User's Guide

iDRX-ACC, iDRX-ACV, iDRX-FP, iDRX-PR, iDRX-RTD, iDRX-ST, iDRX-TC

Communication Manual for iDRX Signal Conditioner Series

omega.com®
ΩOMEGA®

OMEGAnet® On-Line Service	Internet e-mail
www.omega.com	info@omega.com

Servicing North America:

USA:
ISO 9001 Certified

One Omega Drive, P.O. Box 4047
Stamford CT 06907-0047
TEL: (203) 359-1660   FAX: (203) 359-7700
e-mail: info@omega.com

Canada:

976 Bergar
Laval (Quebec) H7L 5A1
TEL: (514) 856-6928   FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA and Canada:

Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®

**Mexico and
Latin American:**

TEL: (001) 203-359-7803   FAX: (001) 203-359-7807
e-mail: espanol@omega.com

Servicing Europe:

Benelux:

TEL: +31 20 3472121   FAX: +31 20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic:

Frystatska 184, 733 01 Karviná
TEL: +420 59 6311899   FAX: +420 59 6311114
e-mail: info@omegashop.cz

France:

TEL: +33 1 61 37 29 00   FAX: +33 1 30 57 54 27
Toll Free in France: 0800 466 342
e-mail: sales@omega.fr

Germany/Austria:

Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 7056 9398-0   FAX: +49 7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom:
ISO 9001 Certified

One Omega Drive
River Bend Technology Centre
Northbank, Irlam Manchester M44 5BD United Kingdom
TEL: +44 161 777 6611 FAX: +44 161 777 6622
Toll Free in England: 0800 488 488
e-mail: sales@omega.co.uk

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply.
OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

⚠ This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

TABLE OF CONTENTS

SAFETY CONSIDERATIONS

⚠ This device is marked with the international Caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

Unpacking & Inspection

Note ☞ Unpack the instrument and inspect for obvious shipping damage. Do not attempt to operate the unit if damage is found.

⚠ For instruments with AC Voltage and AC Current inputs, observe the input signal connections in the appropriate section of this manual. These instruments must only be installed by professional electricians.

Note ☞
- Do not exceed voltage rating on the label located on the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure instrument does not exceed operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install without exposing bare wire outside the connector to minimize electrical shock hazards.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

Failure to follow all instructions and warnings may result in injury!

I. WHAT SIGNAL CONDITIONERS DO:

The iDRX Series Signal Conditioners are high performance devices used as a front end for PLC's and Data Acquisition systems to measure a variety of low level transducer signals with high precision and accuracy. The iDRX Series Signal Conditioners interface directly to transducers and digitize the input signal. The measured signal is then transmitted to a PLC or a computer using the RS485 Serial Communication. **Up to 32 units may be connected to the same serial RS485 bus**, and each unit may be addressed to transmit the signal being measured under program control, executed on a PLC or a computer. The key features of the iDRX Series Signal Conditioners are the ease of set-up and factory calibrated ranges. All range switching are done electronically by sending the appropriate command; therefore, there is no need to remove or open the units when signal input levels are changed. All set-up may be done by using the Set-up Software running on a computer or by user supplied programs.

II. MODEL OF UNIT :

There are 7 models available:

THERMOCOUPLE	**(iDRX-TC)**
RTD	**(iDRX-RTD)**
STRAIN	**(iDRX-ST)**
PROCESS	**(iDRX-PR)**
FREQUENCY/PULSE	**(iDRX-FP)**
AC VOLT	**(iDRX-ACV)**
AC CURRENT	**(iDRX-ACC)**

III. RS485 SERIAL COMMUNICATION SETUP:

Communication with the UNIT will be performed via serial communication using RS485 standard (half duplex). To use the RS485 communication for the Signal Conditioners you'll need an available Communication port in your computer and have access to a generic communication software program (e.g.: Procomm[1], Windows[2] HyperTerminal[3], etc, see details below for information). A RS485 signal conditioner communication software program is also available as an option to speed the set-up. A RS232 to RS485 converter box will also be required if your computer communications port is RS232.

---

[1] Procomm is a registered trademark of Datastorm Technologies, Inc.

[2] Windows is a registered trademark of Microsoft Corp.

[3] HyperTerminal is a registered trademark of Microsoft Corp.

For Procomm:

Start the Procomm Program.

Press ALT + P (Select the appropriate communication parameters: Baud Rate, Parity, Data Bits, Stop Bits.) The default settings may require modifications.
- Factory Default communication settings are as follows:
Baud Rate = 9600
Parity = Odd
Data Bits = 7
Stop Bits = 1

Press ALT + S (To save current communication settings)
Press ALT + O (To go to chat mode)
If the communication port selected is available and the communication parameters of both the computer and the iDRX are matched, then a serial link may be established. To check the communication any of the commands may be tried i.e. ***01X01** would return the current measured signal value.

For Hyper Terminal (Windows 95):

Start the Hyper Terminal Program from programs/accessories.

Click on the Properties from the File menu.

Under the Phone Number Menu choose:
Connect using "Direct to COM1 or COM2" whichever that's available.
Click on Configure Button.
Choose: Baud rate, Data bits, Parity and Stop bits
According to iDRX's settings.
Flow Control = None.
Click "OK" Button.

- Factory Default communication settings are as follows:
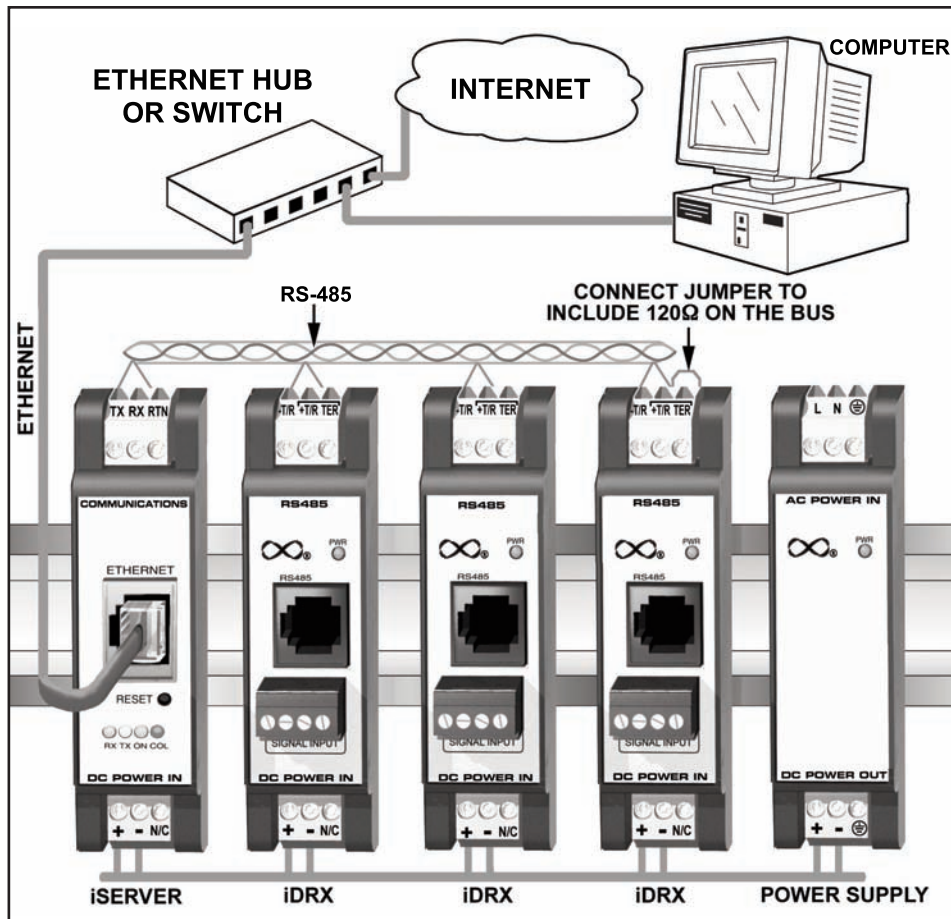Baud Rate = 9600
Parity = Odd
Data Bits = 7
Stop Bits = 1

Under Settings Menu:
Click ASCII Setup Button.
Choose all options except "Force Incoming Data to 7 Bits ASCII".
Click "OK" Button.

Communication Parameter Settings:

Communication settings information are very critical during set-up, if any of the parameters are changed, it should be recorded on the label for future reference. If the communication parameters used by the computer does not match the communication parameter of the iDRX, then the communication link may not be established. Hence it is important to record the communication parameter on the label if different from default.

Resetting Communication Parameters to Factory Defaults

To restore the communication parameters to the factory default settings, two test points must be shorted together. There are two ways of shorting these test points together, both are detailed below and shown in the following figure.

Version A--   Test point TP6 must be shorted, by a wire, to test point TP17.
               or
Version B--   Newer units have a jumper position S1-A for connecting these two test points together.
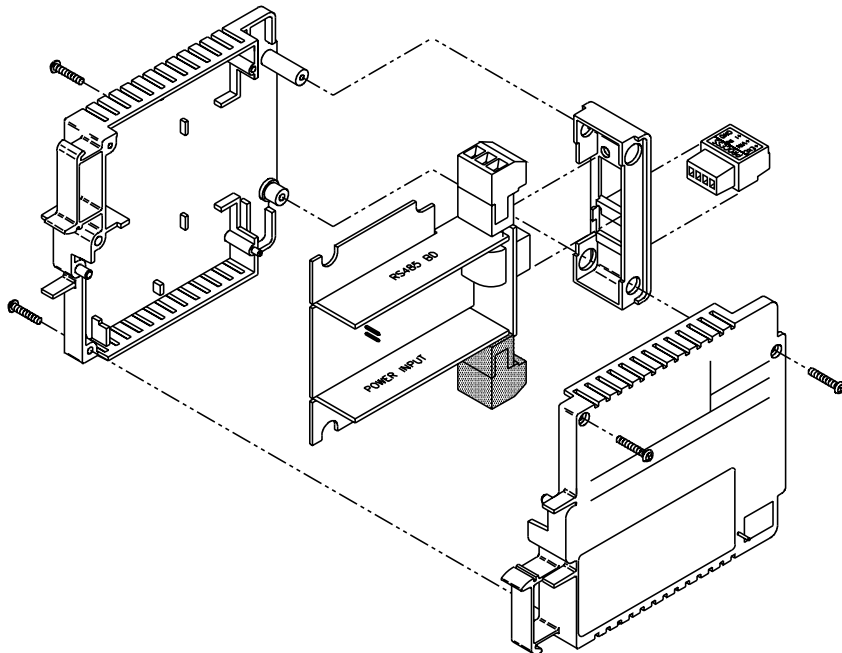
Factory Default Settings for Communication:

      Baud Rate = 9600
      Data Bit = 7
      Parity = Odd
      Stop Bits = 1
      Recognition Character = *
      Address = 01

Open the Signal Conditioner Unit

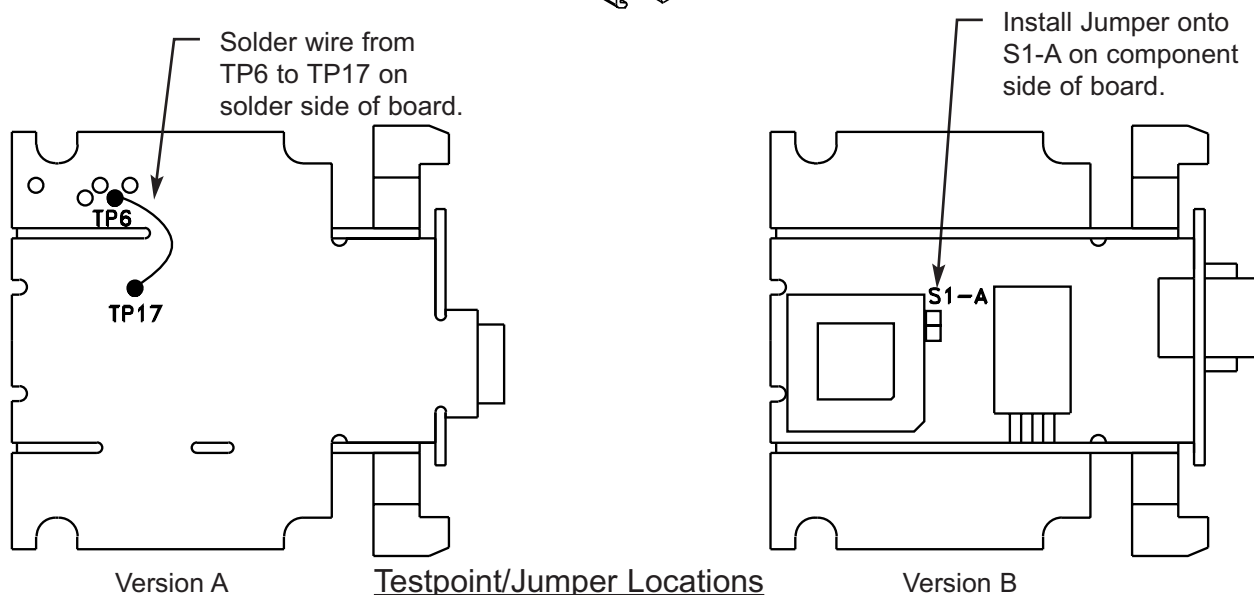**Note** ▼ **Disconnect all signal input and outputs before attempting this procedure.**

Instructions

1) To open the Signal Conditioner Unit—Remove Side Covers from Unit by removing 4 screws, using a Phillips head screwdriver.
2) Short TP6 & TP17 together, either by wire <u>or</u>, if available, jumper S1-A.
3) After shorting TP6 to TP17, apply power to the unit.
4) The Front Panel Power Indicator (LED) will <u>NOT</u> turn on.
5) After power has been applied to the unit for about 3 seconds, remove jumper S1-A or open the TP6 & TP17 connection without turning off the power.

<u>Opening Unit</u>

Solder wire from TP6 to TP17 on solder side of board.

Install Jumper onto S1-A on component side of board.

Version A   <u>Testpoint/Jumper Locations</u>   Version B

6) The communication parameters now have been restored to the default settings temporarily in RAM memory. (If power is removed from the unit, the RAM memory will be lost and the communication parameters will be lost.)

7)   To read the default communication parameters, type the following command using HyperTerminal or some other terminal communication program.

^AE01

8)   The unit will respond with the following ASCII characters depending on the model of iDRX unit.

PR/FP/ST   TC/RTD/ACV/ACC
2A011C0D   2A01140D

9)   The ASCII response is decoded below:

2A = Recognition Character = *
01 = Unit Address = 01
1C = Command Mode, Multipoint Address, Echo ON, Checksum OFF, Line Feed OFF
0D = 9600 Baud, Odd Parity, 7 Data Bits, 1 Stop Bit

10)   To permanently write the above default communication parameters to EEPROM send the following sequence of commands:

*01W0B2A   Unit Response = 01W0B
*01W0A01   Unit Response = 01W0A
*01W081C   Unit Response = 01W08
*01W070D   Unit Response = 01W07
*01Z01   Unit Response = 01Z01   LED on iDRX unit will blink

11)   The default communication parameters are now permanently stored in the unit's EEPROM and will not be lost upon power removal.
12)   Use the iDRX Set-up Program to establish communication with the unit.
13)   This procedure will not affect calibration. It only resets the communication parameters to the factory default settings.

IV. COMMANDS FOR ACCESSING EEPROM:

NO.	command letter	index	meaning	# of bytes
1.	R,W	01	Input range or function	1
2.	R,W	02	Input/output Configuration	1
3.	R,W	03	Decimal point	1
4.	R,W	04	Filter time constant	1
5.	R,W	05	Reading Scale	3
6.	R,W	06	Reading Offset	3
7.	R,W	07	Communication parameters	1
8.	R,W	08	Communication bus format	1
9.	R,W	09	Communication Data format	1
10.	R,W	0A	Communication device address	1
11.	R,W	0B	Communication recog. char.	1
12.	R,W	0C	Unit of measure	3
13.	R,W	0D	Gate time	1
14.	R,W	0E	Debounce time	1
15.	R,W	0F	Transmit time	2
16.	R,W	12	Reading Scale (iDRX-PR)	3
17.	R,W	13	Reading Offset (iDRX-PR)	3

NOTE:

1. **Data** (Number of hex digits) = 2 * number of bytes

2.

command letter	meaning
R	Read from EEPROM
W	Write to EEPROM

3. **"W" commands should be followed by "Z01" command for new values to take effect.**

A. COMMAND FORMAT (TRANSMITTING):

*[nn]Cxx[data][hh]<cr>

Note: Data is required if Command Letter is "W"

B. RESPONSE FORMAT (RECEIVING):

A. Correct response :

1. **If unit is in echo mode*** (see "**BUS FORMAT**") :
   [nn]Cxx[data][hh]<cr>

   *echo mode = unit will send back the command.

2. **If unit is <u>not in echo mode</u> :**

    i. For the commands which require the data to be transmitted by the iDRX Signal Conditioner, data is sent in the following formats:

        data[hh]<cr>

    ii. For the commands which do not require the data:

        NO RESPONSE

B. Error response:

1. If unit is <u>in echo mode</u>:

    [nn]?ee<cr>

2. If unit is <u>not in echo mode</u>:

    ?ee<cr>

<u>NOTE :</u>

[ ]	:	Means will be used wherever applicable.
*	:	Is the security recognition character(default is "*").
nn	:	Is the unit's address in hexadecimal(default is 01). Address may be from 01 to FF.
C	:	Is the command letter (must be capital).
W	:	For writing to the EEPROM (requires **data**)
R	:	For reading from the EEPROM (doesn't require **data**)
xx	:	Command index is a hexadecimal number from 01 to FF.
data	:	Is one, two, or three bytes (2,4,6 characters respectively). It will be in hexadecimal format except when command "X" is executed in which case it is in decimal format.
hh	:	Is checksum characters (Required if **Checksum option** is on. See "**BUS FORMAT**")**.** The checksum is one byte (two characters) that is the simple hexadecimal addition of all the previous bytes, ignoring any overflow.

?ee : Special code indicating an error has occurred as:

    ?43 : Command error
          (occurs if command letters and indexes are invalid)

    ?46 : Format error
          (occurs if length of the data or number of characters is not correct)

    ?48 : Checksum error
          (occurs if checksum is not correct)

    ?50 : Parity error
          (occurs if parity is not correct)

<cr> : Carriage return

Note: If Baud rate, Recognition character or address are not correct then the UNIT will not respond.

V. DESCRIPTION OF DATA :

For the following **Bit Pattern**. The **LSB** is always **bit 0. Bit numbers are always counted from right to left, with the rightmost digit being bit 0, and the next to the left would be bit 1.**

1. INPUT RANGE:

This is one byte data (2 characters). This byte will specify input range and other input configurations of each model. Bit pattern for different models :

a. INPUT RANGE BYTE VALUE

Bits:3210	TC	ACV	ACC
0000	J	400 mV ac	10 mA
0001	K	4 V ac	100 mA
0010	T	40 V ac	1 A
0011	E	400 V ac	5 A
0100	N	----	----
0101	DIN J	----	----
0110	R	----	----
0111	S	----	----
1000	B	----	----

(1001-1111 not used)

Bit 6-4: not used

Bit 7:   0 Line frequency = 60Hz
             1 Line frequency = 50Hz

b. INPUT RANGE BIT NO. VALUE   RTD

Bits:		
1-0	00	100 ohms
	01	500 ohms
	10	1000 ohms
	11	not used
2	0	PLATINUM
	1	NICKEL
3	0	DIN STANDARD
	1	NIST FOR Pt (SAMA FOR Ni)
5-4	00	2 wire
	01	3 wire
	10	4 wire
	11	not used
6		not used
7	0	Line frequency = 60Hz
	1	Line frequency = 50Hz

c. INPUT RANGE BIT NO. VALUE   PROCESS (PR)   STRAIN (ST)

BIT NO.	VALUE	PROCESS (PR)	STRAIN (ST)
3-0	0000	0-20 mA	30 mV
	0001	400 mV	100 mV
	0010	1 V	---
	0011	2 V	---
	0100	5 V	---
	0101	10 V	---
	(0110 - 1111 not used)		
4	0	14V Excit.	Internal excit.
	1	10V Excit.	External excit.
5	0	Non-ratiometric (PR,ST)	
	1	Ratiometric (PR,ST)	
6	0	Disable Reading Scale and Offset	
	1	Enable Reading Scale and Offset	
7	0	Line frequency = 60Hz(PR,ST)	
	1	Line frequency = 50Hz(PR,ST)	

d. INPUT RANGE BIT NO.   **VALUE**   **FREQUENCY/PULSE (FP)**

BIT NO.	VALUE	FREQUENCY/PULSE (FP)
0	0	----
	1	Low input level
1	0	----
	1	Debounce contact
2	0	----
	1	3K pull up to 5V
3	0	----
	1	1K pull down
5-4	00	12.5V excit.
	01	5V excit.
	10	8V excit.
	11	not used
6	0	Disable Reading Scale and Offset
	1	Enable Reading Scale and Offset
7		not used

2. INPUT/OUTPUT CONFIGURATION:

This is one byte data (2 characters).
Bit pattern is:

BIT NO.	VALUE	TC/RTD	ACV/ACC/ST	PR	FP
				MEANING	
1-0	00	Degree C	----		----
	01	Degree F	----		Freq. mode
	10	Degree K	----	Totalizer	----
	11	Degree K	----	Totalizer	Freq. mode
2	0	Temp. compensation	----	**See Note 1**	----
	1	No temp compensation	----	**See Note 1**	Quadrature
3	0	----	----	**See Note 1**	----
	1	----	----	**See Note 1**	A-B mode
4	0	----	----	----	----
	1	----	----	----	Totalize mode
5	0	----	----	----	----
	1	----	----	Square root	----
7-6	not used set to 0				

Note 1:   Bit 2&3 set the speed of process totalize. The time it would take process totalize to reach the non-totalize reading is shown in the following table:

Bit 3	Bit 2	Time to reach regular reading
0	0	1 minute
0	1	1 hour
1	0	1 day
1	1	30 day

3. DECIMAL POINT :

This is one byte (2 characters) as:

value	meaning
1	XXXXXX.
2	XXXXX.X
3	XXXX.XX
4	XXX.XXX
5	XX.XXXX
6	X.XXXXX

Note 1: For TC and RTD models, value must be 1 to 3 only.

4. FILTER TIME CONSTANT:

This is one byte (2 characters) as:

value	meaning (per no. of readings)
0	No filtering
1	2
2	4
3	8
4	16
5	32
6	64
7	128

5. ANALOG OUTPUT / READING SCALE:

Multiplication factor applied to input to get a higher or lower reading.

This is 3 byte data (6 characters) as follows:
- Bits 0 to 18 (19 bits) are value of the scale from 0 to 500000
- Bit 19 is sign, 0 for positive and 1 for negative
- Bits 20 to 23 are for decimal point value = DP
      It means as:
      Actual decimal value = $10^{(1-DP)}$
      where ** means "TO THE POWER OF"

      example: if scale is -0.000345678.= - 345678 x $10^{(-9)}$
                  value will be 345678 decimal = 5464E hex
                  bit 19 =1 for negative
                  bits 20-23 = DP = 10 = A hex
                  then data will be AD464E hex

6. ANALOG OUTPUT / READING OFFSET:

Deviation applied to input to get a higher or lower reading.

This is 3 byte data (6 characters) as follows:
- Bits 0 to 19 are value from 0 to 1000000
- Bit 23 is sign, 0 for positive, 1 for negative
- Bits 20,21,22 are decimal point value = DP
      It means as :
      Actual decimal value = $10^{(2-DP)}$
      where ** means "TO THE POWER OF"

      example: offset value is 234.089
                  value of 234089 decimal = 39269 hex
                  decimal value = $10^{(-3)}$ then DP=5
                  then 234.089 decimal = 539269 hex

7. COMMUNICATION PARAMETERS:

This is one byte data and specifies
BAUD, PARITY, DATA, and STOP bit.

BAUD =   bits 2,1,0 are:

000-001	not used
010	for 1200
011	for 2400
100	for 4800
101	for 9600
110	for 19200
111	not used

PARITY = bits 4,3 and are:

00	for NO
01	for ODD
10	for EVEN
11	not used

DATA BIT = bit 5 and is:

0	for 7 data
1	for 8 data

STOP BIT = bit 6 and is:

0	for 1 stop
1	for 2 stop

Bit 7 : always 0

Note 1: Stop bit is always 1. Unless 7 data, no parity is selected then unit will use 2 stop bits.

Note 2: When 8 Data bit is selected, only NO PARITY is allowed.

8. BUS FORMAT:

This is one byte data as:

Bit 0 = 0/1   means checksum not included/included
Bit 1   not used
Bit 2 = 0/1   means no echo/echo
Bit 3 = 1   means 485 mode
Bit 4 = 0/1   means continuous/command mode
Bits 7-5   not used

For models (PR/ST/FP):
Bit 7 = 0/1   Enable/Disable peak and valley comparison

NOTE 1 :   ECHO mode means the unit will echo back the command letter and index.

NOTE 2 :   Do not use checksum option unless you have to use it.

9. DATA FORMAT:

This is one byte and specifies the data which will be transmitted against the "V01" command.
Bit pattern:

bit 0 = 0/1   Means do not include/include peak & valley status register.

bit 1 = 0/1   Means do not include/include reading.

For models(TC/RTD/ACV/ACC):
bit 2 = 0/1   Means do not include/include peak reading.

For models(PR/ST):
bit 2 = 0/1   Means do not include/include process totalize.

For models(TC/RTD/ACV/ACC):
bit 3 = 0/1   Means do not include/include valley reading.

For models(PR/ST/FP):
bit 3 = 0/1   Means do not include/include peak reading.

For models(TC/RTD/ACV/ACC):
bits 4   Not used. Set to 0.

For models(PR/ST/FP):
bits 4 = 0/1   Means do not include/include valley reading.

bit 5   Not used. Set to 0.

bit 6 = 0/1   Means do not include/include unit of measure.

bit 7 = 0/1   Means space/carriage return between values.

10. DEVICE ADDRESS :

This is one byte data and specifies the address of the unit when in RS485 multipoint mode. Addresses are in hexadecimal from 01 to FF.

NOTE: Address 00 is for broadcasting. All units on the same BUS will perform any command with this address but will not respond.

11. RECOGNITION CHARACTER:

This is one byte security character.
(Default is *)

12. UNIT OF MEASURE:

This is 3 bytes. It is ASCII value of unit of measure.

13. GATE TIME(For FP model only):

This is 1 byte from 00 to FF.

For value = 00 to FA:
Each count equals 10ms. If 0 then gate time = 3ms.
Example : 1 second gate time = 64 hex.

For value = FB to FF:

Value	Gate time
FB	5 seconds
FC	10 seconds
FD	20 seconds
FE	40 seconds
FF	80 seconds

14. DEBOUNCE TIME(For FP model only):

This is 1 byte from 01 to FF.
Each count equals 5ms. If 0 then error.

15. TRANSMIT TIME:

This is 2 bytes data in second and specifies the time of the transmission by the meter.

VI. COMMANDS FOR MEASUREMENT VALUES:

Command   **Receiving <u>value</u>**

*01X01   **(For all models):**   Reading value**.** After reading scale and offset.

<u>Note:</u>   In order to have continuous update on reading. Customer should send **X01** command every time reading is requested.

<u>Models(TC/RTD/ACV/ACC):</u>
*01X02   Peak reading value.
*01X03   Valley reading.

<u>Models(PR/ST/FP):</u>
*01X03   Peak reading value.
*01X04   Valley reading.
*01V01   **(For all models):** String of values.
Received values are in decimal with decimal point and no sign for positive and minus sign for negative.

Example :   00345.6 or -00345.6

If value is overflowed a "?" will be transmitted along with value (?-99999. or ?999999).

VII. COMMANDS FOR READING MODEL/INPUT TYPE:

Command   **Receiving <u>value</u>**

*01U01   One byte for model number

<u>VALUE</u>	<u>MODEL</u>
00	FP
01	PR
02	ST
03	TC
04	RTD
05	ACV
06	ACC

VIII. <u>RESET COMMANDS :</u>

*01Z01 (For all models): Hard reset (reading data from EEPROM).

*01Z02 (For all models): Soft reset (Initialize reading).

*01Z03 (For models: TC/RTD/ACV/ACC): Reset peak and valley.
(For models: PR/ST): Reset process totalize value.

*01Z04 (For models: (PR/ST/FP): Reset peak value.

*01Z05 (For models: PR/ST/FP): Reset valley value.

*01Z07 (For models: TC/RTD/ACV/ACC): Reset peak only.

*01Z08 (For models: TC/RTD/ACV/ACC): Reset valley only.

<u>NOTE:</u>
             * : Recognition character
             01(Follow "*") : Address

IX.   SAMPLE PROGRAM:

```
' ASSUMING :
' BAUD RATE = 9600
' PARITY    = ODD
' DATA BIT  = 7
' STOP BIT  = 1
' COMM PORT = 1
' ADDRESS   = 01
' RECOG. CHAR = *
' SERIAL PORT = COM1
' FOR COMM PORT = 2 ->  CHANGE "COM1:"  TO  "COM2:"
' THIS PROGRAM WILL GET READING AND DISPLAY IT EVERY 1 SECOND
ON ERROR GOTO ER
ON TIMER(1) GOSUB RDG
CLS
CLOSE #1
COLOR 1, 7
LOCATE 22, 30
PRINT "PRESS <ESC> TO END"
OPEN "COM1:" + "9600,O,7,1,CS,DS" FOR RANDOM AS #1
LOCATE 10, 30
PRINT "READING = "
TIMER ON
DO: LOOP UNTIL INKEY$ = CHR$(27)
COLOR 7, 0
CLS
END
RDG:
  PRINT #1, "*01X01"
  DAT1$ = ""
  DAT$ = ""
  T$ = TIME$
  T1$ = MID$(T$, LEN(T$) - 1, 2)
  T1 = VAL(T1$)
  DO
    IF LOC(1) > 0 THEN
      CNT = 0
      DAT1$ = INPUT$(LOC(1), #1)
      DAT$ = DAT$ + DAT1$
    ELSE
      T$ = TIME$
      T2$ = MID$(T$, LEN(T$) - 1, 2)
      T2 = VAL(T2$)
      IF T2 < T1 THEN T2 = T2 + 60
      IF T2 - T1 >= 2 THEN CNT = 1
    END IF
```

```
    LOOP UNTIL CNT = 1 OR INSTR(1, DAT$, CHR$(13)) > 0
    IF DAT$ = "" THEN
      LOCATE 5, 30
      COLOR 28
      PRINT "COMMUNICATION ERROR!"
      P = 1
    ELSE
      IF P = 1 THEN
        LOCATE 15, 30
        COLOR 7, 0
        PRINT "                             "          ' (24 SPACES)
        P = 0
      END IF
      LOCATE 10, 40
      D$ = MID$(DAT$, 6)
      DAT$ = LEFT$(D$, LEN(D$) - 1)
      COLOR 1, 7
      PRINT DAT$; "  "      ' (2 SPACES)
    END IF
RETURN
ER:
  RESUME NEXT
```

Modbus Register Definition for iDRX-FP, iDRX-PR, and iDRX-ST

Reg. #	Read Function	Write Function	# of byte
1	Input Range	Input Range	1
2	Input/Output Config.	Input/Output Conf.	1
3	Decimal Point	Decimal Point	1
4	Filter Time Constant	Filter Time Constant	1
5	Reading/Output Scale	Not supported	3
6	Reading/Output Offset	Not supported	3
7	Comm. Parameters	Comm. Parameters	1
8	Comm. Bus Format	Comm. Bus Format	1
9	Comm. Data Format	Comm. Data Format	1
A	Comm. Device Addr.	Comm. Device Addr.	1
B	Comm. Recog. Char.	Comm. Recog. Addr.	1
C	Unit of measure	Not supported	3
D	Gate Time	Gate Time	1
E	Debounce Time	Debounce Time	1
F	Transmit Time	Transmit Time	2
10	Main Value	Hard Reset	3
11	Peak Value	Reset Peak	1
12	Valley Value	Reset Valley	1
13	Not Supported	M.S. bytes Output Scale	2
14	Not Supported	L.S. byte Output Scale	1
15	Not Supported	M.S. bytes Output Offset	1
16	Not Supported	L.S. byte Output Offset	2

Note:

1) Main, Peak, Valley value: 4 bytes will send from the unit
   a. Highest byte always 00h.
   b. 2nd Highest byte: (MSB is sign (1= negative, 0= positive), next 3 bits are number of decimal points).
   c. Low nibble of second byte, and lowest 2 bytes are the value.
   d. The decimal point register has to set to: 1, 2, 3, or 4.

2) Bus Format:
   Bit 5 1/0 = Modbus/Newport

3) Output Scale/Offset Write:
   Due to write single only, two write operation is needed to write scale/offset, and to make it effective it needs to follow with Hard Reset command.

4) To configure to Newport protocol, set bit 5 of Bus Format to low and follow with Hard Reset command.

Modbus Register Definition for iDRX-ACC, iDRX-ACV, iDRX-RTD, and iDRX-TC

Reg. #	Read Function	Write Function	# of byte
1	Input Range	Input Range	1
2	Input/Output Config.	Input/Output Conf.	1
3	Decimal Point	Decimal Point	1
4	Filter Time Constant	Filter Time Constant	1
5	Reading/Output Scale	Not supported	3
6	Reading/Output Offset	Not supported	3
7	Comm. Parameters	Comm. Parameters	1
8	Comm. Bus Format	Comm. Bus Format	1
9	Comm. Data Format	Comm. Data Format	1
A	Comm. Device Addr.	Comm. Device Addr.	1
B	Comm. Recog. Char.	Comm. Recog. Addr.	1
C	Unit of measure	Not supported	3
D	Gate Time	Gate Time	1
E	Debounce Time	Debounce Time	1
F	Transmit Time	Transmit Time	2
10	Main Value	Hard Reset	3
11	Peak Value	Reset Peak	1
12	Valley Value	Reset Valley	1
13	Not Supported	L.S. bytes Output Scale	2
14	Not Supported	M.S. byte Output Scale	1
15	Not Supported	M.S. bytes Output Offset	2
16	Not Supported	L.S. byte Output Offset	1

Note:

1) Main, Peak, Valley value: 4 bytes will send from the unit

   a. Highest byte always 00h.

   b. 2nd Highest byte: (MSB is sign (1= negative, 0= positive), next 3 bits are number of decimal points).

   c. Low nibble of second byte, and lowest 2 bytes are the value.

   d. The decimal point register has to set to: 1, 2, 3, or 4.

2) Bus Format:

   Bit 5 1/0 = Modbus/Newport

3) Output Scale/Offset Write:

   Due to write single only, two write operation is needed to write scale/offset, and to make it effective it needs to follow with Hard Reset command.

4) To configure to Newport protocol, set bit 5 of Bus Format to low and follow with Hard Reset command.

iDRX-ACC SPECIFICATIONS

INPUT RANGES:
10 mA, 100 mA, 1 Amp, 5 Amp AC current
Dedicated input terminals for (10, 100 mA same input), 1 Amp and 5 Amp. Return terminal common to all ranges.

FREQUENCY RANGE:
30 Hz to 1KHz

INPUT IMPEDANCE:
3.3 Ohms for 10, 100 mA input
0.2 Ohms for 1 Amp input
0.04 Ohms for 5 Amp input

ISOLATION:
Dielectric strength per 1 minute test based on
EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
   • Power to input 1800V Peak
   • Power to analog output/communication 1800V Peak
   • Input to analog output/communication 1400V Peak

INPUT OVER-CURRENT PROTECTION:
10% Above full scale continuously
100% Above full scale for 10 seconds

ANALOG TO DIGITAL TECHNIQUE:
Dual slope

READ RATE:
3 readings/second

ACCURACY AT 25 °C:
± 0.2% of FS from 30 Hz to 1 KHz

TEMPERATURE STABILITY:
10, 100 mA Range 100 ppm/°C typical
1 Amp Range 150 ppm/°C typical
5 Amp Range 200 ppm/°C typical

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return
<CR>, it will be sent at the end of the response. You can
send another command after you receive the <CR>.
i.e.   send: *01X01
             response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
2.4 Watts (100 mA at 24 Vdc)

OPERATING AMBIENT:
-5 to +55 °C

**STORAGE TEMPERATURE:**
-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

| J3	iDRX
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

⚠ **WARNING:** For low leakage current through the power supply, the ac voltage at "Return" input must not exceed 30 Vrms with reference to Earth Ground.
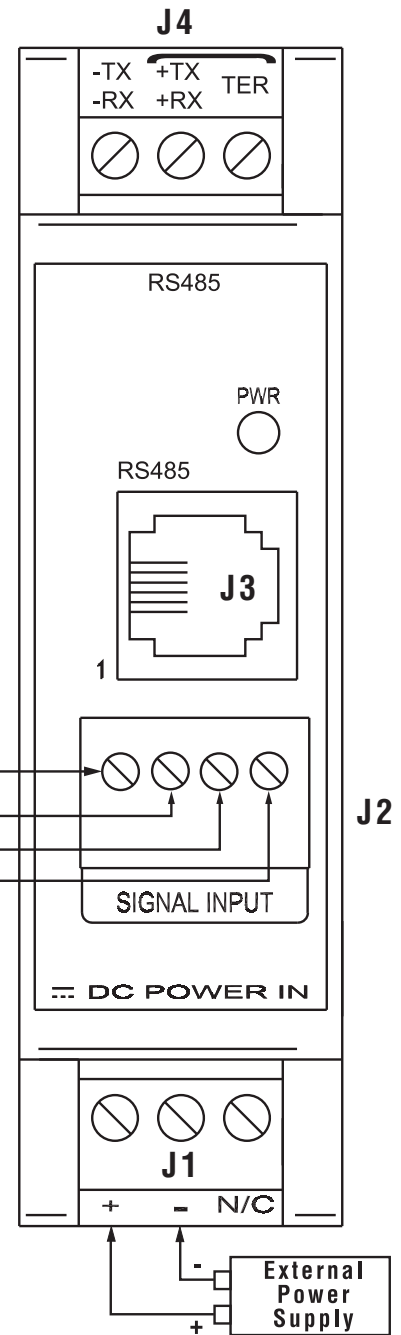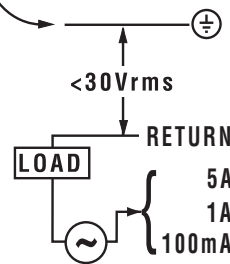
iDRX-ACV SPECIFICATIONS

INPUT RANGES:
400 mV, 4V, 40 Volt, 400 Volt

FREQUENCY RANGE:
30 Hz to 1 KHz

INPUT IMPEDANCE:
2.1 Meg for all ranges.

ISOLATION:
Dielectric strength per 1 minute test based on
EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
   • Power to input 1800V Peak
   • Power to analog output/communication 1800V Peak
   • Input to analog output/communication 1400V Peak

INPUT OVER-VOLTAGE PROTECTION:

10% Above full scale continuously.
100% Above full scale for 10 seconds.

ANALOG TO DIGITAL TECHNIQUE:
Dual slope

READ RATE:
3 readings/second

ACCURACY AT 25 °C:
400 mV, 4V, 40V and 400V ranges
49 Hz to 500 Hz ±0.2% of FS
30 Hz to 1KHz ±0.2% of FS ±10 counts

TEMPERATURE STABILITY:
400 mV and 40 Volt range 150 ppm/°C typical
4V and 400 Volt range 100 ppm/°C typical

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return
<CR>, it will be sent at the end of the response. You can
send another command after you receive the <CR>.
i.e.   send: *01X01
       response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
2.4 watts (100 mA at 24 Vdc)

OPERATING AMBIENT:
-5 to +55 °C

STORAGE TEMPERATURE:
-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

J3 iDRX	
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

⚠ WARNING: The high side of ac signal, that is being measured, must be connected to the "Sig Hi" of signal input.
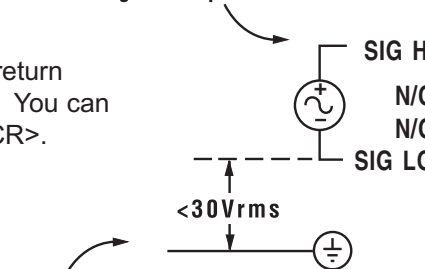
⚠ WARNING: For low Earth leakage current through the power supply, the ac voltage at "Sig Lo" input must not exceed 30 Vrms with reference to Earth Ground.
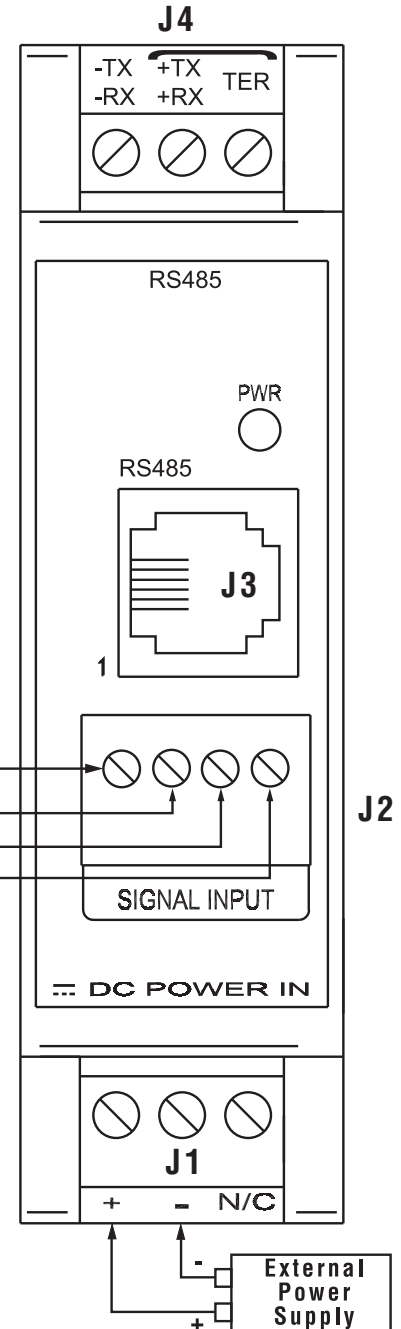
iDRX-FP SPECIFICATIONS

INPUT TYPE:

Min. Low level signal input (magnetic pickups) : From 0 mV to 120 mV
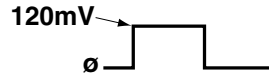
Open Collector NPN (Use software to set: 3 KΩ pull up to 5V): Max. current source = 1.66 mA

Open Collector PNP (Use software to set: 1KΩ pull down to RTN): Max. current sink = 12.5 mA

TTL/CMOS Input: (Use software to set: no pull up/down).

Low <= 0.8 V , High >= 3.5 V (For Input: 0.2 Hz to 16 KHz)

Low <= 0.8 V , High >= 12 V (For Input: 0.2 Hz to 50 KHz)

NAMUR Sensors (Use software to set: 1KΩ pull down to RTN and 8.2V Excitation.)

For measuring a low level signal riding on top of a large DC signal, connect a 0.1 uF capacitor. See Detail.Use software to set 1KΩ pull down to RTN.
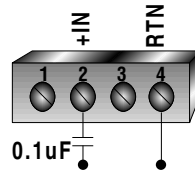
OPERATING MODES:

Frequency: Range = 0.2 Hz to 50 KHz

Max. Input Frequency: 30 KHz. for Input Level: 0-5 V

Max. Input Frequency: 50 KHz. for Input Level: 0-12 V

FREQUENCY	RESOLUTION
0 to 9.99999 Hz	0.00001 Hz
10 to 99.9999 Hz	0.0001 Hz
100 to 999.999 Hz	0.001 Hz
1000 to 9999.99 Hz	0.01 Hz
10000 to 50000.0 Hz	0.1 Hz
0 to 50000 Hz	1 Hz

Totalize with Reset:
Range = 0 to 999999*, if reading is larger than 999999, then reading is converted to floating point number, i.e. 9.99E9 (maximum).

Max. Input Frequency: 30 KHz. for Input Level: 0-5 V

Max. Input Frequency: 50 KHz. for Input Level: 0-12 V

A-B Totalize (Reset input used as +A input):
Range = -99999 to 999999*, if reading is larger than 999999, then reading is converted to floating point number, i.e. -9.99E9 (minimum), 9.99E9 (maximum).

Max. Input Frequency: 30 KHz. for Input Level: 0-5 V

Max. Input Frequency: 25 KHz. for Input Level: 0-12 V

Quadrature (Reset input used as second input):
Range= -99999 to 999999*, if reading is larger than 999999, then reading is converted to floating point number, i.e. -9.99E9 (minimum), 9.99E9 (maximum).

Max. Input Frequency: 30 KHz. for Input Level: 0-5 V

Max. Input Frequency: 25 KHz. for Input Level: 0-12 V

  * Resolution is 1 count.

ISOLATION:

Dielectric strength per 1 minute test based on EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
  • Power to input 1800V Peak
  • Power to analog output/communication 1800V Peak
  • Input to analog output/communication 1400V Peak

INPUT IMPEDANCE:
Input: 1MΩ to +EXC
Reset: 100K to +5V

INPUT OVER-VOLTAGE PROTECTION:
With 1K pull down: 14V
With 3K pull up: 20V
Without pull up/down: 60V

EXCITATION:
5, 8.2 or 12.5V at 25mA, programmable

ACCURACY AT 25 °C:
± 0.1% of FS Crystal time base accuracy: ± 50 ppm

TEMPERATURE STABILITY:
± 50 ppm/°C typical   Time base stability: ± 1ppm/°C

STEP RESPONSE FOR RS485 OUTPUT:
0.1 second to 99% of the final value
(Filter time constant = 0, Gate time = 0.05 Sec)

RESPONSE TIME:
To verify the response time, check the carriage return <CR>, it will be sent at the end of the response. You can send another command after you receive the <CR>.
i.e.   send: *01X01
          response: 01X01<DATA><CR>
          Note: Only for reading (X01 command).
          01 is address.
Frequency mode: response time is controlled by the gate time. If gate time is increased then response time is longer. Other modes: response time is not controlled by the gate time.

WARM UP TO RATED ACCURACY: 30 minutes

INPUT POWER: 10 to 32 Vdc
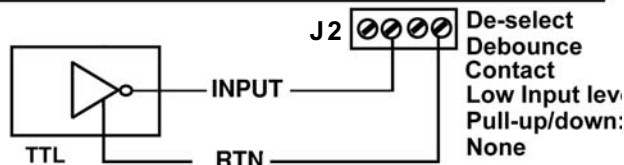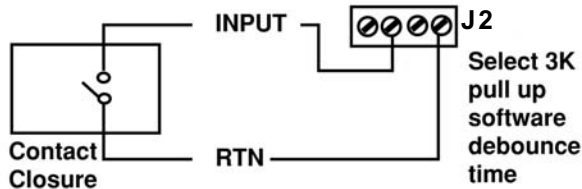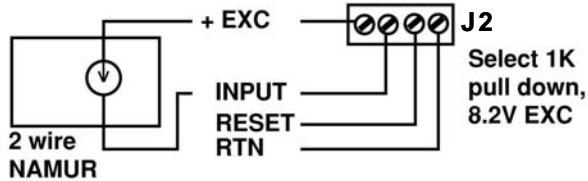
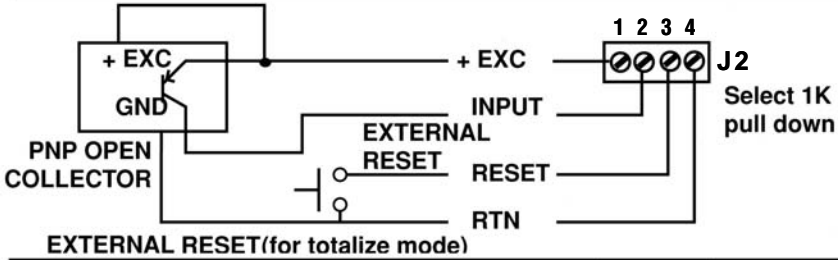## POWER CONSUMPTION: 3 Watts (125mA at 24Vdc)

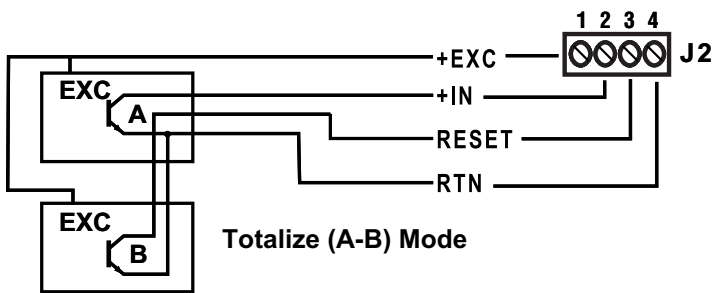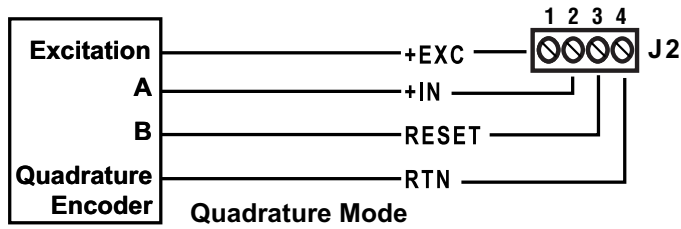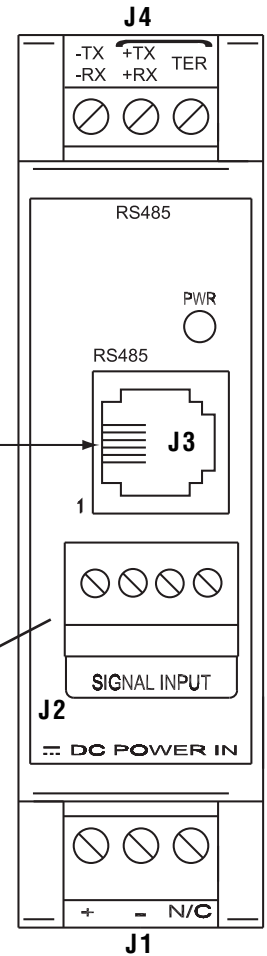## OPERATING AMBIENT: -5 to +55 °C

STORAGE TEMPERATURE: -40 to +85 °C

RELATIVE HUMIDITY: 90% at 40 °C non-condensing

iDRX-FP SPECIFICATIONS (continued)

Example: Connecting different signal sources

Quadrature Mode

Totalize (A-B) Mode

EXTERNAL RESET(for totalize mode)

J3	iDRX
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

Select 3K Pull up

Select 1K pull down

Select 1K pull down, 8.2V EXC

Select 3K pull up software debounce time

De-select Debounce Contact Low Input lev: Pull-up/down: None
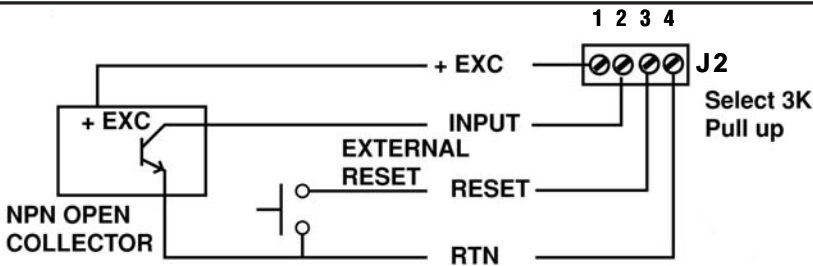
iDRX-PR SPECIFICATIONS

INPUT RANGES:
±20mA; ±400mV, ±1V, ±2V, ±5V, and ±10V
Ratiometric or nonratiometric

EXCITATION:
14V or 10V @ 25mA

INPUT IMPEDANCE:
Voltage Range: 1MΩ
Current Range: 10Ω

ISOLATION:
Dielectric strength per 1 minute test based on
EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
   • Power to input 1800V Peak
   • Power to analog output/communication 1800V Peak
   • Input to analog output/communication 1400V Peak

INPUT OVER-RANGE PROTECTION:

Voltage input: 50V
Current input: 50mA

MODE:
Linear, Square root, Linear totalize,
Square root totalize

ANALOG TO DIGITAL TECHNIQUE:
Multiple slopes

READ RATE:
8 readings/second, automatic polarity
ACCURACY AT 25 °C:
±0.1% of FS ± 2 counts

TEMPERATURE STABILITY:
100 ppm/°C typical

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return
<CR>, it will be sent at the end of the response. You can
send another command after you receive the <CR>.
i.e.   send: *01X01
          response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
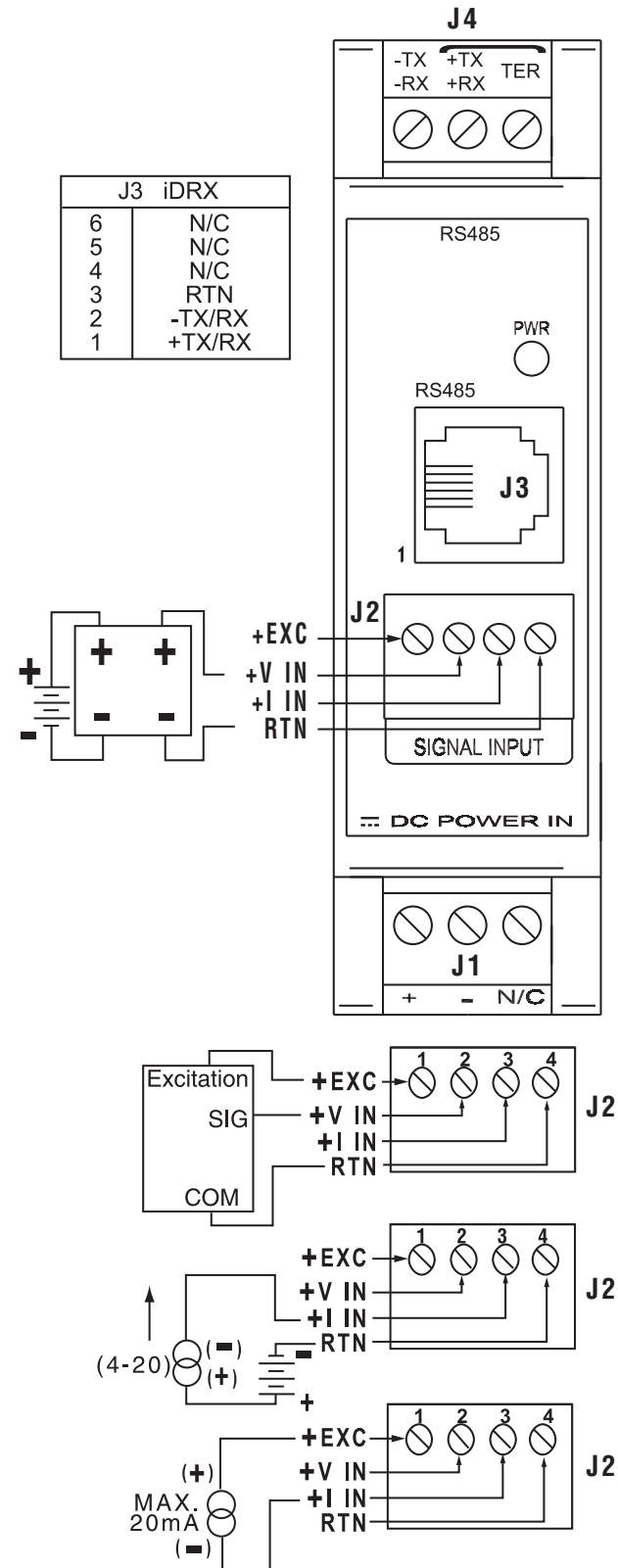3 watts (125 mA at 24Vdc)

OPERATING AMBIENT:
-5 to +55 °C

STORAGE TEMPERATURE:
-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

J3 iDRX	
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

iDRX-ST SPECIFICATIONS

INPUT RANGE:
±30mV/ ±100mV
Ratiometric or nonratiometric

EXCITATION:
10V @ 30mA or external

INPUT IMPEDANCE:
More than 1MΩ

ISOLATION:
Dielectric strength per 1 minute test based on
EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
   • Power to input 1800V Peak
   • Power to analog output/communication 1800V Peak
   • Input to analog output/communication 1400V Peak

INPUT OVER-RANGE PROTECTION:

Voltage input: From -10 to +20V

ANALOG TO DIGITAL TECHNIQUE:
Multiple slopes

READ RATE:
8 readings/second, automatic polarity

ACCURACY AT 25 °C:
±0.2% of FS ± 2 counts

TEMPERATURE STABILITY:
75 ppm/°C typical

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return
<CR>, it will be sent at the end of the response. You can
send another command after you receive the <CR>.
i.e.   send: *01X01
            response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
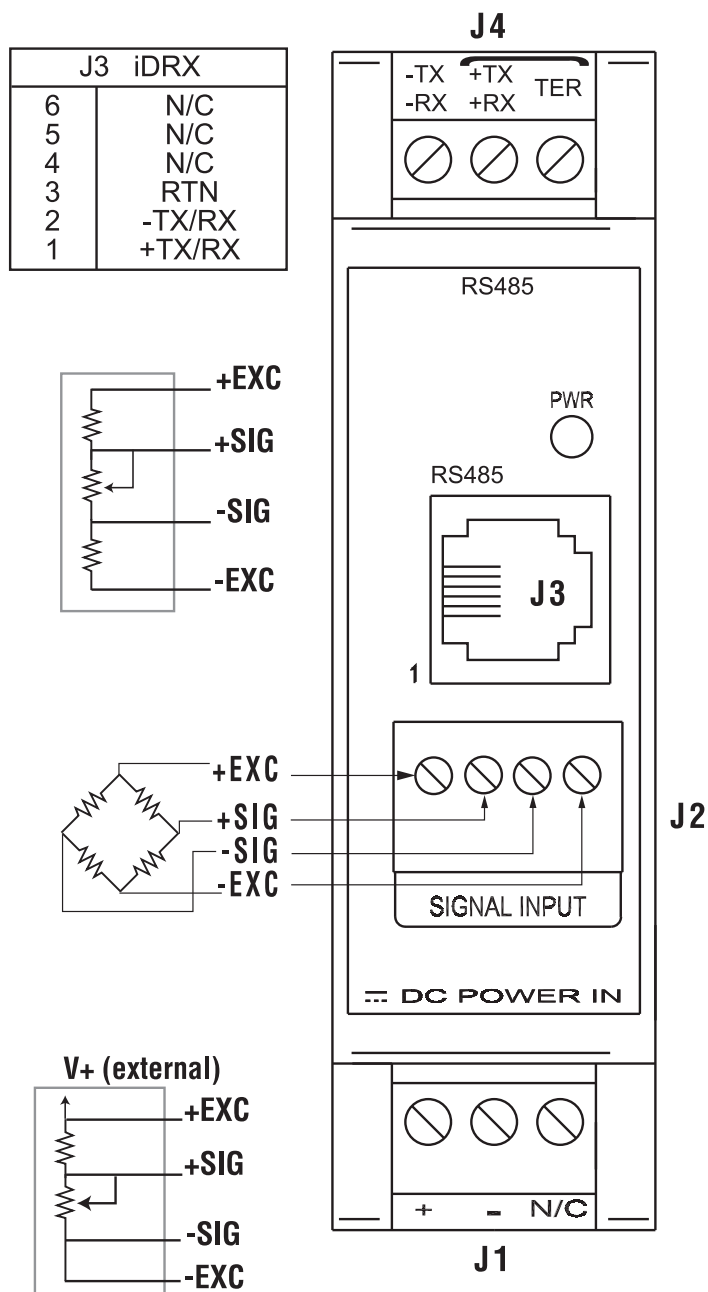3 watts (125 mA at 24Vdc)

OPERATING AMBIENT:
-5 to +55 °C

STORAGE TEMPERATURE:
-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

iDRX-RTD SPECIFICATIONS

SPECIFICATIONS:
100, 500, 1000 Ohm platinum RTD with both European (alpha=0.00385) and American (alpha=0.00392) curves.

Input Type:
100 Ohm   -328 to 1562 °F -200 to 850 °C
500 Ohm   -328 to 1562 °F -200 to 850 °C
1000 Ohm   -328 to 1562 °F -200 to 850 °C

ISOLATION:
Dielectric strength per 1 minute test based on EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
  • Power to input 1800V Peak
  • Power to analog output/communication 1800V Peak
  • Input to analog output/communication 1400V Peak

INPUT OVER-VOLTAGE PROTECTION:

250 V AC for 1 Minute

ANALOG TO DIGITAL TECHNIQUE:
Dual slope

READ RATE:
3 readings/second, automatic polarity

ACCURACY AT 25 °C:
±0.5 °C for platinum RTD's

TEMPERATURE STABILITY:
0.05 °C/°C

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return <CR>, it will be sent at the end of the response. You can send another command after you receive the <CR>.
i.e.   send: *01X01
          response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
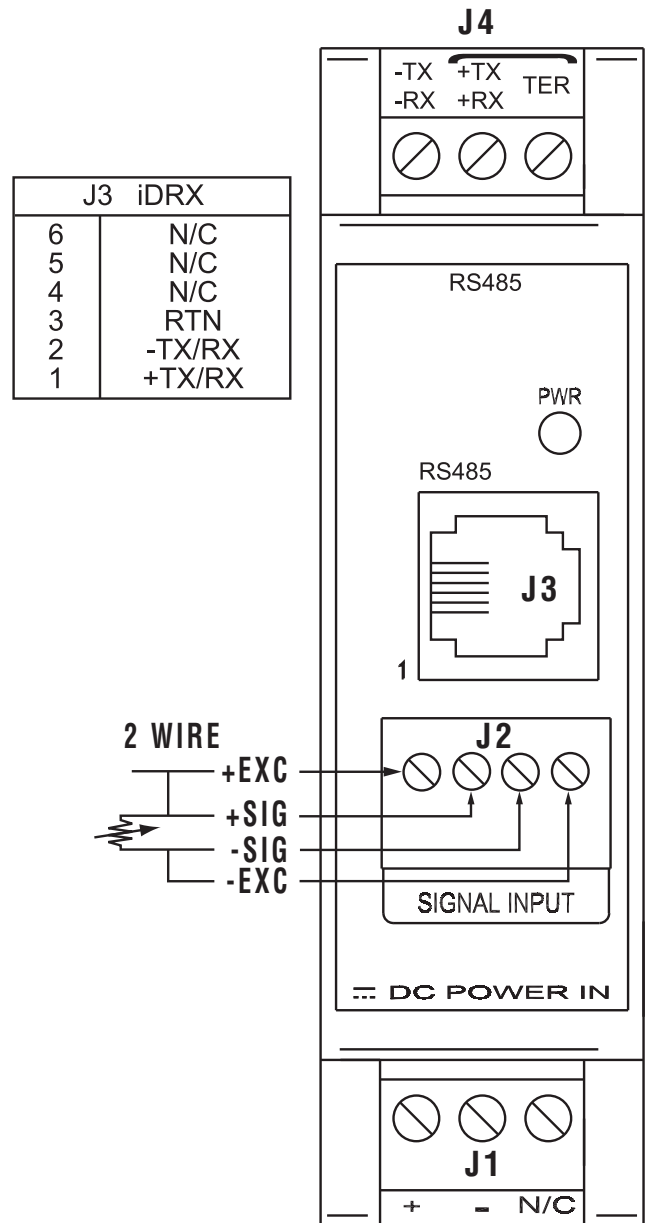2.4 Watts (100 mA at 24 Vdc)

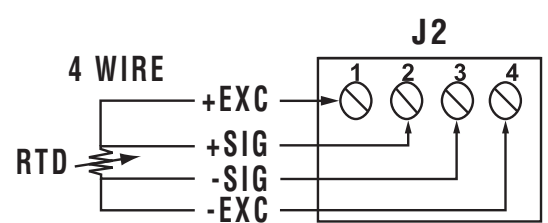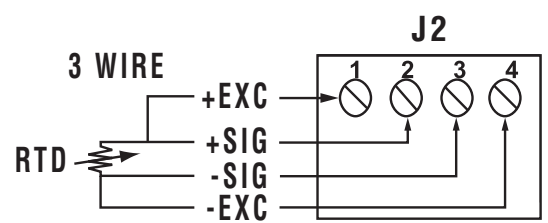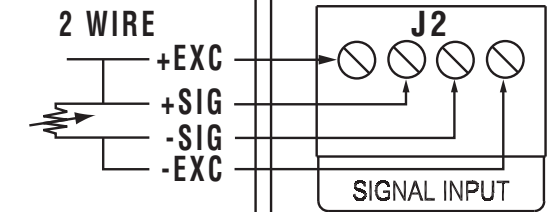**OPERATING AMBIENT:**
-5 to +55 °C

STORAGE TEMPERATURE:
-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

J3	iDRX
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

iDRX-TC SPECIFICATIONS

INPUT TYPE:

Type J,K,T,E,R,S,B,N, J DIN

Input Type	Range °F	Range °C
J	-346 to 1400°F	-210 to 760 °C
K	-454 to 2500°F	-270 to 1372 °C
T	-454 to 752 °F	-270 to 400 °C
E	-454 to 1832 °F	-270 to 1000 °C
R S	-58 to 3214 °F	-50 to 1768 °C
B	+212 to 3300 °F	+100 to 1820 °C
N	-454 to 2372°F	-270 to 1300 °C
J DIN	-328 to 1652 °F	-200 to 900 °C

ISOLATION:

Dielectric strength per 1 minute test based on
EN 61010 for 50 Vdc or Vrms working voltage.
Three way Isolation:
- Power to input 1800V Peak
- Power to analog output/communication 1800V Peak
- Input to analog output/communication 1400V Peak

INPUT OVER-VOLTAGE PROTECTION:

250 V AC for 1 minute

ANALOG TO DIGITAL TECHNIQUE:
Dual slope

READ RATE:
3 readings/second, automatic polarity

ACCURACY AT 25 °C:
±1°C for temperature above -150 °C
±2°C for temperature below -150 °C

TEMPERATURE STABILITY:
0.05 °C/°C

STEP RESPONSE FOR RS485 OUTPUT:
2 seconds to 99% of the final value
(Filter time constant = 64)

RESPONSE TIME:
To verify the response time, check the carriage return
<CR>, it will be sent at the end of the response. You can
send another command after you receive the <CR>.
i.e.   send: *01X01
          response: 01X01<DATA><CR>
Note: 01 is address.

WARM UP TO RATED ACCURACY:
30 minutes

INPUT POWER:
10 to 32 Vdc

POWER CONSUMPTION:
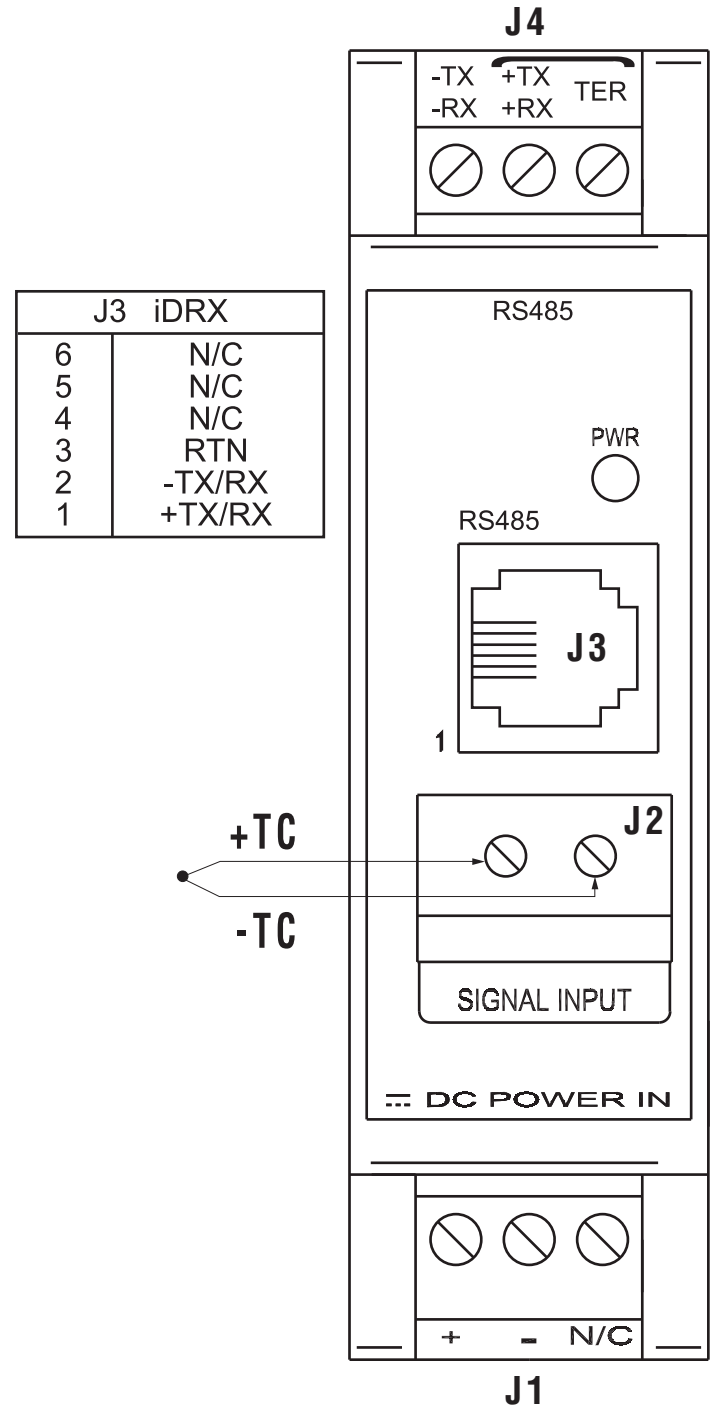2.4 Watts (100 mA at 24 Vdc)

OPERATING AMBIENT:
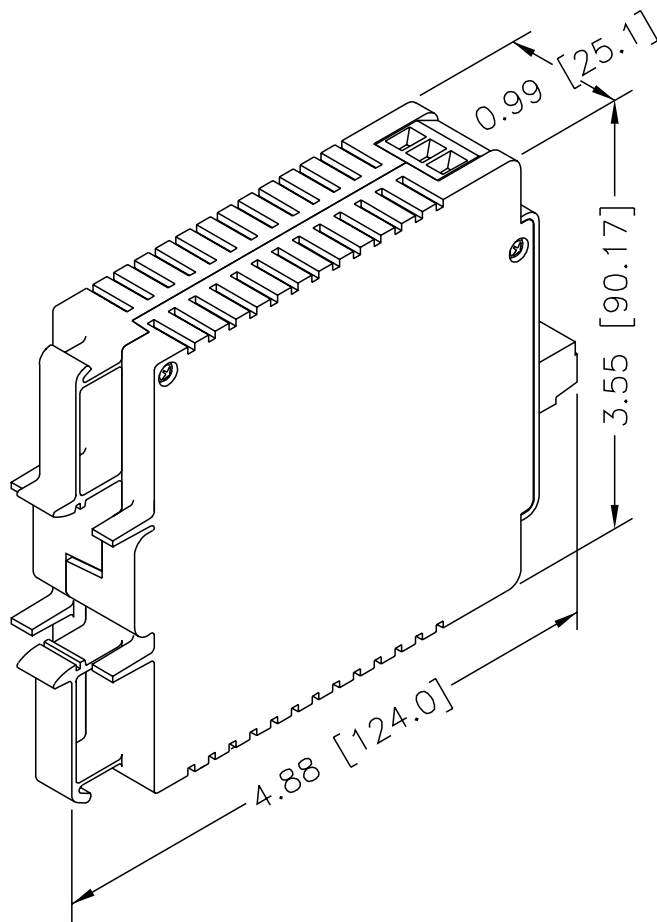-5 to +55 °C

STORAGE TEMPERATURE:
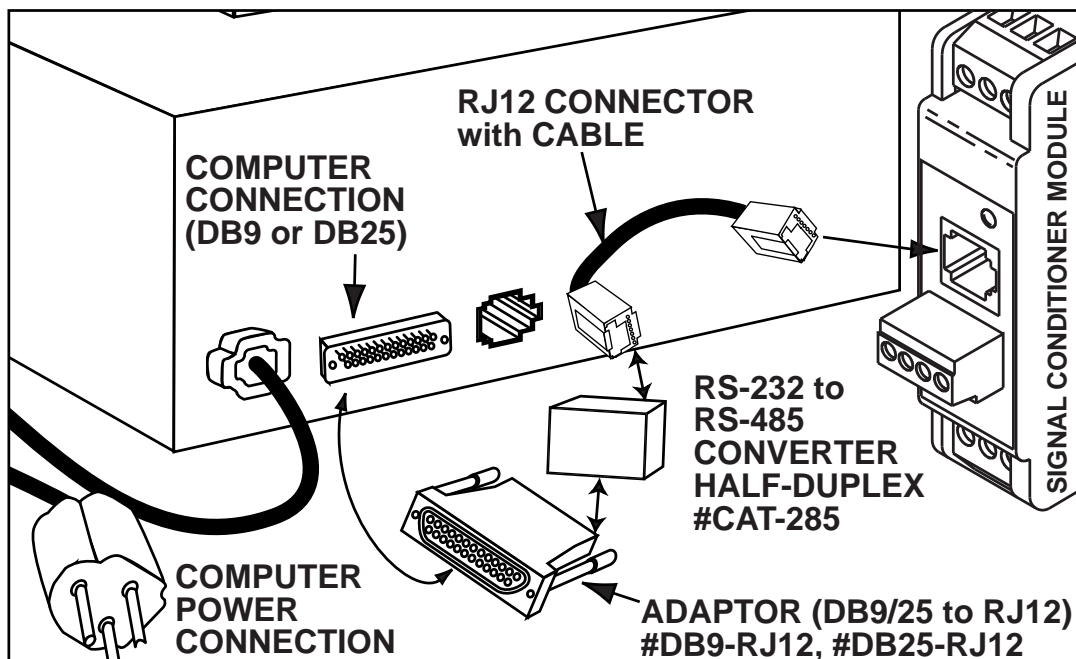-40 to +85 °C

RELATIVE HUMIDITY:
90% at 40 °C non-condensing

J4

-TX	+TX	TER
-RX	+RX	

J3	iDRX
6	N/C
5	N/C
4	N/C
3	RTN
2	-TX/RX
1	+TX/RX

RS485

PWR

RS485

J3

1

+TC

J2

-TC

SIGNAL INPUT

DC POWER IN

| + | − | N/C |

J1

DIMENSIONS:

0.99 [25.1]

3.55 [90.17]

4.88 [124.0]

TYPICAL COMPUTER SETUP:

RJ12 CONNECTOR
with CABLE

COMPUTER
CONNECTION
(DB9 or DB25)

SIGNAL CONDITIONER MODULE

RS-232 to
RS-485
CONVERTER
HALF-DUPLEX
#CAT-285

COMPUTER
POWER
CONNECTION

ADAPTOR (DB9/25 to RJ12)
#DB9-RJ12, #DB25-RJ12

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **one (1) year** from the date of purchase. In addition to OMEGA's standard warranty period, OMEGA Engineering will extend the warranty period for **one (1) additional year** if the warranty card enclosed with each instrument is returned to OMEGA.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

TRADEMARK NOTICE: Ω®, *omega.com*®, and ΩΕ OMEGA® are Trademarks of OMEGA ENGINEERING, INC.

PATENT NOTICE: This product is covered by one or more of the following patents: U.S. Pat. No. Des. 336,895; 5,274,577/ CANADA 2052599; 2052600 / ITALY 1249456; 1250938 / FRANCE BREVET No. 91 12756 / SPAIN 2039150; 2048066 / UK PATENT No. GB2 249 837; GB2 248 954 / GERMANY DE 41 34398 C2. Other US and International Patents pending or applied for.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA…Of Course!
Shop on line at omega.com

TEMPERATURE
- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE
- ☑ Transducers & Strain Gauges
- ☑ Load Cells & Pressure Gauges
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL
- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY
- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION
- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

HEATERS
- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL
- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments

M2539/0909