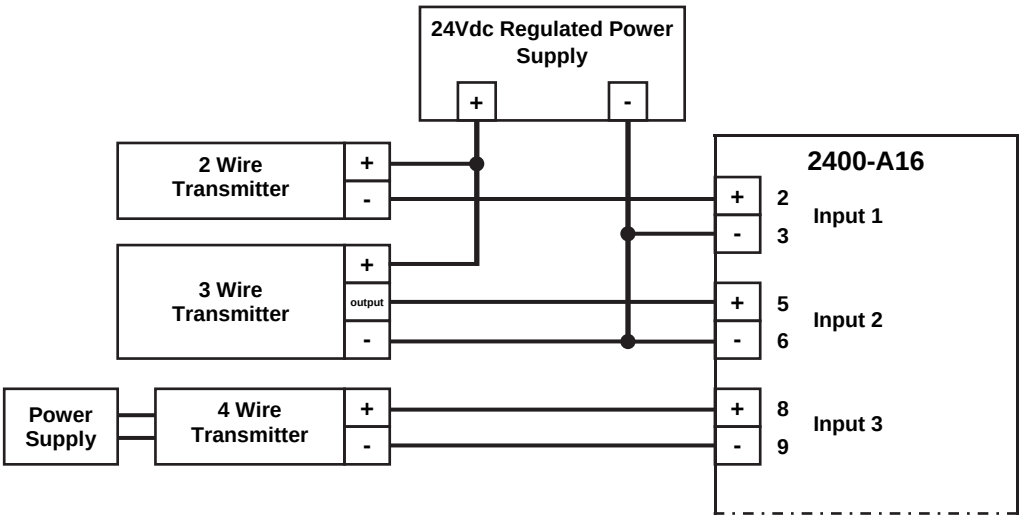
2400-A16 Power Supply Connections.

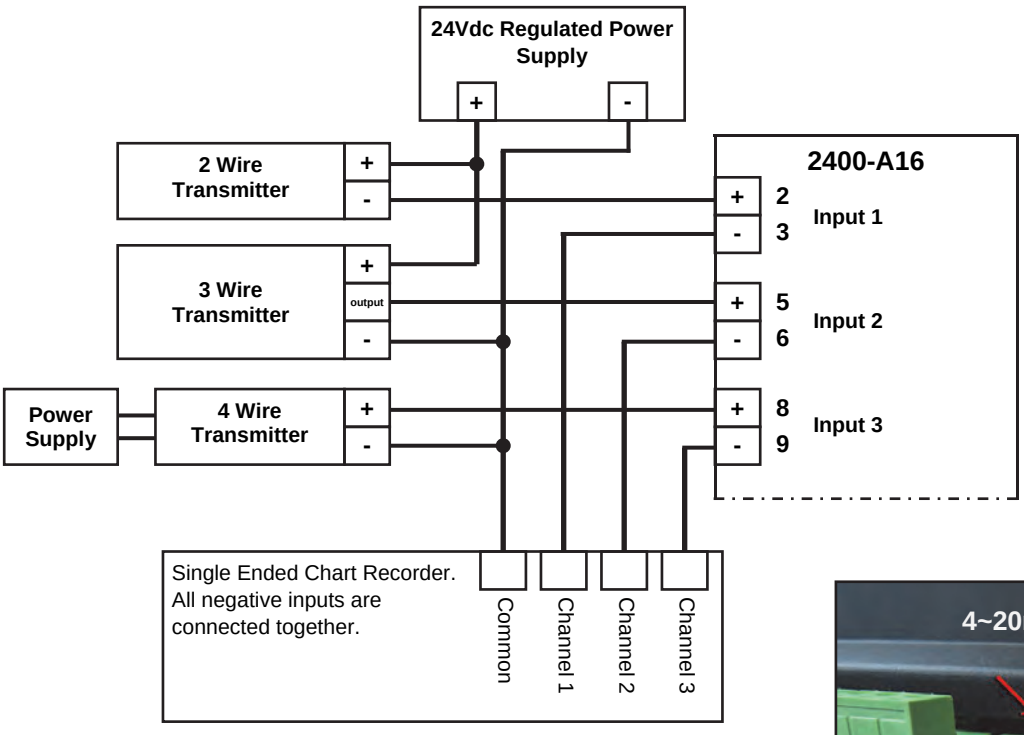
Terminals:	81	82
H:	N	P
M:	-	+
L:	-	+

Note. H: 85~265Vac, 95~370Vdc.
M: 24~48Vac, 17~72Vdc.
L: 10~30Vdc.
Power Rating: 10VA.

2400-A16 Input Connection Diagram for mA Inputs.

Connection configuration for 2, 3 and 4 wire transmitters inputs.





Note 1. Inputs can be used as digital inputs for sensing a clean, voltage free, field contact.

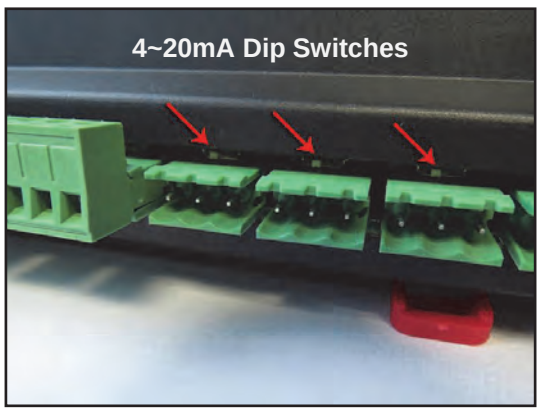
Note 2. Voltage free contact values must be brought in through 'tags' in the SCADA software.

Note 3. mA failsafe switches to mA position if more than one device on mA loop.

Note 4. The 2400-A16 must remain powered up to ensure the integrity of the mA loop. (When the 2400-A16 is not powered; the loop will read zero mA.)

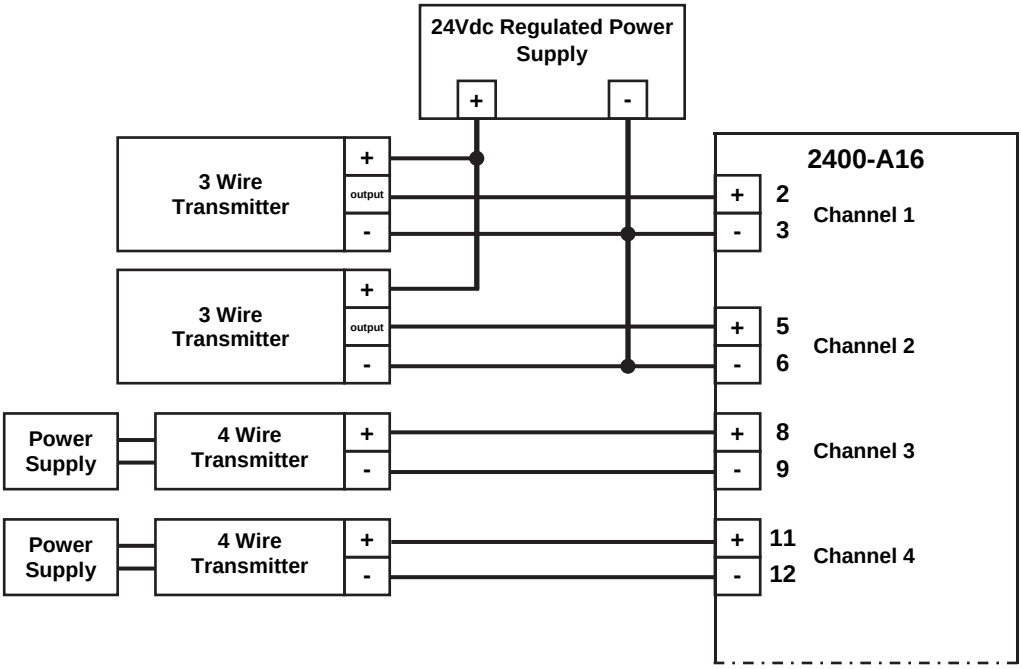
Note 5. For <u>permanent</u> 4~20mA Loop connections; turn on the dip switch behind the terminal block connection (see picture below). This allows the Loop to continue functioning normally even if the 2400-A16 is not powered. Remember to turn the dip switch off if the channel is changed to another input type.

Note 6. All cables to be screened, and the screens earthed at one end only.



2400-A16 Input Connection Diagram for milliVolt and Voltage Inputs.

Connection configuration for 3 and 4 wire transmitters inputs.



Note 1. Inputs can be used as digital inputs for sensing a clean, voltage free, field contact.

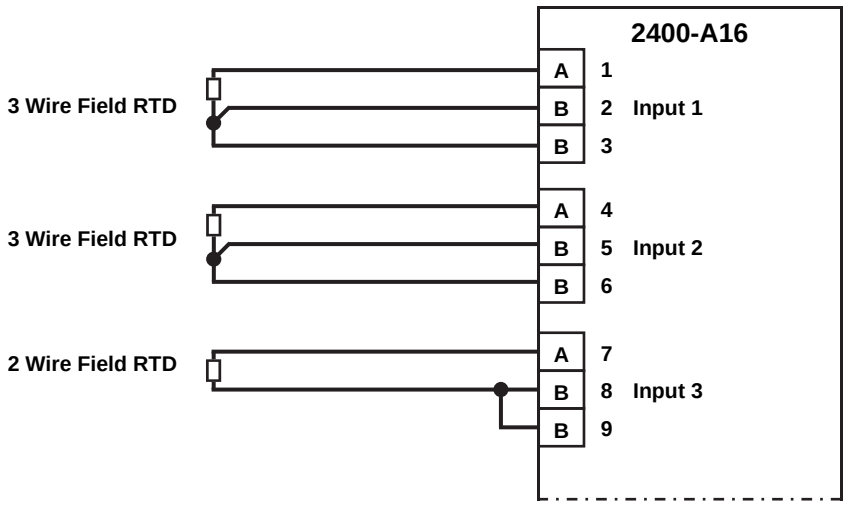
Note 2. Input voltages must not exceed 24Vdc.

Note 3. Voltage free contact values must be brought in through 'tags' in the SCADA software.

Note 4. All cables to be screened, and the screens earthed at one end only.

Input Voltage Selections:	
Voltage Inputs:	**milliVolt Inputs:**
DC 0~5Vdc	DC -25~+25mV
DC 0~10Vdc	DC -50~+50mV
	DC -100~+100mV
	DC -200~+200mV
Customise Ranges:	
DC 0~10Vdc	-200~+200
	Min Span = 5mV (5000 steps)
	Max Span = 400mV

2400-A16 Input Connection Diagram for RTD Inputs.



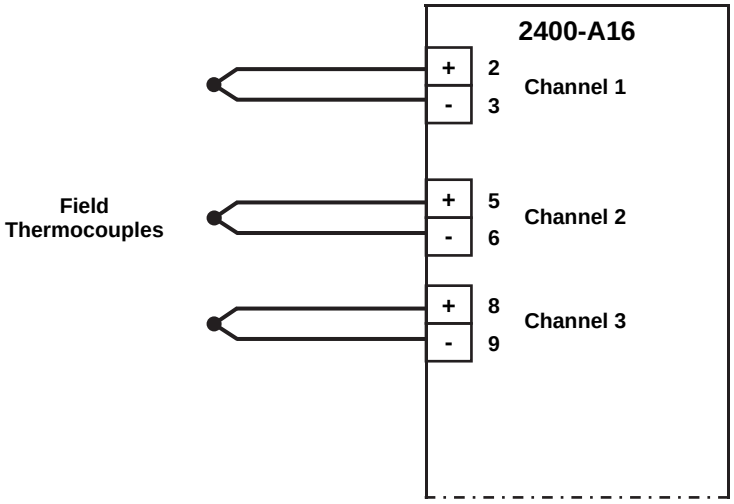
Note 1. To minimise lead resistance errors, 3 wire RTDs should be used. If 2 wire RTDs are used small offset errors can be compensated for in the software.

Note 2. All RTD cable to be screened, and the screens earthed at one end only. The three wires must be the same resistance. (i.e. the same type and size.) Refer to '2400-A16 Wiring and Installation' for recommended types.

RTD Pt1000 Selection: The 2400-A16 comes with the default setting of RTD Pt100 0~100°C. To change inputs 1~16 from Pt100 to Pt1000, refer to '2400 Station Software Programming' on page 19 to connect the 2400-A16 to your PC. Once you have the 'Program Outstation' window open on you PC: click on the 'Advanced' button and then the 'RTD Pt100 / Pt1000' button. Within the 'RTD Pt100 / Pt1000' window you can select individual channels to be either Pt100 or Pt1000. Once you have finished, click 'OK', then 'OK'. Now you can use the drop-down boxes to choose the desired temperature ranges. When finished remember to 'Program' the station before disconnecting.

2400-A16 Input Connection Diagrams for Thermocouple Inputs.

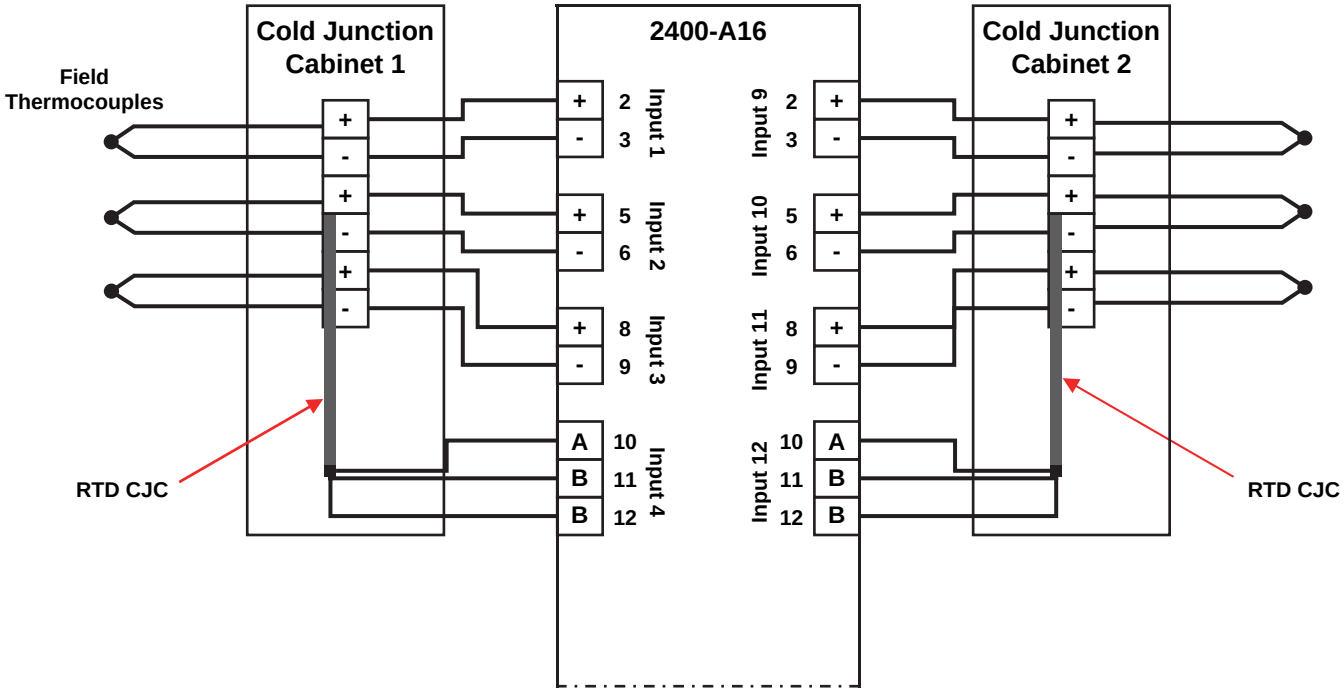
Thermocouple Connection Using The Default Integral CJC:



Note 1. When using the default integral CJC for accurate thermocouple measurement, especially low temperature:

- The cover must be fitted.
- Avoid drafts and temperature differences across terminals (not to be exposed to direct sunlight).
- Once installation is complete, close the cabinet door and allow the cabinet to reach equilibrium. This may take several hours.
- Place all the thermocouple probes into a calibrated thermal bath at temperature of interest. Any errors can be zeroed out in software.

Thermocouple Connection Using An External RTD CJC:



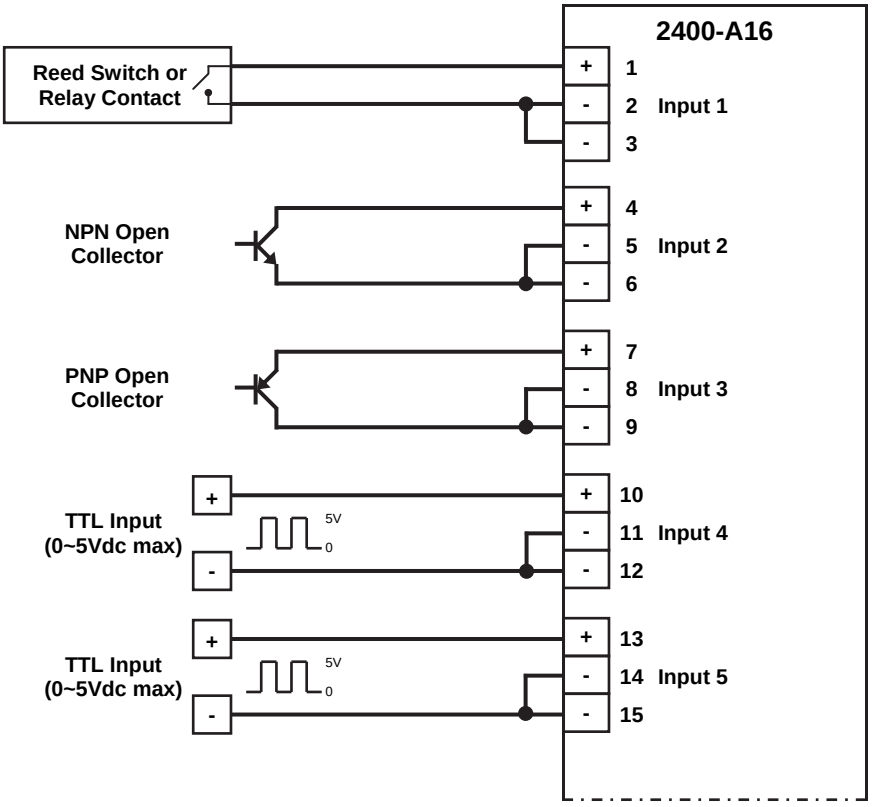
Note 2. The external RTD CJC, facility can be selected for accurate Cold Junction Compensation.

- Terminate all thermocouples in a terminal box.
- Use copper cable between the terminal box and 2400-A16 inputs.
- Bond the external CJC RTD probes to the appropriate terminals.
- A cover must be fitted on the terminal box to prevent drafts and temperature differences across terminals.

2400-A16 Pulse, Frequency & On/Off State Input Connections.

Both the 16 universal inputs (terminals 1~48) plus the 4 dedicated digital inputs (terminals 54~58) can be used for pulse and frequency outputs from flow or energy meters. These inputs can also be used for on/off state inputs.
Note: When connecting on/off State to universal Inputs 1~16, software configuration in MicroScan is via 'Pseudo Digital Input'. Use MicroScan Help for detailed instructions.

2400-A16 Input Connection Diagram Digital Signals Into Universal Inputs 1~16.

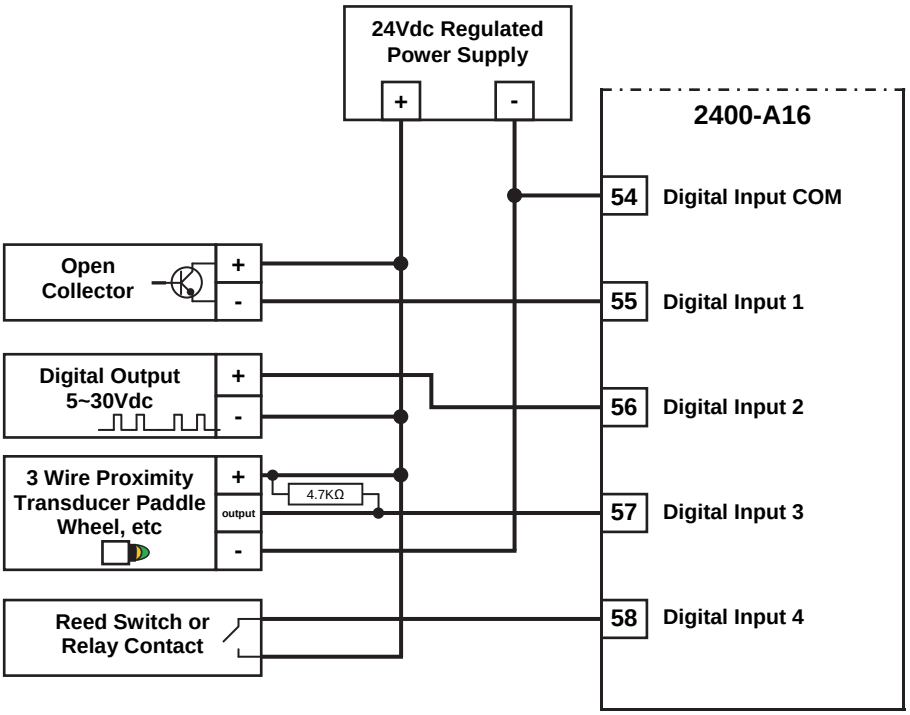


Note 1. Inputs can be used as state Pseudo Digital inputs for sensing a clean, voltage free, field contact.

Note 2. Select input range PD1, PD2 for Pseudo Digital inputs.

Note 3. All cables to be screened, and the screens earthed at one end only. All the three wires must be the same resistance. (i.e. the same type and size.) Refer to '2400-A16 Wiring and Installation' for recommended types.

2400-A16 Input Connection Diagram for Digital Signals Into Dedicated Digital Inputs 54~58.



Note 1. Inputs can be either:
State - i.e. ON / OFF or
Frequency - 0~8000Hz (e.g. flow and energy meters).

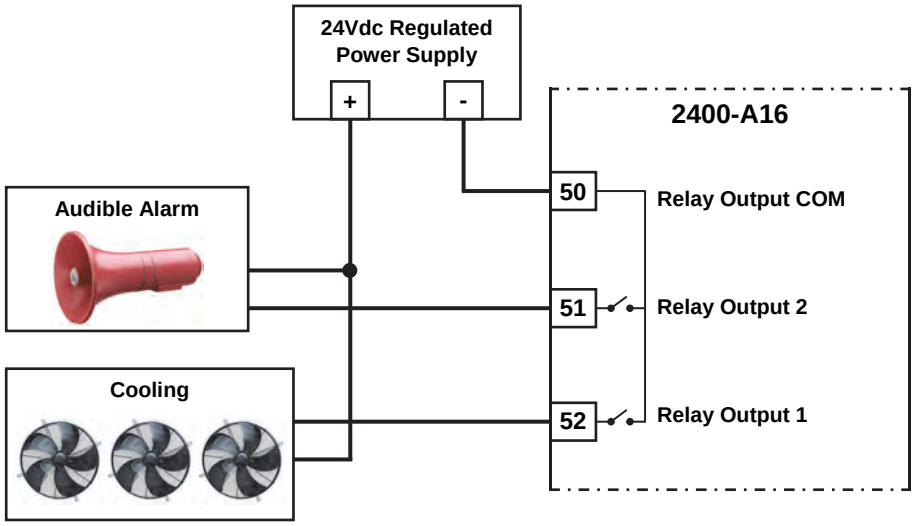
Note 2. LED indication per input. Refer to '*Specifications*' for input loads.

Note 3. For Scaling of counter inputs, totalising and flow data conversion, refer to MicroScan Help, line setup/counter scaling.

Note 4. Do not fit the 4K7 resistor for 3 wire PNP transducers.

Note 5. All cables must be screened, and the screens earthed at one end only. Refer to '2400-A16 Wiring and Installation'.

2400-A16 Connection Diagram for Digital Outputs.



Note 1. Both relays are Normally Open, and share a common.

Note 2. LED indication per output when relay is energised.

Note 3. Contact rating of 30Vdc, 3A Max.

Note 4. For additional Relay Expansion refer to 2400-R2.

Note 5. Each relay can be configured for a 'Normally ON' or 'Normally OFF' output state (e.g. for fail safe operation). The 'Normally ON/OFF' settings are retained in software on power down, but the relays are de-energised. Refer to MicroScan Help.

Note 6. Relay 2 can be selected as a Comms failure time-out alarm. The relay is normally active and deactivates after 5mins if no Comms messages are received. This function does not detect microprocessor failure. When used for this function the relay cannot be used for any other function (adjustable delay in seconds).

Note 7. Digital Outputs are not available when used as an intelligent multiplexer.

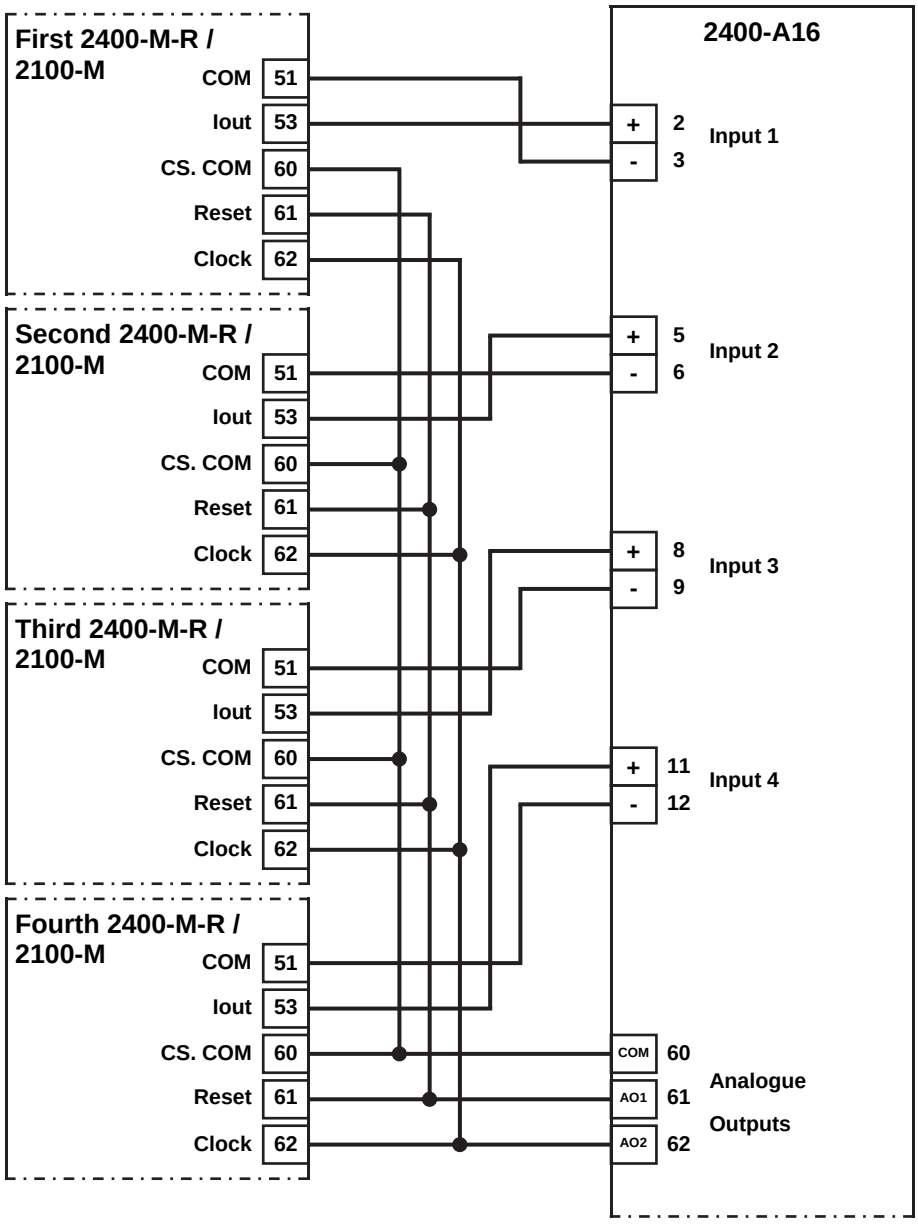
Note 8. All cables must be screened, and the screens earthed at one end only.
Refer to '2400-A16 Wiring and Installation'.

Connecting to a MicroScan SCADA System.

2400-A16 Analogue Input Expansion - Using a 2400-M-R / 2100-M Input Multiplexer.

Analogue input expansion can be achieved using up to four 2400-M-R (RTD inputs only) or 2100-M 16 Channel Analogue Input Multiplexers. This gives a total of 76 analogue inputs. Channel select control for the 2400-M-R is through the Analogue Output 1 and Analogue Output 2 on the 2400-A16 (Refer to Note 2 below). One analogue input is required per M-R, and each M-R input must be of the same type and range.
The remaining 2400-A16 analogue inputs can be used for any other type of input.

Option 1. Five Wire Connection Diagram.
This uses 5 wires for the first 2400-M-R / 2100-M with 2 additional wires for each additional 2400-M-R.



Note 1. The 2400-A16 resolution on the 2400-M-R / 2100-M multiplexer inputs is 12 bits (4096 steps).

Note 2. When 2400-M-R / 2100-M multiplexers are used:
AO COM connects to CS COM.
AO1 is used for the RESET pulse.
AO2 is used for the CLOCK pulse.
AO1 & AO2 are not available for any other use.

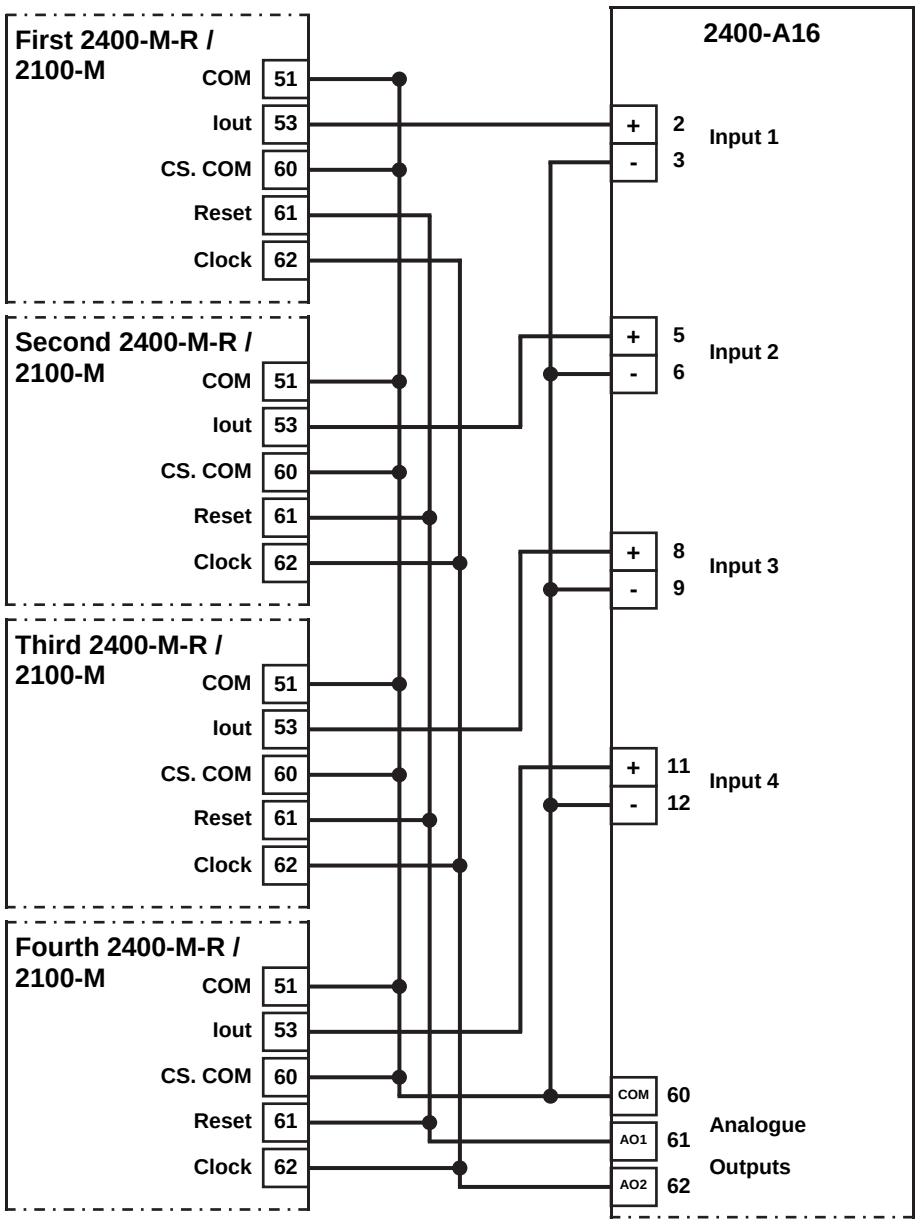
Note 3. All cable must be screened, and the screens earthed at one end only.

Note 4. Any input can be used as a Multiplexer input.

Note 5. The 2400-A16 does not have a Multiplexer priority scan mode.

The analogue output mode is set in the Station Software Programming under ‘AO1/AO2 Mode’.
For 2400-M-R / 2100-M Driver select Mode 1.
For detailed programming info, refer to ‘programming 2400-Series Remote Station’ in the MicroScan Help.
Note: The 2400-A16 does not have Clock & Reset LED Indication on Analogue Outputs 1 & 2 - terminals 61 & 62.

Option 2. Four Wire Connection Diagram.
This uses 4 wires (two pair) for the first 2400-M-R / 2100-M, with 1 additional wire for each additional 2400-M-R / 2100-M. In this configuration the analogue inputs are single ended. i.e. All the –ve inputs are all commoned.



Note 1. The 2400-A16 resolution on the 2400-M-R / 2100-M multiplexer inputs is 12 bits (4096 steps).

Note 2. When 2400-M-R / 2100-M multiplexers are used:
AO COM connects to CS COM.
AO1 is used for the RESET pulse.
AO2 is used for the CLOCK pulse.
AO1 & AO2 are not available for any other use.

Note 3. All cable must be screened, and the screens earthed at one end only.

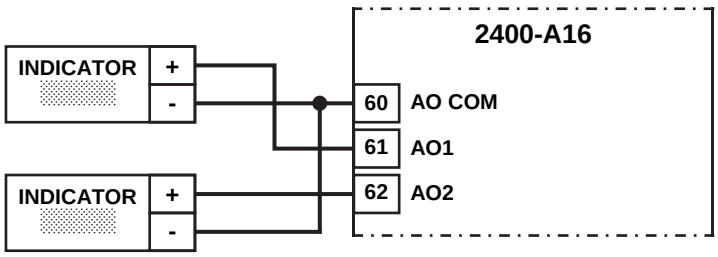
The analogue output mode is set in the Station Software Programming under 'AO1/AO2 Mode'.
For 2400-M-R / 2100-M Driver select Mode 1.
For detailed programming info, refer to 'programming 2400-Series Remote Station' in the MicroScan Help.

2400-A16 Analogue Outputs Controlled by SCADA.

The analogue output mode is set in the Station Software Programming under 'AO1/AO2 Mode'.
For SCADA outputs select Mode 2.
For detailed programming info, refer to 'Programming 2400-Series Remote Station' in the MicroScan Help.

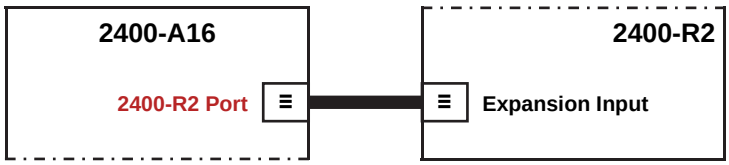
AO1 & AO2 are controlled by the SCADA software.
4~20mA output (0~4096 steps).
Outputs are powered (sourced).

The example shows two 4~20mA indicators that are powered by the 4~20mA loop.



2400-A16 Relay Output Expansion - Using the 2400-R2 Relay Output Expansion Modules.

2400-A16 Relay Output Connection Example Diagrams:

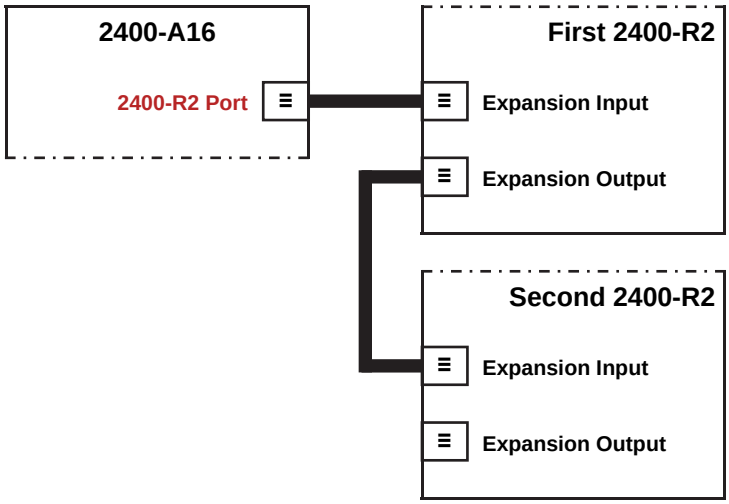


2400-R2 Specifications:

Relay Ratings:	**Rating**	**Approved**
	250Vac, 5A	UL
	30Vdc, 5A	

Note 1. The 2400-A16 connects to the **2400-R2** via standard Ethernet cable (note this is not an Ethernet port).

Note 2. The 2400-A16 does **not** connect to the **2100-R2** or **2100-R**.



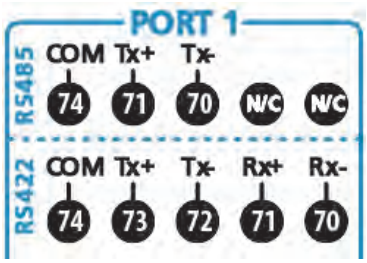
Output relay expansion is available using the 2400-R2, 16 relay output expansion module. This allows the 2400-A16 to stand alone as a 16 channel controller and/or alarm unit. The 2400-R2 relay outputs can be used for any combination of control and alarm functions. The control parameters for each of the 16 controllers is downloaded from the user friendly MicroScan Software, and stored in permanent memory on the 2400-A16.
These parameters include Setpoint (SV), Output Switching Differential, Auto/Manual, Manual Output Setting, Dual Action Control, Single Action Control, Heat/Cool, Heat Only, Cool Only. The 16 controller/alarms will operate unaffected by computer power downs, reboots, etc. The relay outputs can also be accessed directly from the SCADA.

Note. For detailed programming information, refer to 'Programming 2400-Series Remote Station' in the MicroScan Help.

Serial Communications Ports.

Fitted with two serial communications ports plus a third port for programming.
The only exception to this is when an Ethernet TCP/IP port is fitted which replaces port 1.

Port 1:
Default port for connecting to the SCADA computer or PLC, and supports RS422 or RS485, with total isolation; except Port 3.
Note: RS422 & RS485 wiring use separate terminal blocks - see diagram >>



Port 2:
Auxiliary port for programming the configuration settings, or secondary MicroScan system. Supports RS485 or RS232, with total isolation from all other inputs and outputs.

RS232 Connection to DB9:

2400-A16 terminal No	DB9 Pin No (Computer)
Tx 76	2
Rx 75	3
COM 74	5



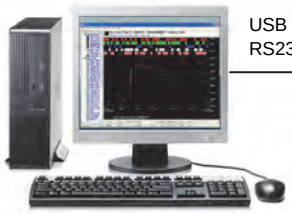
Note: The **2400-RS232** comes as an optional 5m RS232 cable for the 2400-A16 / 2400-M-R.

Port 3:
Programming port via the **XU-USB** Programming Key.
(Plug located on end of 2400-A16 module, see page 8).



Outstation Layout - RS485:

2 Wire RS485 Connections:



USB / RS232



2400-IS Converter.

MicroScan Computer.

	74 com			71 Tx+	70 Tx-

Never guess Tx or Rx connections.
Follow the terminal numbers in the serial connections diagrams exactly.

Important:
1. All cables must be screened.
2. All screens must be connected together.
3. The screen must not be earthed at any point.

Port 1 or 2.



70
71
74

2400-A16 Remote Station.

SD	16A	24	20
-	17	3	21
+	16	2	22
SG	15	1	1



Shimaden SD16A/24/20 with RS485 option.



70
71
74

2100-A16 / 2100-A4 Remote Station.

	SR23
-	14
+	13
SG	12



Shimaden SR23 with RS485 option.



70
71
74

2100-D Remote Station.

	FP23
-	14
+	13
SG	12



Shimaden FP23 with RS485 option.



70
71
74

2100-AO Remote Station.

	FP93
-	25
+	24
SG	23



Shimaden FP93 with RS485 option.

SR	91	92/93/94	
	12	3	-
	11	2	+
	1	1	SG



Shimaden SR90 Series with RS485 option.

SR	82	83	84	
-	18	25	22	
+	17	24	21	
SG	16	23	1	



Shimaden SR80 Series with RS485 option.

SRS	11A	12A	13A/14A	
	18	2	12	-
	17	1	11	+



Shimaden SRS10A Series with RS485 option.

RS485 DATA HI-WAY. CABLE POLARITY MUST BE OBSERVED.

TWISTED PAIR

	SR253
-	3
+	9
SG	5



Shimaden SR253 with RS485 option.

	MR13	
	25	-
	24	+
	23	SG



Shimaden MR13 with RS485 option.

1KΩ **End of Data Highway Junction Box; Resistor = 1KΩ.**

Outstation Layout - RS422:

4 Wire RS422 Connections:



USB / RS232



2400-IS Converter.

MicroScan Computer.

74	73	72	71	70
com	Rx+	Rx-	Tx+	Tx-

Never guess Tx or Rx connections.
Follow the terminal numbers in the serial connections diagrams exactly.

Important:
1. All cables must be screened.
2. All screens must be connected together.
3. The screen must not be earthed at any point.

Port 1 Only.



70 71 72 73 74

2400-A16 Remote Station.



70 71 72 73 74

2100-A16 / 2100-A4 Remote Station.



70 71 72 73 74

2100-D Remote Station.



70 71 72 73 74

2100-AO Remote Station.



21 20 23 22

IN-2000-AI Remote Station.



36 35 38 37

IN-2000-DI Remote Station.



26 25 28 27

IN-2000-DO Remote Station.

4 6 3 9 5



Shimaden SR25/253 with RS422 option.

25 24 23 22 21



Shimaden SR53/54 with RS422 option.

5 4 3 2 1



Shimaden SR73A/74A with RS422 option.

24 23 21 22 1



Shimaden SD20 with RS422 option.

4 6 3 9 5



Shimaden FP21 with RS422 option.

Important: When an **FP21** is present all devices in the Data Highway must use **4800 baud rate**.

RS422 DATA HI-WAY. CABLE POLARITY MUST BE OBSERVED.

TWISTED PAIR

TWISTED PAIR

1KΩ

End of Data Highway Junction Boxes; Resistors = 1KΩ.

1KΩ

Important: change resistors to 120Ω when using IN-2000-XX Remote Stations in data highway.

2400-A16 Station Programming and Setup.

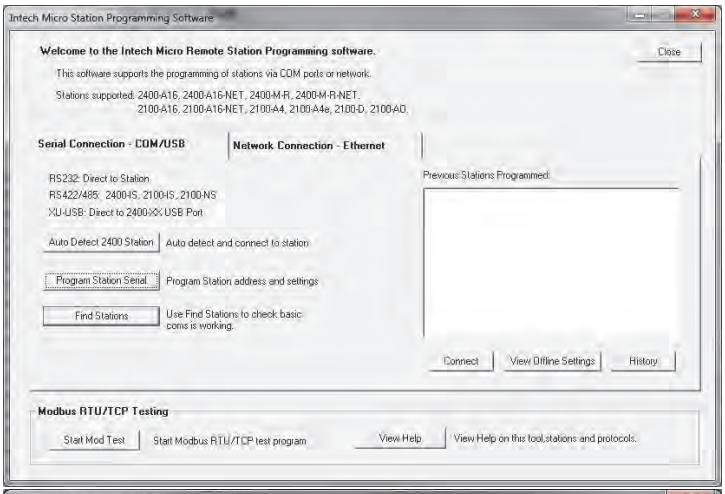
Important: When commissioning remote stations, you must programme a unique station number before using the 2400 station. To connect the new 2400 Station, refer to *'Wiring and Installation'* and *'Commissioning'* on page 30 onwards.

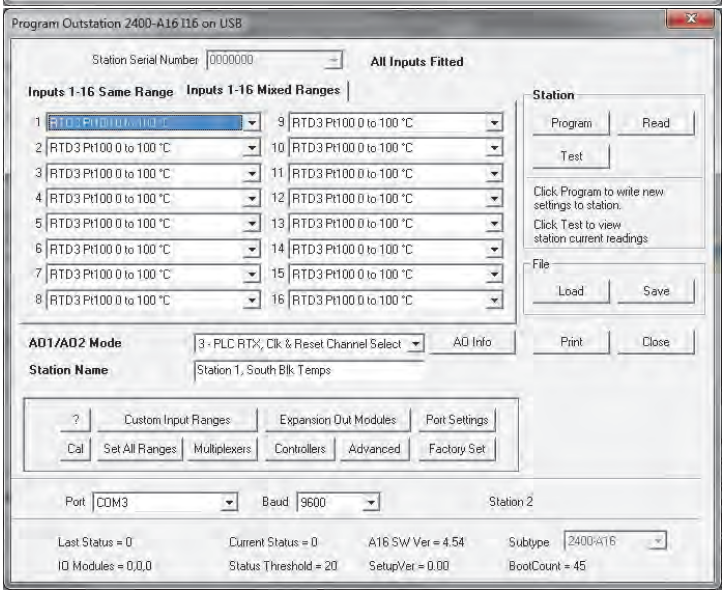
2400 Station Software Programming.

There are 2 methods for configuring the 2400-A16:

A. Connecting the 2400 station to a MicroScan v5 SCADA software package.
Programming the 2400 station requires MicroScan version 5.1 onwards, follow the instructions in the MicroScan Help. The first step under 'Setup Tools' is to click on "Add New Station". Refer to MicroScan Help to proceed.

B. When connecting to a PLC or similar, programming station inputs using Station Programmer.
Station Programmer can be downloaded from the download area of the Intech website.





1. Once the 2400-A16 station is connected to your PC (Connection to the 2400 Stations USB Port 3 is Recommended), start by opening the Station Programmer application.
2. There are two connection tabs; 'Serial Connection' or 'Network Connection'. Select the tab which corresponds to your current station's connection. Next click on the 'Auto Detect 2400 Station' button.
   Note: the 'Auto Detect' can only be used to connect to a single 2400 station at a time, i.e. it should not be used on a data loop with multiple 2400 stations attached.
3. Once your computer has found the 2400 station and has finished receiving setup data, you are able to change the necessary channels to the input ranges you require from the drop down menus.
   Note 1: It is a good idea to check the serial number at the top of the window matches the 2400 station you are trying to program.
   Note 2: 'Same Range' tab sets all channels to the same range, 'Mixed Ranges' tab allows you to set the channels individually.
   Note 3: The 'Station Name' field can be set to identify the station with a custom user friendly name.
   Note 4: See page 10 for selecting RTD Pt1000 inputs.
4. When you have finished setting up the channels, click 'Program'; this will then program the necessary changes into the 2400 station memory.
5. Now that the station is programmed, you can click the 'close' button to finish.
   Note: Once you have programmed a 2400 Station for the first time, the Name and Serial number will be stored in your history and will appear in the 'Previous Stations Programmed' dialog box. This allows you to simply select the identified station and click connect.

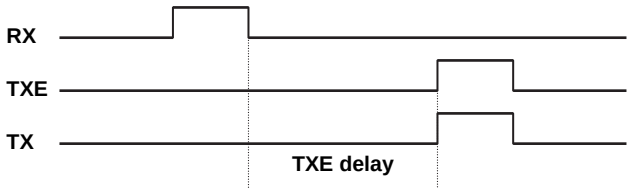
For more detailed programming information, refer to 'View Help'.

Programing the 2400-A16 Station Number.

1. The unique station number can be programmed using either MicroScan (version 5.1 onwards) or Station Programmer software.
2. The programing software will require the 2400-A16's serial number before allocating a station number, so remember to have it on hand before you begin.
3. Using Station Programmer, the 2400-A16 station number can be programmed by selecting 'Program Station Serial', and then clicking on either 'Add New Station' or 'Program Station Address' under Step 1. You can also program the station number via 'Port Settings' if you click the 'Auto Detect 2400 Station' option.
   For MicroScan programming information, refer to 'Programming 2400-Series Remote Station' in the MicroScan Help.
4. Once programed, the station number will be stored in the 2400-A16's permanent memory.

2400-A16 TXE Settings.

The TXE delays are software selectable in the MicroScan Outstation Programming Box.



TXE delay options: 2, 20, 50, 100ms.

These delays are used for RS422/485 operation, to control the behaviour of the transmitter on the outstation, when it is ready to send data. The TXE delay controls how long the transmitter waits before turning on.

Connecting to a PLC.

Connecting to a PLC as an Intelligent Multiplexer.

To set up the 2400-A16 as an intelligent multiplexer, a free software download is available from the Intech website Downloads area called Station Programmer. The analogue output mode must be selected as either Mode 3 or Mode 4. This is set in the Station's Dialog Box 'AO1 & AO2 button'. For detailed programming information, refer to 'Programming 2400-Series Remote Station' in the MicroScan Manual.

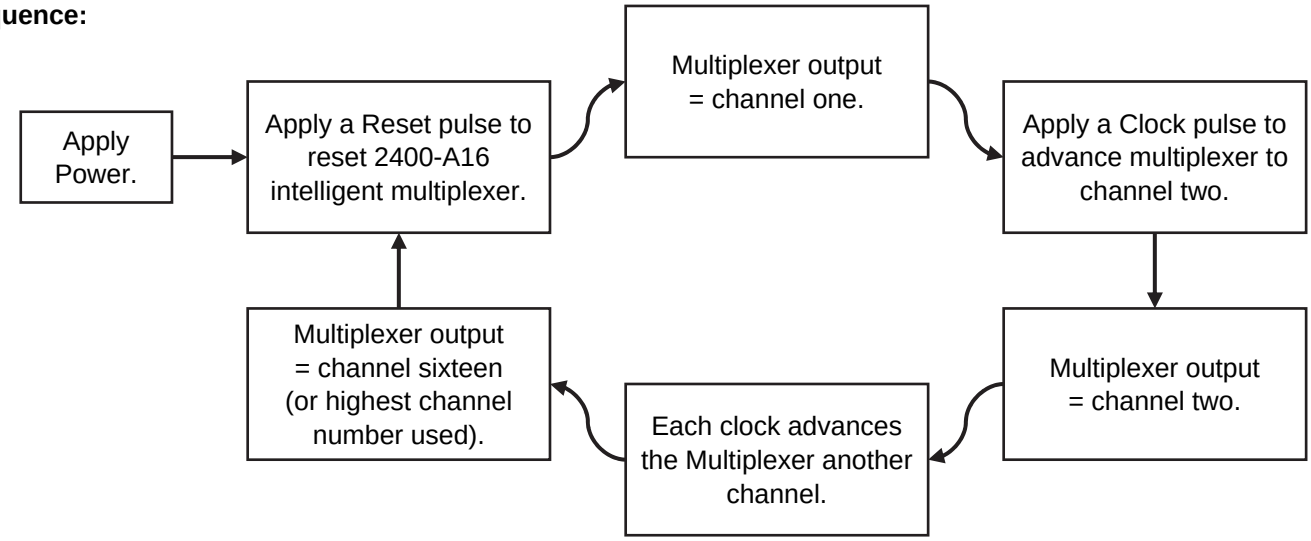
Mode 3. 2400-A16 Clock and Reset Channel Selection Mode, PLC Installation Guide.

Mode 3. PLC RTX, Clock & Reset Channel Select.
DI COM = CS COM.
DI 1 = RESET Input.
DI 2 = CLOCK Input.
Issue a RESET pulse to select channel 1.
Issue a CLOCK pulse to advance to the next channel.

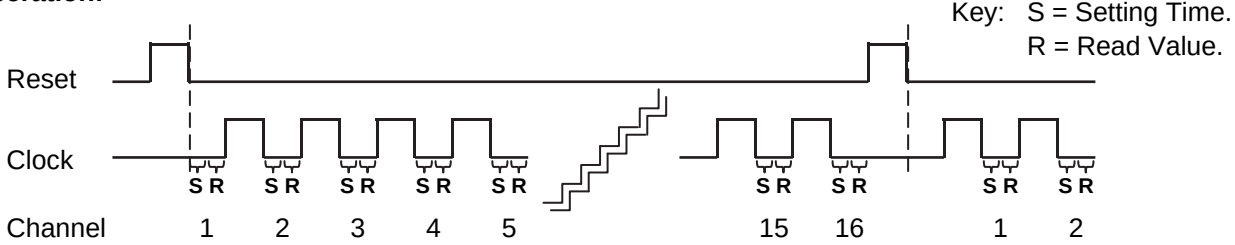
Specifications.

Clocking Speed	-Reset pulse length	20msec.
	-Clock pulse length	20msec.
Setting Times Before Reading		100msec Min. Multiple readings with averaging recommended.
		Note: Longer times may be required for longer cable lengths and higher resolution.
Binary Signal Magnitude	-All modes	5~30Vdc.
Cycle Time		2 seconds minimum to cycle through all 16 inputs.
Resolution		12Bits, 4000 steps typical.

Sequence:



Operation:



Mode 4. 2400-A16 Clock and Reset Channel Selection Mode, PLC Installation Guide.

Mode 4. PLC RTX, Bin Select Channel. Allows direct selection of input channel number.
Bin channel selection is by digital inputs D1~D4.

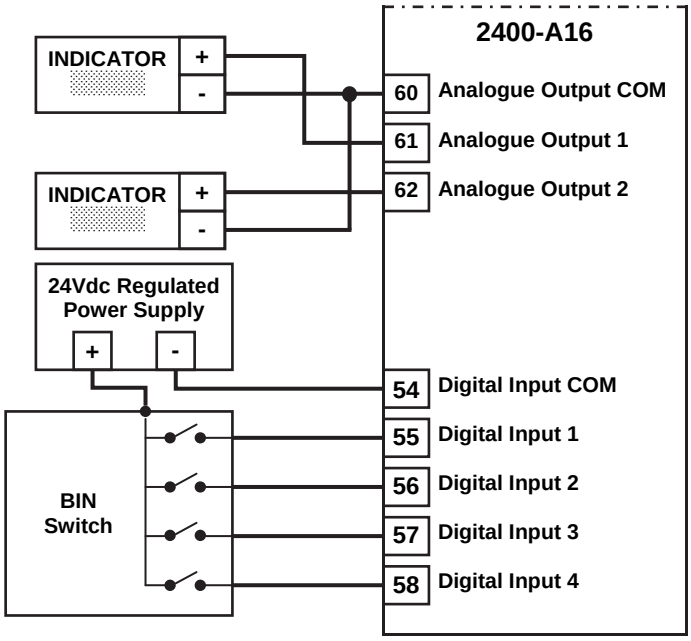
DI COM = CS COM.
DI 1 = BIN 1.
DI 2 = BIN 2.
DI 3 = BIN 4.
DI 4 = BIN 8.

Specifications.

Setting Times Before Readings	-All modes	100msec Min. Multiple readings with averaging recommended.
		Note: Longer times may be required for longer cable lengths and higher resolution.
Binary Signal Magnitude	-All modes	5~30Vdc.
Cycle Time		4sec minimum to cycle through all 16 inputs.
Resolution		12Bits, 4000 steps typical.

2400-A16 Binary Channel Selection Mode Table.

Bin Channel Selection				
DI 1 BIN 1	DI 2 BIN 2	DI 3 BIN 4	DI 4 BIN 8	Retransmission Channel
0	0	0	0	1
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8
0	0	0	1	9
1	0	0	1	10
0	1	0	1	11
1	1	0	1	12
0	0	1	1	13
1	0	1	1	14
0	1	1	1	15
1	1	1	1	16



Notes:

Note 1. '0' = No voltage on the terminal.
'1' = 5~30Vdc on the terminal.

Note 2. Ensure that if the analogue output from each 2400-A16 is fed into the same unit (e.g. PLC), then it is recommended that the analogue inputs to the PLC, etc, be isolated.

Note 3. Analogue Output 1 = Retransmission of input process value 1~16.
Analogue Output 2 = Retransmission of controller setpoints 1~16.

Note 4. The input and output always share the same range.
E.g. if input 1 is ranged 0~100°C and retransmission channel 1 is selected on Digital Input 1~4, then Analogue Outputs 1 & 2 are both transmitted as 4~20mA = 0~100°C.
Similarly if input 2 is ranged for 0~250°C, then Analogue Outputs 1 & 2 are transmitted as 4~20mA = 0~250°C.

Note 5. If Analogue Output 1 process value or Analogue Output 2 are transmitted to an indicator, then all inputs must be ranged the same, unless the indicator is ranged 0~100%.

Note 6. The PLC RTX modes can operate simultaneously with the SCADA COMMS, allowing a PLC to read back data that the SCADA will be showing.

Note 7. Digital inputs and digital outputs are not available in the mode.

2400-A16 Used as an Intelligent Multiplexer. Connection Examples to a PLC With Open Collectors.

Connection Example 1 - Commoned to 24V:
Connection of a 2400-A16 to a PLC with open collectors, commoned to 24V of an external power supply.

Note 1. In this configuration the 2400-A16 Digital Input COM and Digital Inputs are isolated from the 2400-A16 inputs and outputs. The 24Vdc external power supply can therefore be used to power transmitters connected to the 2400-A16 inputs.

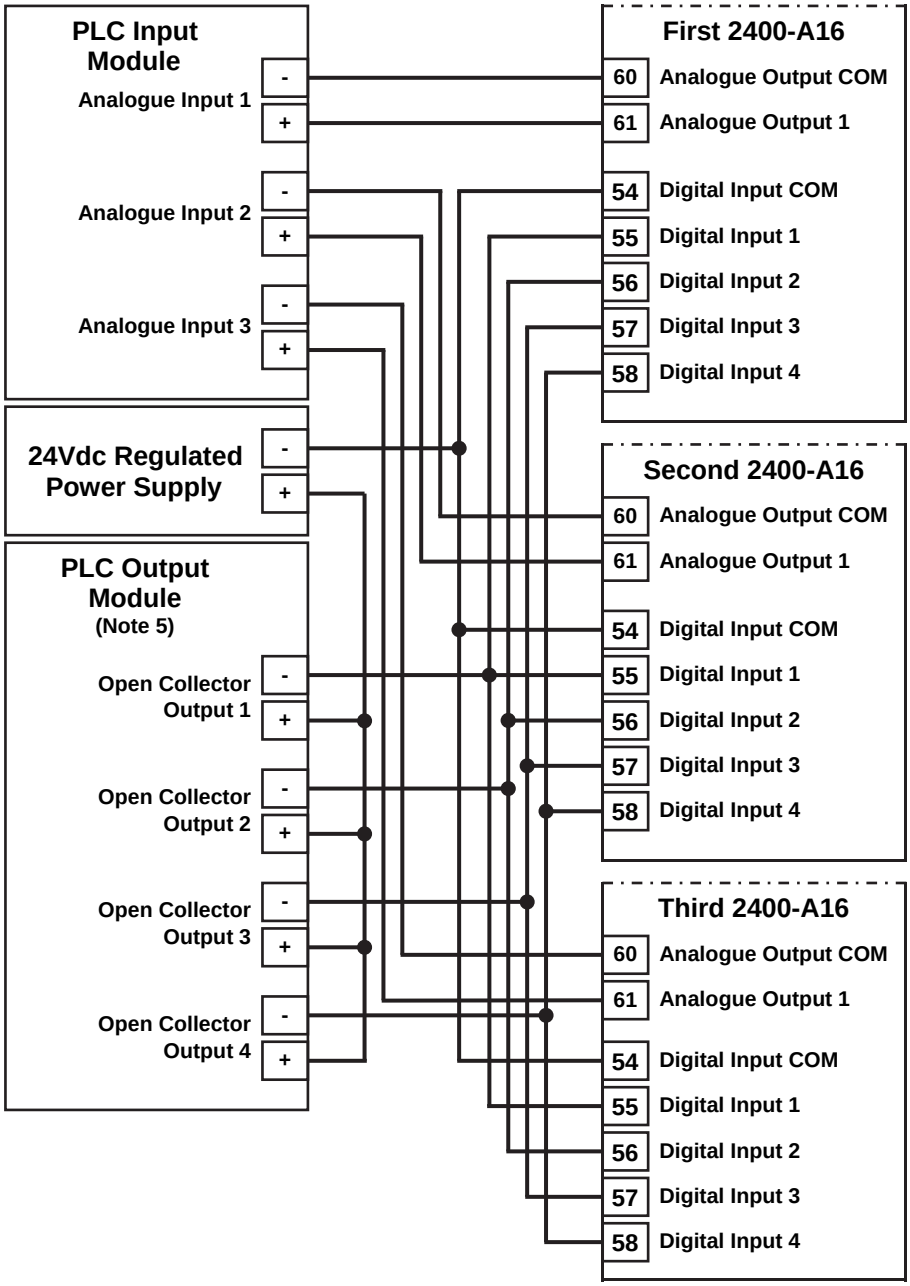
Note 2. There is no limit to the number of 2400-A16s that can be connected, except that the power supply and open collector outputs must be able to handle the load.

Note 3. Each digital input draws 10mA at 24Vdc.

Note 4. All cables must be screened, and the screens earthed at on end only.

Note 5. For Clock/Reset Channel Selection DO NOT connect PLC Outputs 3 & 4 to Digital Inputs 3 & 4 of the 2400-A16.

* For PLC RTX, Clock & Reset Channel Selection refer to '*Mode 3. 2400-A16 Clock and Reset Channel Selection Mode*' on page 20.
* For PLC RTX, Bin Channel Selection refer to '*Mode 4. 2400-A16 Clock and Reset Channel Selection Mode*' on page 21.



Connection Example 2. - Commoned to 0V:
Connection of a 2400-A16 to a PLC with open collectors, commoned to 0V of an external power supply.

Note 1. This configuration reverses the logic so when the PLC digital output is off, the 2400-A16 is on.

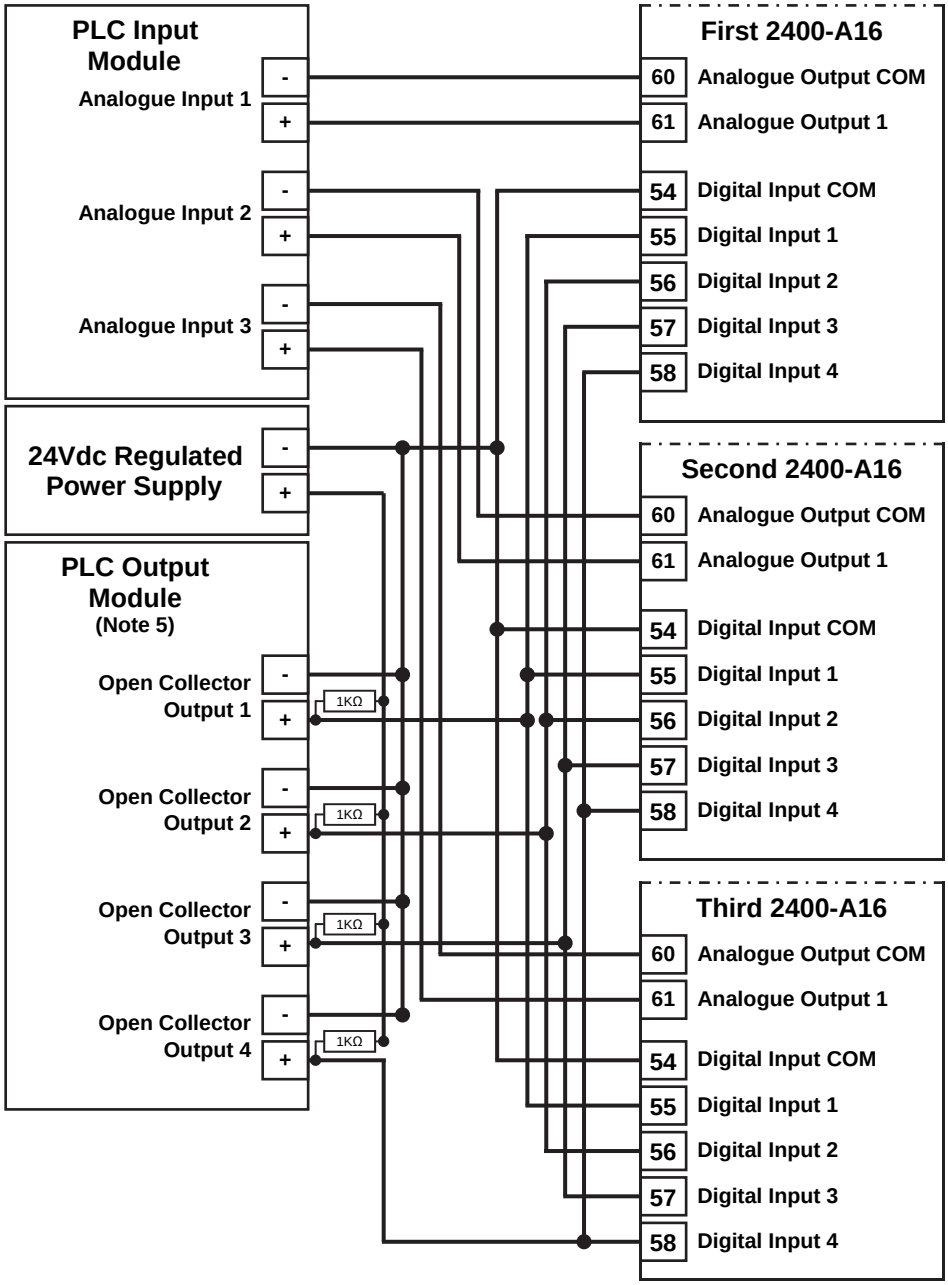
Note 2. With 1KΩ resistor, up to four 2400-A16s can be connected in this configuration, provided the open collector outputs can handle the load.

Note 3. Each digital input draws 10mA at 24Vdc.

Note 4. All cables must be screened, and the screens earthed at on end only.

Note 5. For Clock/Reset Channel Selection DO NOT connect PLC Outputs 3 & 4 to Digital Inputs 3 & 4 of the 2400-A16.

* For PLC RTX, Clock & Reset Channel Selection refer to '*Mode 3. 2400-A16 Clock and Reset Channel Selection Mode*' on page 20.
* For PLC RTX, Bin Channel Selection refer to '*Mode 4. 2400-A16 Clock and Reset Channel Selection Mode*' on page 21.



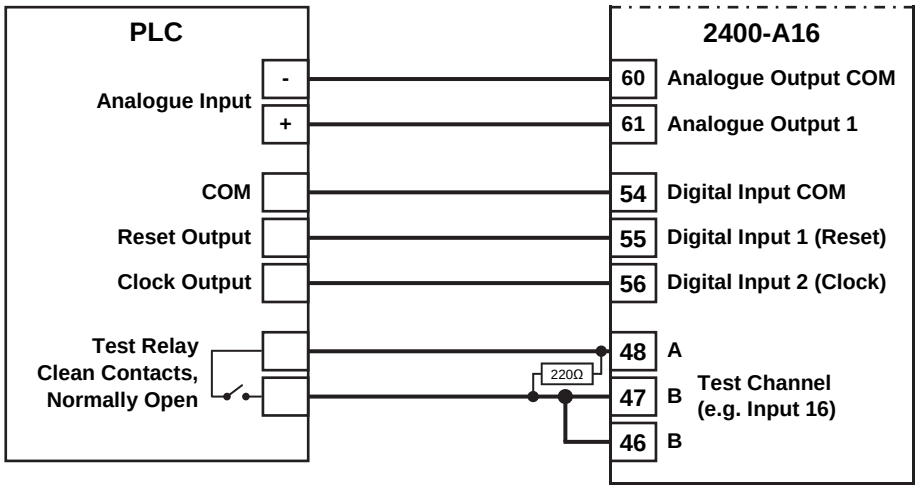
2400-A16 PLC RTX Fail Safe System.

The PLC uses one channel of the 2400-A16 to verify that the 2400-A16 is reading the channel correctly, Analogue Output 1 is working and the clock and reset/BCD channel select is working.
Test Channel = spare channel on 2400-A16, set to RTD 0~850°C. This has a PLC relay connected which is used to short out A-B, under the PLCs command. Do not use channel 1 as a test channel.

Sequence of Operation:

1) The PLC reads the required channels as normal.
2) The PLC then advances to the test channel (the next free channel or channel 16).
3) The test channel is read.
4) The relay changes state to alter the reading of the test channel.
5) Steps 1) to 4) are repeated. If the reading on the test channel does not alternate between 4mA & 10mA as the relay changes state, within the specified tolerances as listed below, then there is a fault in the system. The PLC software should be setup to detect these values as the relay changes state.

Relay State	Test Channel Reading	Output Value	PLC Test Value
Closed	Less than -15°C	4mA	Test for 5mA and below
Open	Approx. 320°C ±10°C	10mA	Test for above 9.5mA and below 10.5mA



Communications.

2400-A16 'Modbus RTU/TCP' Communication Protocol.

Note: This section only applies to Modbus Protocol resident on all 2400-A16's.

Modbus RTU COMMS Specifications	
Error Check	Standard Modbus CRC.
End of message framing delay	Min: 5msec, Max: 7msec. (Minimum specification is 3.5sec @ 9600 baud).
	Counting is based on internal 2.5msec timer.

Product Liability. Due to on-going research and development, designs, specifications, and documentation are subject to change without notification.

2400-A16 Modbus RTU Station Addresses.

Station addresses 1~64. The station number is programmed via the Program Address dialog box, which ties a station number to the serial number of the station which the Modbus protocol then uses. The Factory set default station number for all stations is Station #1. Station 0, broadcast commands are not supported.

Station address and input range configuration etc. are set using either MicroScan (version 5.1 onwards) or Station Programmer software. Setup of onboard station controllers and other station parameters supported in eeprom are also set via the programming dialog boxes. These parameters are not accessible via the protocol.

The station can be tested with the Stations test dialog box which shows the current values of the inputs and relay states, analogue output values can be set.

Using the Modbus Protocol.
The MicroScan / Modbus protocol selection is automatic.

2400-A16 Modbus RTU/TCP Address Map.

Coil Addresses (Relay Outputs)			
Coil (000xx)	**Output**	**Coil (000xx)**	**Output**
01	Internal Relay 1		
02	Internal Relay 2		
03~16	Reserved		
17	2400-R2 #1 Relay 1	33	2400-R2 #2 Relay 1
18	2400-R2 #1 Relay 2	34	2400-R2 #2 Relay 2
19	2400-R2 #1 Relay 3	35	2400-R2 #2 Relay 3
20	2400-R2 #1 Relay 4	36	2400-R2 #2 Relay 4
21	2400-R2 #1 Relay 5	37	2400-R2 #2 Relay 5
22	2400-R2 #1 Relay 6	38	2400-R2 #2 Relay 6
23	2400-R2 #1 Relay 7	39	2400-R2 #2 Relay 7
24	2400-R2 #1 Relay 8	40	2400-R2 #2 Relay 8
25	2400-R2 #1 Relay 9	41	2400-R2 #2 Relay 9
26	2400-R2 #1 Relay 10	42	2400-R2 #2 Relay 10
27	2400-R2 #1 Relay 11	43	2400-R2 #2 Relay 11
28	2400-R2 #1 Relay 12	44	2400-R2 #2 Relay 12
29	2400-R2 #1 Relay 13	45	2400-R2 #2 Relay 13
30	2400-R2 #1 Relay 14	46	2400-R2 #2 Relay 14
31	2400-R2 #1 Relay 15	47	2400-R2 #2 Relay 15
32	2400-R2 #1 Relay 16	48	2400-R2 #2 Relay 16

Note 1 2400-R2 must be fitted to access 2400-R2 relays 1~16, plus 2400-R2 enabled on Station Programming dialog box.

Note 2 Coils 3~16 reserved for future expansion.

2400-A16 Modbus RTU/TCP Inputs.

Digital Inputs	
Inputs (1 XXXX)	
10001	Digital Input 1
10002	Digital Input 2
10003	Digital Input 3
10004	Digital Input 4
10005~10016	Reserved

Note Inputs 5~16 reserved for future expansion.

2400-A16 Modbus RTU/TCP Address Map.

Input Registers (Analogue Inputs)			
(3XXXX, 4XXXX)	**Input**	**(3XXXX, 4XXXX)**	**Input**
30001	Input 1 (12 Bit 000-FFF) * Note 1	30071	Mux 2 Input 7 (12 Bit 000-FFF)
30002	Input 2 (12 Bit 000-FFF) * Note 1	30072	Mux 2 Input 8 (12 Bit 000-FFF)
30003	Input 3 (12 Bit 000-FFF) * Note 1	30073	Mux 2 Input 9 (12 Bit 000-FFF)
30004	Input 4 (12 Bit 000-FFF) * Note 1	30074	Mux 2 Input 10 (12 Bit 000-FFF)
30005	Input 5 (12 Bit 000-FFF) * Note 1	30075	Mux 2 Input 11 (12 Bit 000-FFF)
30006	Input 6 (12 Bit 000-FFF) * Note 1	30076	Mux 2 Input 12 (12 Bit 000-FFF)
30007	Input 7 (12 Bit 000-FFF) * Note 1	30077	Mux 2 Input 13 (12 Bit 000-FFF)
30008	Input 8 (12 Bit 000-FFF) * Note 1	30078	Mux 2 Input 14 (12 Bit 000-FFF)
30009	Input 9 (12 Bit 000-FFF) * Note 1	30079	Mux 2 Input 15 (12 Bit 000-FFF)
30010	Input 10 (12 Bit 000-FFF) * Note 1	30080	Mux 2 Input 16 (12 Bit 000-FFF)
30011	Input 11 (12 Bit 000-FFF) * Note 1	30081	Mux 3 Input 1 (12 Bit 000-FFF)
30012	Input 12 (12 Bit 000-FFF) * Note 1	30082	Mux 3 Input 2 (12 Bit 000-FFF)
30013	Input 13 (12 Bit 000-FFF) * Note 1	30083	Mux 3 Input 3 (12 Bit 000-FFF)
30014	Input 14 (12 Bit 000-FFF) * Note 1	30084	Mux 3 Input 4 (12 Bit 000-FFF)
30015	Input 15 (12 Bit 000-FFF) * Note 1	30085	Mux 3 Input 5 (12 Bit 000-FFF)
30016	Input 16 (12 Bit 000-FFF) * Note 1	30086	Mux 3 Input 6 (12 Bit 000-FFF)
30017	Input 1 (IEEE 754 - 2 Words)	30087	Mux 3 Input 7 (12 Bit 000-FFF)
30019	Input 2 (IEEE 754 - 2 Words)	30088	Mux 3 Input 8 (12 Bit 000-FFF)
30021	Input 3 (IEEE 754 - 2 Words)	30089	Mux 3 Input 9 (12 Bit 000-FFF)
30023	Input 4 (IEEE 754 - 2 Words)	30090	Mux 3 Input 10 (12 Bit 000-FFF)
30025	Input 5 (IEEE 754 - 2 Words)	30091	Mux 3 Input 11 (12 Bit 000-FFF)
30027	Input 6 (IEEE 754 - 2 Words)	30092	Mux 3 Input 12 (12 Bit 000-FFF)
30029	Input 7 (IEEE 754 - 2 Words)	30093	Mux 3 Input 13 (12 Bit 000-FFF)
30031	Input 8 (IEEE 754 - 2 Words)	30094	Mux 3 Input 14 (12 Bit 000-FFF)
30033	Input 9 (IEEE 754 - 2 Words)	30095	Mux 3 Input 15 (12 Bit 000-FFF)
30035	Input 10 (IEEE 754 - 2 Words)	30096	Mux 3 Input 16 (12 Bit 000-FFF)
30037	Input 11 (IEEE 754 - 2 Words)	30097	Mux 4 Input 1 (12 Bit 000-FFF)
30039	Input 12 (IEEE 754 - 2 Words)	30098	Mux 4 Input 2 (12 Bit 000-FFF)
30041	Input 13 (IEEE 754 - 2 Words)	30099	Mux 4 Input 3 (12 Bit 000-FFF)
30043	Input 14 (IEEE 754 - 2 Words)	30100	Mux 4 Input 4 (12 Bit 000-FFF)
30045	Input 15 (IEEE 754 - 2 Words)	30101	Mux 4 Input 5 (12 Bit 000-FFF)
30047	Input 16 (IEEE 754 - 2 Words)	30102	Mux 4 Input 6 (12 Bit 000-FFF)
30049	Mux 1 Input 1 (12 Bit 000-FFF)	30103	Mux 4 Input 7 (12 Bit 000-FFF)
30050	Mux 1 Input 2 (12 Bit 000-FFF)	30104	Mux 4 Input 8 (12 Bit 000-FFF)
30051	Mux 1 Input 3 (12 Bit 000-FFF)	30105	Mux 4 Input 9 (12 Bit 000-FFF)
30052	Mux 1 Input 4 (12 Bit 000-FFF)	30106	Mux 4 Input 10 (12 Bit 000-FFF)
30053	Mux 1 Input 5 (12 Bit 000-FFF)	30107	Mux 4 Input 11 (12 Bit 000-FFF)
30054	Mux 1 Input 6 (12 Bit 000-FFF)	30108	Mux 4 Input 12 (12 Bit 000-FFF)
30055	Mux 1 Input 7 (12 Bit 000-FFF)	30109	Mux 4 Input 13 (12 Bit 000-FFF)
30056	Mux 1 Input 8 (12 Bit 000-FFF)	30110	Mux 4 Input 14 (12 Bit 000-FFF)
30057	Mux 1 Input 9 (12 Bit 000-FFF)	30111	Mux 4 Input 15 (12 Bit 000-FFF)
30058	Mux 1 Input 10 (12 Bit 000-FFF)	30112	Mux 4 Input 16 (12 Bit 000-FFF)
30059	Mux 1 Input 11 (12 Bit 000-FFF)	30113	Counter 1 (0-FFFF) * Note 2
30060	Mux 1 Input 12 (12 Bit 000-FFF)	30114	Counter 2 (0-FFFF) * Note 2
30061	Mux 1 Input 13 (12 Bit 000-FFF)	30115	Counter 3 (0-FFFF) * Note 2
30062	Mux 1 Input 14 (12 Bit 000-FFF)	30116	Counter 4 (0-FFFF) * Note 2
30063	Mux 1 Input 15 (12 Bit 000-FFF)	30117, 40117	Analogue Out 1 (0-FFF) * Note 3
30064	Mux 1 Input 16 (12 Bit 000-FFF)	30118, 40118	Analogue Out 2 (0-FFF) * Note 3
30065	Mux 2 Input 1 (12 Bit 000-FFF)	30119	Reserved
30066	Mux 2 Input 2 (12 Bit 000-FFF)	30120	Reserved
30067	Mux 2 Input 3 (12 Bit 000-FFF)	30121	Ambient Sensor (IEEE 754 - 2 Words)
30068	Mux 2 Input 4 (12 Bit 000-FFF)		
30069	Mux 2 Input 5 (12 Bit 000-FFF)		
30070	Mux 2 Input 6 (12 Bit 000-FFF)		

Note. The multiplexers 1~4 cannot be used if the stations Analogue outs AO1 & AO2 are used for general purpose outputs or retransmission controls.

* 2400-A16 Modbus Notes next page >

2400-A16 Modbus Notes.

Note 1: Analogue Inputs 1~16 scaling:

0-FFF = 0~4095, which is ranged according to the range selected for each input.
For RTD -25 to +25, then 0 = -25, 4095 = +25,
For RTD 0 to +25, then 0 = 0, 4095 = +25,
For DCXX range = 0 to 100%, 0 = 0%, 4095 = 100%.

Note 2: Counter Inputs:

Value ranges from 0-FFFF which is 0 - 65535.
Max speed 8,000Hz. (50~500Hz is the MicroScan limitation.)
Do not read counters when MicroScan V4 is reading counters on a different port.
Count value is reset to zero on power up.

Note 3: Analogue Outputs:

Mode is set in Station programming dialog box, AO1 & AO2 mode.
Mode 1 is Multiplexer output (AO1, AO2 drive 2400-M-R / 2100-M only).
Note: 2400-M-R / 2100-M cannot retransmit to other 2400-M-Rs / 2100-Ms.
Mode 2 is SCADA outputs, AO1, AO2 can be set via protocol.
Mode 3 is retransmission of input to AO1, clock and reset channel selection.
Mode 4 is retransmission of input to AO1, binary channel selection.
If AO1 and AO2 are used for driving 2400-M-R / 2100-M units, do not write the analogue out value using the RTU messages as it will interfere with the 2400-M-R / 2100-M driver.
30117, 30118 = Read Only
40117, 40118 = Read/Write

Note 4: Analogue Input Speed:

Inputs are scanned sequentially by the 2400-A16, a read of the data locations, reads the last value read and does not force the 2400-A16 to read the inputs requested by the protocol read. The normal read speed with all sixteen inputs is 16 channels/second. Channels that are not scanned can be disabled via the station programming dialog boxes.

Supported Modbus Commands.

Modbus Commands:	
Command	
Read Coil	01 (0xxxx)
Force Single Coil	05 (0xxxx)
Force Multiple Coil	15 (0xxxx)
Read Input	02 (0xxxx)
Read Input Register	04 (0xxxx)
Read Holding Register	03 (0xxxx)
Write Holding Register	06 (0xxxx)
Write Multiple Holding Register	16 (0xxxx)

Notes:
Maximum length of Modbus command = 32bytes.
Maximum length of Modbus reply = 80bytes.

CITECH Floating Point Format.

Floating point Byte Order = 1 (3,2,1,0).

CITECH.INI
[Modbus]
FloatMode=1

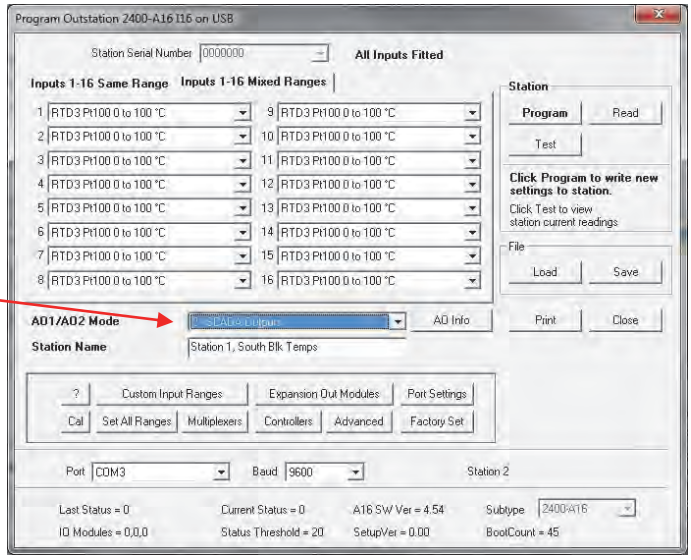
Set using Modbus help in CITECH help file.

2400-A16 Input Counter Registers.

Digital Inputs 1~4 16 bit value:
Wraps around at FFFF to 0. Max speed 8000Hz.

DI	Address (access as holding register or input register):
1	113
2	114
3	115
4	116

Note: Counters cannot be used if PLC RTX modes are set. To use the digital inputs as counters the 2400-A16 must be put into the SCADA Outputs mode. This can be done via the Station Programmer software. Refer to '2400 Station Software Programming' on page 19.
Once you have the 'Program Outstation...' window open, select 'SCADA Outputs' from the drop down menu next to 'AO1/AO2 Mode'.
Then select 'Program', and then 'Close'



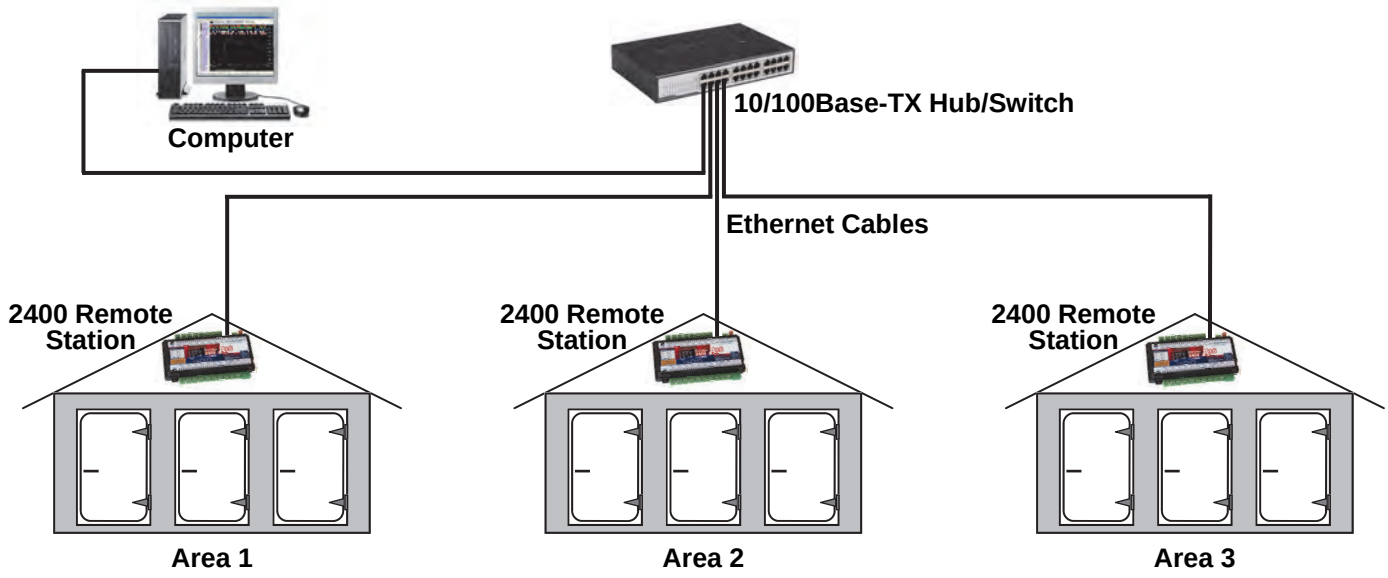
Analogue and Digital Inputs 32 bit Counter Value.
Analogue inputs need to be set to counter mode.
Wraps around at FFFF FFFF to 0.
Analogue Max speed 2.5KHz, Digital Max speed 8000Hz.

Analogue Input	Address (access as holding register or input register)	Digital Input	Address (access as holding register or input register)
1	645	1	369
2	647	2	371
3	649	3	373
4	651	4	375
5	653		
6	655		
7	657		
8	659		
9	661		
10	663		
11	665		
12	667		
13	669		
14	671		
15	673		
16	675		

Data format Little Endian (low address = least significant, high address = most significant).
Value is continually counting. Use sequential reads and subtract values to work out count value that has occurred since last read.

2400-A16-Net Connection Example to an Ethernet 10/100Base-TX Hub.

Used in situations with multiple 2400-A16-NET in a plant.



Note: Use standard Ethernet cabling between devices (recommend Category 5e or better cable).

2400-A16-NET Ethernet 10/100.

The Ethernet converter on the 2400-A16-NET, the XPort®, uses the Ethernet Protocol (IP) for network communications and the Transmission Control Protocol (TCP) to assure that no data is lost or duplicated, and that everything sent to the connection arrives at the correct target.

Ethernet	-Interface	RJ45 10Base-T & 100Base-TX Autosensing.
	-Compatibility	IEEE802.3.
	-LEDs	10Base-T & 100Base-TX Activity; Full/Half Duplex.

2400-A16-NET Software Installation.

Software for use with the 2400-NET (Ethernet) Stations is the same as for the 2400-485 (Serial) Stations.
Refer to '2400-A16 Station Programming and Setup' on page 19.
Note: If using Station Programmer; make sure to select the 'Network Connection' tab before clicking the 'Auto Detect 2400 Station' button.

2400-A16-NET TCP/IP Setup.

Factory Set IP Address is: **192.168.1.100**
Factory Set Port is: **10001**
To assign the 2400-A16-NET with a new IP address in Station Programmer, software click on 'Network Device Setup', then in the 'Network Device Setup' window select the 2400-NET station you wish to assign, and then click the 'Assign IP' button.

Note 1: You will need to allow the Station Programmer software access through the Windows Firewall in order to find the Ethernet converter (XPort®) and set the IP address. When the Windows Security Alert window appears, click 'Allow access' (Win7) or 'Unblock' (XP).

Note 2: This software is to be installed and/or setup by the Installer with Network IT support staff. **Intech will not be able to help with the setup and operation of a TCP/IP network and assigning of IP addresses**. As part of commissioning, IT support staff should assign a static IP address to each 2400-A16-NET. The 2400-A16-NET should be listed as part of the Ethernet system for support by the IT support staff.

Note 3: Installed antivirus software may interfere with the sockets operations. You may need to open the IP address and port numbers for the commands to go through. We have found problems with Nortons System Works 2003, and found it necessary to disable email scanning of messages, as this was blocking the sockets requests. These problems may or may not exist on other antivirus programs.

Note 4: The Ethernet converter (XPORT®) on the 2400-A16-NET only allows one computer communications connection at one time. It is not possible to have multiple computers permanently communicating to the 2400-A16-NET. The computers must share the 2400-A16-NET by connecting and disconnecting as required. For TCP connection; Sockets = 1.

2400-A16-NET Troubleshooting.

Duplicate 0xFF Characters, port numbers 14001 -14009.
Do not use port numbers 14001-14009 with Modbus RTU/TCP protocol or other binary based protocols.
With these port numbers, the 0xFF characters get duplicated, and two 0xFF characters will appear for each 0xFF actually sent.

Description of 2400-A16-NET Ethernet LED Functions.

2400-A16-NET Ethernet L1 & L2 LED Functions

L1 LED	XPORT® 03
Off	No Activity
Solid Amber	
Blinking Amber	Half Duplex Activity
Solid Green	
Blinking Green	Full Duplex Activity

L2 LED	XPORT® 03
Off	No Link
Solid Amber	10Base T
Blinking Amber	
Solid Green	100Base Tx
Blinking Green	

L1 LED is the LED closest to terminal 48.
L2 LED is the LED closest to terminal 80.

Cautions on Ethernet Port.

1) Make sure that the Ethernet cable/plug is not physically damaged before insertion into the Ethernet port. e.g. Burred on plastic edges.
2) Damage to the Ethernet port pins is not covered under warranty.

Wiring, Installation and Maintenance.

2400-A16 Wiring and Installation.

THE 2400-A16 IS TO BE INSTALLED AND SERVICED BY SERVICE PERSONNEL ONLY. NO OPERATOR / USER SERVICEABLE PARTS.

All power and signals must be de-energised before connecting any wiring.
Do not start the MicroScan before programming in a unique station number. Refer 'Station Number Programming and Serial Number'.

Mounting:

* Also refer to Connection Diagrams and Notes.

1) Mount in a clean environment in an electrical cabinet on 35mm Symmetrical mounting rail.
2) Draft holes must have minimum free air space of 20mm. Foreign matter must not enter or block the draft holes.
3) Do not subject to vibration or excess temperature or humidity variations.
4) Avoid mounting in cabinets with power control equipment.
5) To maintain compliance with the EMC Directives the 2400-A16 is to be mounted in a fully enclosed steel fire cabinet. The cabinet must be properly earthed, with appropriate input/output entry points and cabling.
6) Allow 10mm minimum clearance between the 2400-A16 terminals and ANY conductive material.

Analogue Signal Wiring:

1) All signal cables should be good quality overall screened INSTRUMENTATION CABLE with the screen earthed at one end only.
2) Signal cables should be laid a minimum distance of 300mm from any power cables.
3) For 2 wire current loops, 2 wire voltage signals or 2 wire current signals, B5102ES is recommended. For 3 wire transmitters and RTDs B5103ES is recommended.
4) It is recommended that you do not ground analogue signals and use power supplies with ungrounded outputs.
5) Lightning arrestors should be used when there is a danger from this source.
6) Refer to diagrams for connection information.

Thermocouple Extension Wire:

1) Use the correct thermocouple extension or compensation cable. i.e. Thermocouple type, insulation type, correct colour coding.
2) It is recommended to install extension or compensation cable in a grounded conduit by themselves, or use overall screened cable with the screen earthed at one end only. Never run electrical wires in the same conduit.
3) All wires that must be spliced should be soldered, or a proper thermocouple termination block used.
4) Lightning arrestors should be used if there is a chance from this source.

Thermocouples:

1) Avoid locating the thermocouple where it will be in a direct flame.
2) Never insert a porcelain or refactory tube suddenly in a hot area. Pre-heat gradually while installing.
3) Locate it where the average temperature will be measured. It should be representative of the mass. If necessary use several thermocouples to obtain the average temperature.
4) Immerse the thermocouple far enough so that the measuring junction is entirely in the temperature to be measured: nine to ten times the diameter of the protection tube is recommended. Heat conducted away from the junction causes an error in reading.
5) If the thermocouple is mounted horizontally and the temperature is above the softening point of the tube, a support should be provided to prevent the tube sagging. Otherwise install the tube vertically.
6) Keep the junction head and cold junction in the approximation of the ambient temperature. Especially in the Noble Metal Class.

RTDs:

1) Avoid locating the RTD where it will be in a direct flame.
2) Locate it where the average temperature will be measured. It should be representative of the mass.
3) Immerse the RTD far enough so that the measuring point is entirely in the temperature to be measured; nine to ten times the diameter of the protection tube is recommended. Heat that is conducted away from the measuring point causes an error in reading.

Power Supply Wiring:

1) Use Only Instrument Quality Power Supplies.
2) A readily accessible disconnect device and a 1A, 250Vac overcurrent device, must be in the power supply wiring.
3) Any 2400-R2 connected to the 2400-A16, must share the same disconnect device and overcurrent device.
4) For power supply, connect Phase (or +Ve) to terminal 82, Neutral (or -Ve) to 81.

RS422/485 Data Hi-Way Signal Cabling:

1) Use only low capacitance, twisted pair, overall screened data cable. The cable must equal or better the following specifications:

Cable Specifications.		
Conductor Size		7/0.20mm, 24AWG
Conductor Resistance @ 20C		8.9Ω/100m
Maximum Working Voltage		300Vrms
Capacitance between wires of a pair		50ρF/m
Capacitance between each wire to all others bunched together		95ρF/m
Cross-talk between pairs	@ 1kHz @ 100kHz	>-90dB/100m >-50dB/100m
Characteristic Impedance	@ 100kHz	135Ω
Attenuation of a pair	@ 1kHz @ 10kHz @ 100kHz @ 50kHz @ 1MHz @ 1.5MHz	0.15dB/100m 0.42dB/100m 0.8dB/100m 0.9dB/100m 1.9dB/100m 2.4dB/100m

NOTE: All cables are to be subject during manufacture to in-process spark testing @ 4kVrms.
All cables are to be tested between conductors and conductors to screen for 1min @ 1500Vrms.

2) Minimum cable pairs: RS422 = 2. (Plus overall screen.)
RS485 = 1. (Plus overall screen.)
3) Take care not to stress or damage cables during installation.
4) Total length of trunk line, including spurs, is not to exceed 1200m without isolating boosters.
5) Terminating resistors -1KΩ.
6) Cabling paths should avoid sources of radio frequency interferences such as fluorescent lights, variable speed motor drives, welding equipment, radio transmitters, etc.
7) There should be a minimum of 200mm physical separation between power cables and data cables.
8) Data cables should not be exposed to excessive heat or moisture, and should not be buried directly in the ground without protection.
9) Avoid powering a remote station or controller from the same power supply as a variable speed drive.
10) All unused twisted pairs should be terminated at both ends with 1kΩ resistors. DO NOT ground unused pairs.

Ethernet Cabling:

Category 5e (Cat 5e) or better (e.g. Cat 6) cable is required for 100Mbps fast Ethernet transmission. The 2400-A16-NET uses a standard RJ45 Connector.

2400-A16-NET Ethernet Port:

When powering up the 2400-A16-NET or 2100-NET with the Ethernet plug connected, the GREEN LED or the ORANGE LED should light immediately, indicating a good network connection.

USB Programming Port:

The USB port on the 2400-A16 is the best method for programming the station before it's first use. This port can only be connect to a PC via the **XU-USB** Programming key. Refer to the Layout & Dimensions on page 8 to locate USB Port 3.

2400-A16 Commissioning.

1) Check that the 2400-A16 has been set to the correct input ranges and all functions such as Upscale/Downscale Drive and CJC etc. Observe polarity and the correct terminal connections for wiring correctly. Only use certified calibration equipment. For Thermocouple calibration place the 2400-A16 and calibration equipment directly next to each other, in still air, with no direct sunshine. Allow both CJC junctions to equalise in temperature before commencing calibration. Lower temperature ranges are affected more by the CJC Junction (allow more time to equalise).

2) Once the above conditions have been met, and the wiring checked, apply power to the 2400-A16, the loops, sensors, 2400-R2s and 2400-M-Rs. Allow a 5 minute warm-up period - longer for thermocouples - refer to Input Connection Diagram for Thermocouple Inputs (page 11).
Note 1. There is a 15sec initialisation period when the 2400-A16 is powered up, before it will communicate.

3) **RTD Inputs only:** A small error can occur due to differences in cable resistance in the RTD legs and errors in the RTD itself (Usually less than 0.5C). To check the variable being measured use a calibration standard RTD at the same immersion depth. If the Zero error is large, the readings are fluctuating or a Zero error has suddenly appeared after the 2400-A16 has been operating for some time, there could be an earth loop between two or more RTD sensors on the 2400-A16 (or between 2400-M-Rs if connected). Disconnect each RTD sensor individually from the 2400-A16, and 'Megger' the RTD by shorting all three wires together and testing from this point to earth. If a path to earth is found, repair or replace the faulty RTD sensor or probe.
Warning: Do not 'Megger' RTDs while connected to the 2400-A16. Damage to the 2400-A16 or 2400-M-R will result.

4) **Thermocouple Inputs only:** Due to the limits of error in a standard Thermocouple probe, and standard extension wire and compensating wire, an error can occur. E.g. In a type K Thermocouple installation an error of 2.2°C or 0.75% FSO can occur (whichever is greater). For low temperature Thermocouple measurement, the use of the external RTD CJC probes is strongly recommended.
When using the 2400-A16 default integral CJC sensors, the enclosure must be assembled and avoid drafts and temperature differences across terminals. Once installation is complete, close the cabinet door and allow the cabinet to reach equilibrium. This may take several hours. Place all the Thermocouple probes into a calibrated thermal bath at the temperature of interest or use a calibration standard Thermocouple at the same immersion depth and temperature of interest and adjust the Zero until the two temperatures agree.

5) **For PLC Clock/Reset or Binary Channel Selection:** Check that the red LEDs on the appropriate digital inputs on the 2400-A16 are flashing. If there are any issues, check instructions under 'Connecting to a PLC' on page 20.

6) **Calibration Check:** Take a reading of the value being measured on each channel, and ensure that this agrees with the level being indicated by the PLC or SCADA for that channel. Adjust for any differences.

7) **Analogue Outputs:** The two 4~20mA Analogue Outputs can be changed to voltage type by using an appropriate 0.1% tolerance resistor:
- 250ohm = 1~5V
- 500ohm = 2~10V

8) **Ethernet Only:** The GREEN or ORANGE LEDs of the Ethernet port light up according to the devices operation. Refer to "Description of Ethernet LED Functions". Refer to Ethernet 10/100 section on page 29, for more details.

2400-A16 Maintenance.

DC Voltage and Current Inputs:

1) Check the Sensor or Transducer supplying the signal to the 2400-A16 for wear or damage and replace if defective.
2) Check the cables connected to the Sensor or Transducer.
3) Repeat (6) of commissioning. Do it regularly - at least once per year.

Thermocouple Inputs:

1) Replace defective protection tubes - even if they look good they may not be air or gas tight.
2) Check extension and compensating cable circuits, especially cables entering the Thermocouple sensor head.
3) Do not use the same Chromel-Alumel (Type K) Thermocouple below 540C if it was used above 860C.
4) Repeat (6) of commissioning. Do it regularly - at least once per year.

RTD Inputs:

1) Replace defective protection tubes - even if they look good they may not be air or gas tight.
2) Check cables entering the RTD sensor head.
3) Repeat (6) of commissioning. Do it regularly - at least once per year.

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