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Wire*Trak*™

Wire Speed Sensor

User's Manual

Manual Part Number: A8M5021
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1.0 SYSTEM OVERVIEW

1.1 General Overview

The Wire*Trak*™ Sensor (A3A0218) is a lightweight; compact sensor unit designed for monitoring and telemonitoring service purposes in a welding environment. The Wire*Trak*™ Sensor includes an embedded micro-controller to provide the necessary data acquisition, signal processing and communications firmware to allow remote logging of the following parameters.

- Actual Wire Feed Speed
- Arc Time based on wire feed motion
- Summary of Wire Feed Speed and Arc Time Wire Feed for last weld
- Totalized Wire Feed Speed and Arc Time
- Volume deposited for last weld
- Totalized volume deposited based on average wire speed and time

The lightweight, easy to install design allows the user to install the Wire*Trak*™ at the GMAW wire feeder inlet guide using industry standard quick disconnect conduit fittings or to a fixed surface with the optional mounting bracket (A2A0026). The unit is powered by a user supplied external 24 VDC power source via the Sensor Communications cable (A3W0327). This cable also provides the RS-485 MODBUS™ communication to an external system (data acquisition or PLC).

1.2 The Wire*Trak*™ General Specification:

Dimensions:	4.93” L x 5.38” W x 2.43” H (126 mm L x 137 mm W x 61 mm H)
Weight:	1.4 lbs (0.6 kgm)
Power Input:	24 vdc @ 0.2 amp, ripple 200 mv

1.3 Sensor Specifications:

Wire Diameter (min/max)	0.03” - 0.062” (0.8 mm / 1.6 mm)
Speed Range	10 - 1000 ipm (4—420 mm/s)
Relative Precision on Range	+/- 3%
A/N Absolute Resolution	0.4 mm
Summary Data Memory	64Kb EEPROM
Totalizing Memory	16Kb NV – FRAM
Firmware Memory	32Kb Flash for Program Firmware

2.0 INSTALLATION

2.1 General Guidelines

The Wire*Trak*™ can be mounted two different ways. It can be installed at the wire feeder using the quick disconnect fittings or mounted to a fixed surface. Listed below are some things that should be taken into consideration when selecting a place and method for mounting of the Wire*Trak*™:

Warning

Do not use this sensor on systems with High Frequency ARC Starters. Damage to equipment may occur and will void the equipment warranty.

- Mount the Wire*Trak*™ in a location that is convenient for installation of the welding wire and will not cause any binding of the wire or the wire liner. It is recommended that the Wire*Trak*™ be mounted as close to the wire feeder as possible (**not to exceed 1 meter**).

- The Sensor Communications Cable must be mounted in such a manner as to prevent stress on the sensor cable connector.

- When mounting the Wire*Trak*™, position it so the operator or maintenance personnel can see the sensor LEDs if possible.

- If using the optional mounting bracket (A2A0026) to mount the Wire*Trak*™, an insulating liner must be used for support of the wire from the sensor to the back of the wire feeder inlet guide.

2.2 Sensor Installation Guidelines

Installation of the Wire*Trak*™ is a simple 2-step process regardless of the selected mounting method.

1. Feed the wire through the Wire*Trak*™ Wire Feed Speed Sensor inlet. Push down on the pressure release lever located on the top of the sensor while feeding the wire through the guide rollers and out the other side of the sensor. Feed the wire into the wire drive motor as you would normally. If using the quick disconnect fittings to mount the sensor, connect one end to the wire drive motor quick disconnect fitting. Insert the wire liner quick disconnect fitting into the other end of the sensor. *If using the* ***optional mounting bracket****, install the sensor at the desired location. Install an insulated wire liner or conduit*

assembly (Maximum length of 1 meter) for support of the wire from the Wire*Trak*™ *to the wire feeder inlet.*

2. To connect the Sensor Cable (A3W0327) to the Wire*Trak*™, insert the connector into the Wire*Trak*™ Sensor Cable receptacle until it “Clicks” and locks into place. Connect the other end to the appropriate weld data acquisition system or PLC. To remove the Wire*Trak*™ Sensor Cable, pull back on the locking barrel of the connector plug while pulling the plug from the receptacle. A diagram of the connections for the cable can be found in Appendix B.

2.3 Configure MODBUS™ Device ID

Two BCD switches are provided to allow external definition of 0 to 247 MODBUS addresses. Prior to operation the user must set the desired Device ID number for the MODBUS™ communications. Each address must be unique. To set the Device ID remove the front panels of the unit by removing the four (4) cover screws. Locate the LSB and MSB rotary switches located on the Display PC board assembly. Set the binary address by rotating the switches to the desired address. The Switch is Binary encoded and has a range of “0 - F”. Reinstall the front panel after setting the Device ID number. The maximum Device ID is restricted to 247 as specified by the MODBUS™ Protocol standard. See Appendix C for Device ID MSB and LSB Decode Table.

3.0 OPERATION

3.1 Wire*Trak*™ Operation

Operation of the Wire*Trak*™ is simple and easy. A series of display screens have been provided to allow the operator or supervisor access to wire feed speed run data and to program the sensor for operation. Once the Wire*Trak*™ is installed (see Chapter 2 for installation procedures) apply power to the sensor by placing the Power switch in the ON position. The Wire*Trak*™ sensor will then perform a series of self-checks. During the self-check procedure the Wire*Trak*™ will display the following:

Firmware Type:	WSM1
Firmware Version:	1.31
Start Wire Feed Speed:	0

The Start wire feed speed (0) will be displayed until the Wire*Trak*™ detects an ARC ON based on wire feed speed. At that time the sensor will display the actual wire feed speed until the wire speed has stopped. Once the wire feed has stopped the Wire*Trak*™ will scroll through the following displays:

AVE=	###	This display is the Average Wire Feed Speed for the last weld.
DEP=	###	This display is the amount of material deposited during the last weld.
TDEP	###	This display is the Total amount of material deposited for all collected welds.
THRS	###	This display is the Total Number of Weld Hours
TMIN	###	This display is the Total Number of Weld Minutes
TMIN	###	This display is the Total number of Weld Seconds
WELD	###	This display is the Total number of Welds made since last reset.

The Wire*Trak*™ will scroll through these displays until it detects an ARC On condition or the RUN/PROGRAM switch is placed in the Program position.

3.1.1 ARC Detection

The Wire*Trak*™ is programmed to AUTO Detect an Arc On condition based on detecting a wire speed greater then 3 (ipm or mm/sec). The sensor will use the Wire Feed Speed to determine when to log wire speed data. The wire feed speed must exceed a threshold value of 3 ipm to set an “Arc On” condition. When the Wire Feed Speed falls below the specified value, the sensor will set an “Arc Off” condition and stop data logging. After detecting an arc off condition the Sensor will calculate the Deposition rate.

3.1.2 Wire*Trak*™ Program Mode

To complete the set-up of the Wire*Trak*™ the operator or supervisor must enter wire diameter and density so the sensor can calculate the deposition. To perform this operation insert the key into the RUN/Program Selector switch and select the Program Mode. The Wire*Trak* will display the following:

###	This number is the current **Wire Diameter** selected. The Wire Tract is designed to accept a wire diameter of 0.030 to 0.065. To change the Wire Diameter setting toggle the SET/PGM switch up to the SET position until the desired Wire Diameter is displayed. Then toggle the SET/PGM switch down to the PGM position to save the setting and move to the next display.
STL	This display is for the type wire density being used. There are three types that the operator can select: **STL** (Steel), **AL** (Aluminum), **USER** (User Defined density). If the Wire type density is different than that of steel or aluminum then the USER must load the USER Defined density off line through the terminal program (see Chapter 5). To select the desired wire type toggle the SET/PGM switch up to the SET position until the desired type is displayed. Then toggle the SET/PGM switch down to the PGM position to save the setting and move to the next display.
RUN	This display enables the operator to **RUN** the sensor with the current parameters or the ability to **CLEAR** ALL WELD DATA. To Clear the WELD Data toggle the SET/PGM switch up to the SET position until the CLR is displayed. Then toggle the SET/PGM switch down to the PGM position to CLEAR the weld data and move to the next display.

When Programming is completed turn the RUN/PROGRAM selector switch back to the RUN position and the Wire*Trak*™ is ready for operation.

3.2 Embedded Firmware

The embedded firmware has basic scaling and averaging capabilities as well as Slave mode MODBUS RTU Communications protocol support. The sensor will provide user defined average and data collection mode to allow Run time and/or average data storage. The Run time data will be generated based on the averaging sample number specified by the user. The Wire feed conversion time will be based on the actual wire feed rate (16.6 Hz – 16.6 KHz).

Configuration of scaling and averaging parameters will be possible through the MODBUS network port. The user may specify the number of samples (X) to be averaged before saving the data point in memory for later play back. The Wire*Trak*™ will also generate a weld summary for each weld, which will be the average of all sampled data during the last weld cycle. The Data will be Date/Time stamped and stored in NV-RAM. Up to 400 weld summaries may be stored before downloading. The Wire*Trak*™ provides continuous averaging of the X most recent data values, and queries by the host system at lower frequencies of either last data value or last average value. The sensor provides a totalizing function that will calculate the total wire used based on average wire feed speed, deposition rate and total arc time measured since the last totalize reset. The user must specify the wire density and wire diameter. Both values must be set to perform this calculation. If enabled, the value will be stored with the Totalized function in NV-RAM.

3.3 Host System Interface

The sensor will provide a RS-485 compatible serial port and will support the MODBUS RTU protocol. The following baud rates are supported 1200, 2400, 4800, 9600,19.2K and 38.4K. The Baud rate is user selected. The default baud rate is 19.2K.

The following is the general specification for the RS-485 port:

Serial	
Physical support	Twisted Pair
Connector	Lemo 5 pin circular
Network	RS 485 – Half Duplex
Data exchange protocol	MODBUS RTU

The RS-485 is a LEMO type connector and will provide the RS-485 connections and the power to operate the sensor. The Wire*Trak*™ provides a user configurable 120-ohm termination resistor for the RS-485 serial cable. The Host controller will provide the necessary power to operate the sensor. The power will be connected to the sensor through the RS-485 cable. The sensor requires an input voltage of 12 – 36 Vdc @ 2.5 watts. The sensor will provide polarity and over current protection. The sensor terminal connector will Pin out as follows:

Pin	Function
1	Sensor (12 – 24 vdc) Positive Input (NET PWR)
2	Net_High RS-485 Signal High (NET+)
3	Net_Low RS-485 Signal Low (NET-)
4	Shield
5	Sensor (12 – 24 vdc) Common (NET COM)

4.0 Wire*Trak*™ MODBUS MEMORY MAP

4.1 General Description

This document provides the basic MODBUS memory map and command structure for the Wire*Trak*™ RS-485 communications port. The Wire*Trak*™ supports the MODBUS Protocol as specified in the Modicon Technical publications "MODBUS Protocol" (intr7.html). The Wire*Trak*™ control does not support the Broadcast mode. The controller provides the slave side communications routines for the RTU mode. The user must define the Slave ID to a unique ID number from 1 – 247. Default Baud rate is 19.2 K baud.

4.2 Supported MODBUS Commands

The following MOBUS commands are supported:

CODE	DESCRIPTION	ADDRESS RANGE
01	Read Coil Status	0-15
03	Read Holding Registers	0-21
05	Force Single Coil	0-15
06	Preset Single Register	0-21
15	Force Multiple Coils	0-15
16	Preset Multiple Registers	0-21
17	Report Slave ID	5 bytes

4.3 Memory Map for Sensor

The following is the Coil definitions address 0-15:

COIL	ADDRESS	DESCRIPTION
1	0	Arc Active – Set when Weld Arc is detected Set Clock – When set the Date and Time values set in Register 7 – 12 will be loaded to the Real Time Clock. The Coil will be reset after the RTC is set. This function will only execute when the arc is off.
2	1	Save Average Data – When set Weld Summary Data is stored in NVRAM
3	2	Clear Weld Counter – When set the Weld Counter will be reset to 1
4	3	Clear Summary Counter – When set the Average Data Counter is reset to 0 and Average Memory is cleared
5	4	Clear Arc Timer – When set the Accumulative Arc Timer is reset to 0
6	5	Auto Detect Enabled – When set to a value of 1 the Auto Detect is enabled. If set to 0 the Auto Detect is disabled and the Wire*Trak* will not log data.
7	6	Read Memory – When set the Weld Summary data specified by Register 19 will be read into Register 2-12. Coil will be reset when summary has been loaded. Function is executed only when the arc is off.

8	7	Set Metric Mode. When set to a value of 1 the Metric Mode is enabled.
9	8	Wire Size .030” (.8 mm)
10	9	Wire Size .035” (.9 mm)
11	10	Wire Size .045” (1.2 mm)
12	11	Wire Size .052” (1.3 mm)
13	12	Wire Size .062” (1.6 mm)
14	13	Use Steel Wire Density
15	14	Use Aluminum Wire Density
16	15	Use density value specified by REG 19

The following is the Register definitions address 1-20:

REGISTER	ADDRESS	DESCRIPTION
1	0	Arc On Status – When the arc is active the value will be 1. When the arc is off the value will be 0.
2	1	Arc Time – Weld on timer in 0.1-second intervals. Value is incremented during a weld cycle and measures the Arc On time for each weld. When the weld cycle is complete the total time for the weld will be set. (Note 100 = 10.0 sec)
3	2	Wire Speed – During the Arc on Time the value represents the actual wire feed speed. The value is in 1mm/sec (ipm) increments (100=100 MM/Sec). When the weld cycle is complete the value will be the statistical average for the last weld.
4	3	Deposition Rate in Kgms/Hr (Lbs/hr)
5	4	Arc Start Hour – The value is the arc start Hour based on the Real Time Clock. This value is set when an arc on condition is detected.
6	5	Arc Start Minute – The value is the arc start minute based on the Real Time Clock. This value is set when an arc on condition is detected.
7	6	Arc Start Second – The value is the arc start second based on the Real Time Clock. This value is set when an arc on condition is detected.
8	7	Arc Start Month – The value is the arc start month based on the Real Time Clock. This value is set when an arc on condition is detected.
9	8	Arc Start Day – The value is the arc start day based on the Real Time Clock. This value is set when an arc on condition is detected.
10	9	Arc Start Year – The value is the arc start year based on the Real Time Clock. This value is set when an arc on condition is detected.
11	10	Total Arc On Hours – This value is the accumulative arc on hours since the last arc time reset.
12	11	Total Arc On Minutes – This value is the accumulative arc on minutes since the last arc time reset.
13	12	Total Arc On Second (##.#) – This value is the accumulative arc on seconds since the last arc time reset. Value is in 0.1-second increments (100=10.0 seconds).
14	13	Weld Counter (0-65535) – Total number of weld since last reset. If weld counter reaches the max count of 65535 the

		counter will reset to 0.
15	14	Memory Weld Count (0-400) – Value indicates the number of weld summaries stored in memory (Max Count = 409).
16	15	Average Sample Counter (1-50) – Value indicates the number of raw data samples to average to produce a single sample value as stored in Register 3-5.
17	16	Read Stored Average Data – the value is used to select the stored Summary data to be read from memory to Register 2-10. Range of Value 1-500.
18	17	Minimum Time for Valid Weld
19	18	User defined wire Density
20	19	Total – Total Usage in Kgms or Lbs
21	20	Actual wire speed value (R21=0 when wire speed is idle)

The following is a summary of the Report Slave ID and Status (Code 17) Response Data fields:

Byte	Contents
1	Sensor ID Number =20 Hex (Version 1, Rev0)
2	Run Indicator (0=OFF, FF=On)
3	Status Byte Bit 0 = Ram 0 Full Bit 1 = RAM 1 Full Bit 2 = Self Test Ok Bit3-7 = 0
4	Firmware Version Number – BCD Format (MSB = Major: ISB = Minor)
5	Firmware Version Number – BCD Format (MSB+LSB = Release)

4.4 Coil Definitions and Operation

The Wire*Trak*™ has 16 simulated output coils. These coils are used as internal bit flags to perform specific functions. Only 1-8 of the simulated coils is used. Setting the control modes and to clear the internal counters. Coils 9-16 are used to define the Wire diameter and density parameters used for internal calculations. The Wire*Trak*™ support both single and group force coil commands. Refer to Section 4.3 for summary of the Coil functions.

To clear the Wire*Trak*™ weld and average counters or reset the total arc timer, force the specific coil to the “ON” condition. The Wire*Trak*™ will clear the requested counter or timer and then reset the coil to the “OFF” condition signifying a successful operation.

To disable the auto arc on detection mode force coil 6 to the “OFF” condition. When set the Wire*Trak*™ will only log data when the Coil 6 is active. To allow normal arc on detection Coil 2 must be in the “ON” condition.

To set the Real time clock perform the following steps:

1. Load the BCD formatted Time and Date into the value Registers 6-12.

2. Set Coil 8 to the “ON” condition. The Wire*Trak*™ will clear the coil after completing the function.

3. Enable Coil 6 to resume automatic arc detection.

To read a stored weld data summary perform the following steps:

1. Load the desired weld summary number into Registers 17. This value must be equal to or less then the total number of saved welds as indicated by Register 15.

2. Set Coil 7 to the “ON” condition. The Wire*Trak*™ will load the stored data into Registers 2-10 and will clear the coil after completing the function. The data will remain in the register until the next arc on or stored weld request.

3. Enable Coil 6 to resume automatic arc detection.

4.5 Register Definitions

Register 1: Used to indicate when a welding arc has been detected. When this register is a 1 the Wire*Trak*™ controller is updating the welding parameters with new measured values.

Register 2–4: Contains the current value for each of the welding parameters. The following table shows the value and units of measure for each weld parameter register:

REGISTER	MEASURED PARAMETERS	UNITS OF MEASURE
2	Arc On time – Time in 0.1 seconds from arc detection	(Value /10) sec.
3	Wire Speed – Linear wire speed measured by encoder	Value = mm/sec
4	Deposition Rate – The calculated deposition rate based on the last average wire speed and arc on time	(Value/1000) Kgm/Hr or Lbs/hr

When the Arc is in the off condition the Registers will display the statistical average for the last weld.

Registers 5-11: Contains the Time and Date at the start of the last weld. These registers will only update when a new weld is detected or a weld summary is loaded from memory. The Time and Date parameters are in BCD format. The low nibble is the 1’s units and the upper nibble is the 10’s units. Only the lower byte is used for all parameters except the year. The MSB byte holds the BCD value for the century value.

Note: When setting the Real time Date and Time the values loaded into the Registers 6-12 must be in a decimal format.

Register 12–14: Used to indicate the accumulative arc time. The value is an integer value and represents the total arc on time since the last reset. At the end of each weld the accumulated arc timer will be updated. Writing to these registers will have no effect on the total arc time. When the next weld occurs the new value will be written.

Register 15: The current weld count since the last weld count reset. This counter is incremented when the total arc time for a weld is greater then 0.5 seconds. This prevents false arc starts from being counted as a valid weld.

Register 16: Indicates the number of weld summaries stored in the weld memory. The maximum number of welds stored is 1365. Writing a new value to this register will cause the next collected weld to be written to that weld number location. The Welds will only be saved if the Save Weld summary coil (2) has been set and the minimum weld time is greater than 0.5 seconds.

Register 17: This register sets the number of raw data points to be averaged to generate a single sampled value. The minimum value is 1 and the maximum value is 255. Setting this value to 0 will disable the Analog Data collection routines.

Register 18: This register is used to read a previously stored weld summary from memory. Set the desired weld summary number in this register then set the Read Weld Memory Coil 7. The value will be written to Register 2 – 12. Maximum value is 409.

Register 19: This register is used to set the user defined density value. The value must be in Kgm/mm^3 or $Lbs/inch^3$.

Register 20: This register is the total volume used since the last reset. The units are in Kgms or lbs.

Register 21: This register is the actual wire speed value. The value will be zero when the wire speed is idle.

5.0 Wire*Trak*™ ASCII TERMINAL MODE PROTOCOL

5.1 General Description

If the Device ID is set to zero when the power is applied then the Wire*Trak*™ Terminal mode is active and can be used to off-line program the user configurable parameters and operating modes. The protocol is a simple ASCII command string that allows the user to upload or download the various data. The user can use any terminal program to perform the programming function. All program command functions are case sensitive. The serial port is configured for the following data format:

- Baud Rate: 19.2K, Full Duplex
- Word Length: 8 Data Bits, One Stop and no parity
- Hand Shaking: None

NOTE: *If using the RS-232/RS-485 Converter, PN C3A5023 for Terminal Communications, remove the top cover and place the* ***JP1*** *jumper on Pins A (ECHO).*

5.2 TERMINAL PROTOCOL

The protocol consists of a command string and optional data bytes. The command string is an alpha character and an option number followed by a "=" or "?", followed by optional data and terminated with an ASCII "cr" (0dh). The "=" will indicate that data is being sent to the selected parameter by the host controller. The "?" will indicate a request for data from the Wire*Trak*™ to the host controller. If the host is sending data to the Wire*Trak*™ the data will be placed after the "=" character and will be an ASCII string terminated with an ASCII "cr" (0dh). The following is an example of reading a parameter value from the Wire*Trak*™:

From Host type: **V1? (cr)**
Response from Wire*Trak*: **##**

Where: ## is the current value for the parameter and
(cr) is the enter key

The following is an example of how to modify a value in the Wire*Trak*™ using the terminal commands:

From Host type: **V1=#### (cr)**

Where: ## is the new value for the parameter and
(cr) is the enter key

The following is a summary of the two special command functions. They are used to set and read the Wire*Trak*™ Real time Clock (RTC). To read the current Time type the following command:

From Host type: **T? (cr)**
Response from Wire*Trak*: **hh:mm:ss**

Where: hh is the current hour, mm is the current minute and ss is the current second. (cr) is the enter key

To set the time (hour/minute/second) type: **T=10:17:35** (cr) Entire field must be completed as explained below:

Type 6:45 am as **T=06:45:00 (cr)**
Type 7:25 pm as **T=19:25:00 (cr)**

Note: *"cr" denotes carriage return (Enter)*

To read the current Date type the following command:

From Host type: **D? (cr)**
Response from Wire*Trak*: **mn:dd:yy**

Where: mn is the current month, dd is the current day and yy is the current year, (cr) is the enter key

To set the date (month/day/year) type: **D=06/01/99** (cr). The Entire field must be completed as explained below:

Type February 4, 1999 as **D=02/04/99(cr)**
Type November 23, 2000 as **D=11/23/00(cr)**

Note: *"cr" denotes carriage return (Enter)*

5.3 TERMINAL COMMANDS

The following is a summary of the Terminal Commands supported by the Wire*Trak*™:

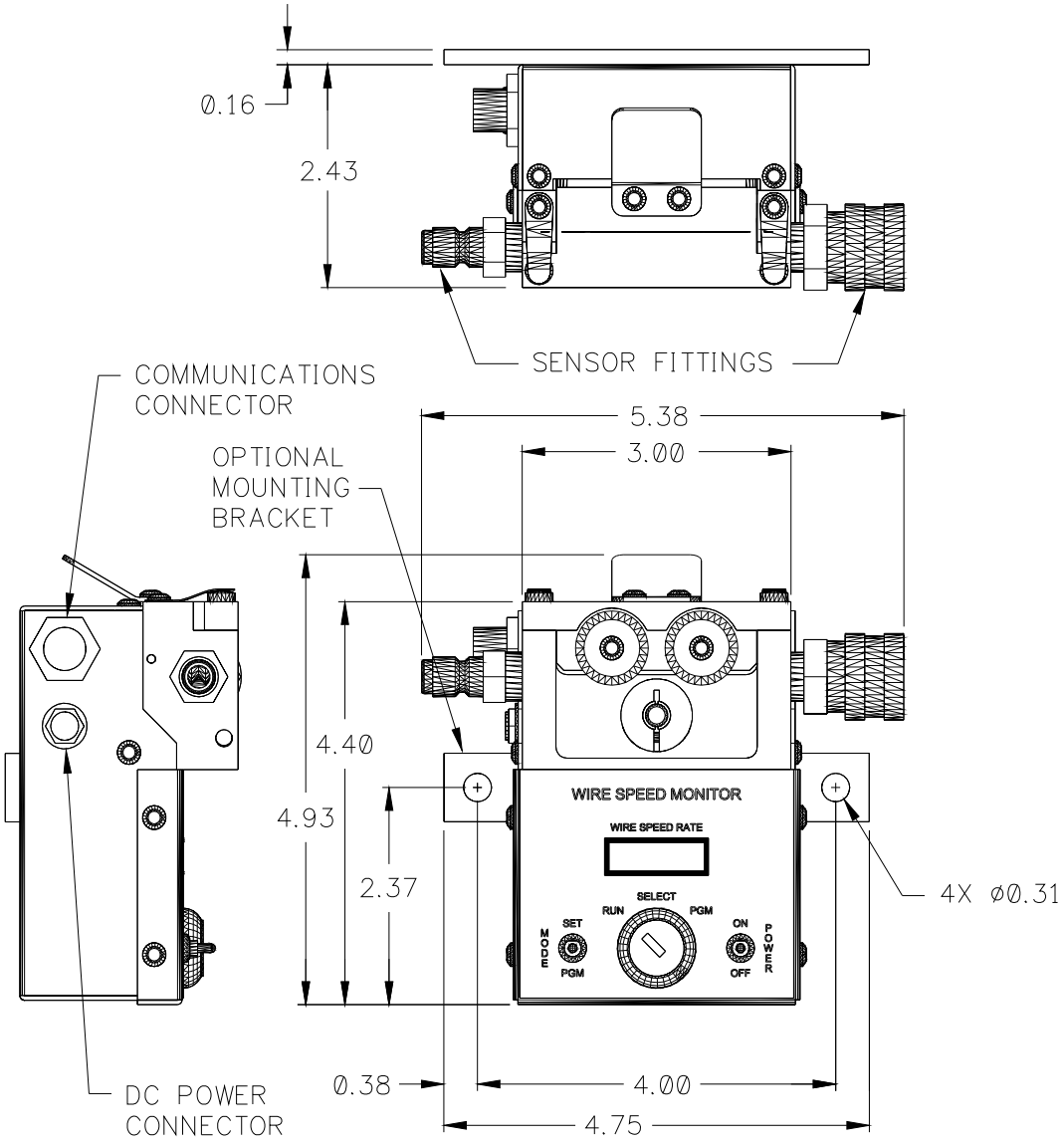
Command	DESCRIPTION	RANGE
D	Sets or reads the Real Time Clock date parameters Format = MM/DD/YY	8 Bytes
T	Sets or Reads the Real Time Clock Time parameters	8 Bytes

	Format = HH:MM:SS	
M0	MODBUS Coils 1-8 Set/Read. Binary Bit's are set by decimal value. CR1=1, CR2=2, CR3=4, CR4=8, CR5=16, CR6=32, CR7=64, CR8=128	0-255
M1	MODBUS Coils 9-16 Set/Read. Binary Bit's are set by decimal value. CR1=1, CR2=2, CR3=4, CR4=8, CR5=16, CR6=32, CR7=64, CR8=128	0-255
M2	Baud Rate	0-255
M3	Operational Mode. Binary Bit's are set by decimal value. Metric=1, BITs 1..7 not used	0-1
V0	Arc On Status – When the arc is active the value will be 1 when the arc is off the value will be 0	0-1
V1	Arc Time – Weld on timer in 0.1-second intervals. Value is incremented during a weld cycle. And measures the Arc On time for each weld. When the weld cycle is complete the total time for the weld will be set. (Note 100 = 10.0 sec)	0-65535
V2	Wire Speed – During the Arc on Time the value represents the actual wire feed speed. The value is in 1-mm/sec increments (100=100 MM/Sec). When the weld cycle is complete the value will be the statistical average for the last weld.	0-1023
V3	Deposition Rate – The value is the Wire Deposition Rate in Pounds per hour or Kilograms per Hour. This value is calculated at the end of each weld.	0-65535
V4	Hour – The value is the arc start Hour based on the Real Time Clock. This value is set when an arc on condition is detected.	0-65535
V5	Minute – The value is the arc start minute based on the Real Time Clock. This value is set when an arc on condition is detected.	0-59
V6	Second – The value is the arc start second based on the Real Time Clock. This value is set when an arc on condition is detected.	0-59
V7	Day – The value is the arc start day based on the Real Time Clock. This value is set when an arc on condition is detected.	0-31
V8	Month – The value is the arc start month based on the Real Time Clock. This value is set when an arc on condition is detected.	0-12
V9	Year – The value is the arc start year based on the Real Time Clock. This value is set when an arc on condition is detected.	0-2999
V10	Total ARC Hours – This value is the accumulative arc on hours since the last arc time reset.	0-65535

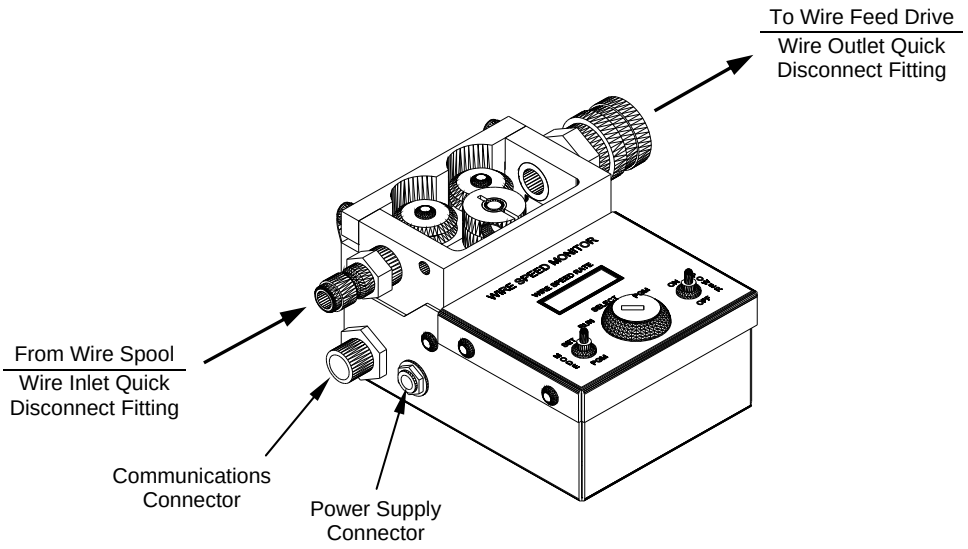
V11	Total ARC Minutes – This value is the accumulative arc on minutes since the last arc time reset.	0-59
V12	Total Arc Seconds – This value is the accumulative arc on seconds since the last arc time reset. Value is in 0.1-second increments (100=10.0 seconds).	0-59
V13	Weld Count – Total number of weld since last reset. If weld counter reaches the max count of 65535 the counter will reset to 0.	0-65535
V14	Weld Summary Count – Value indicates the number of weld summaries stored in memory (Max Count = 400).	0-400
V15	Sample Count – Value indicates the number of raw data samples to average to produce a single sample value as stored in Register 3.	0-400
V16	Read Weld Number – the value is used to select the stored Summary data to be read from memory to Register 2-12. Range of Value 1-500.	0-400
V17	Minimum Time required for storage of weld data.	0-100
V18	Density	0-1365
V19	Total Weight of consumed electrode in pounds per square inch or kilograms per centimeter^{3}	0-65535

Appendix A Wire*Trak*™ Installation Specifications

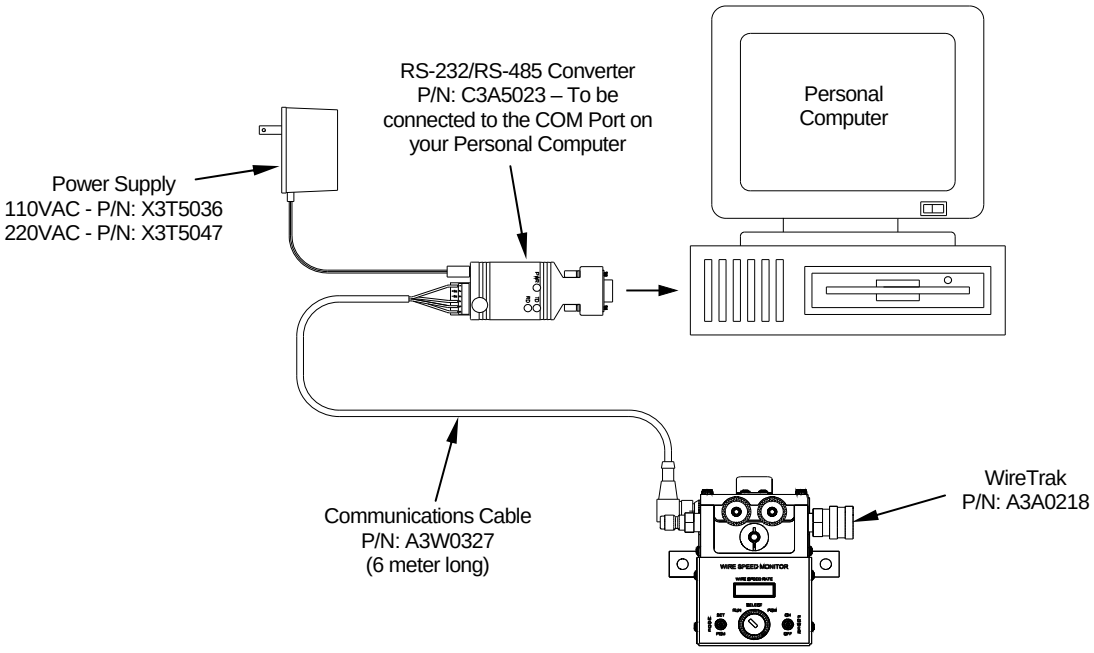
A.1 Wire*Trak*™ Sensor Mounting Dimensions



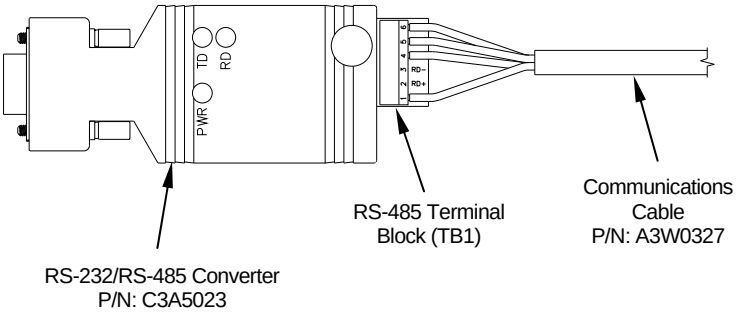
A.2 Sensor Cable and Wire Speed Sensor Installation



A.3 Single Unit Installation



SYSTEM INSTALLATION DIAGRAM

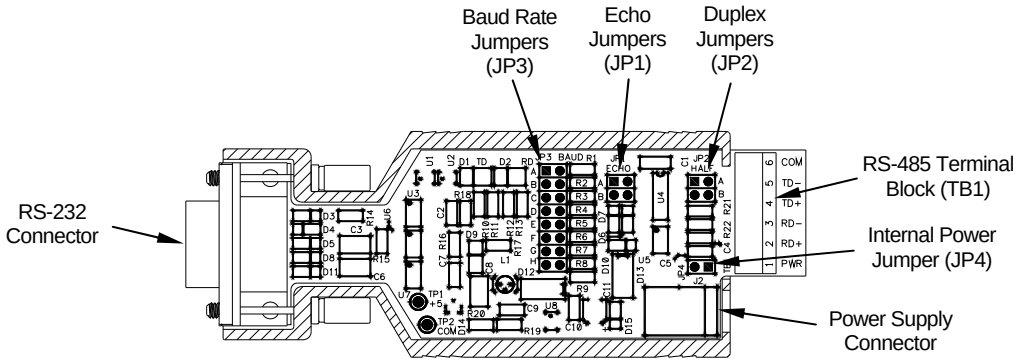


RS-485 CABLE HOOKUP

TERMINAL	LABEL	WIRE COLOR
1	PWR	Brown
2	RD+	N/C
3	RD-	N/C
4	TD+	White
5	TD-	Blue
6	COM	Gray

Note: Cable shield to be clipped off.

COMMUNICATIONS CABLE INSTALLATION DIAGRAM



ECHO JUMPERS (JP1)

ECHO	JUMPER
On	A
Off**	B

** Denotes the default jumper

DUPLEX JUMPERS (JP2)

DUPLEX	JUMPER
Full	None
Half**	A and B

** Denotes the default jumper

BAUD RATE JUMPERS (JP3)

BAUD	JUMPER
1200	A
2400	B
4800	C
9600	D
19200**	E
38400	F
57600	G
115200	H

** Denotes the default jumper

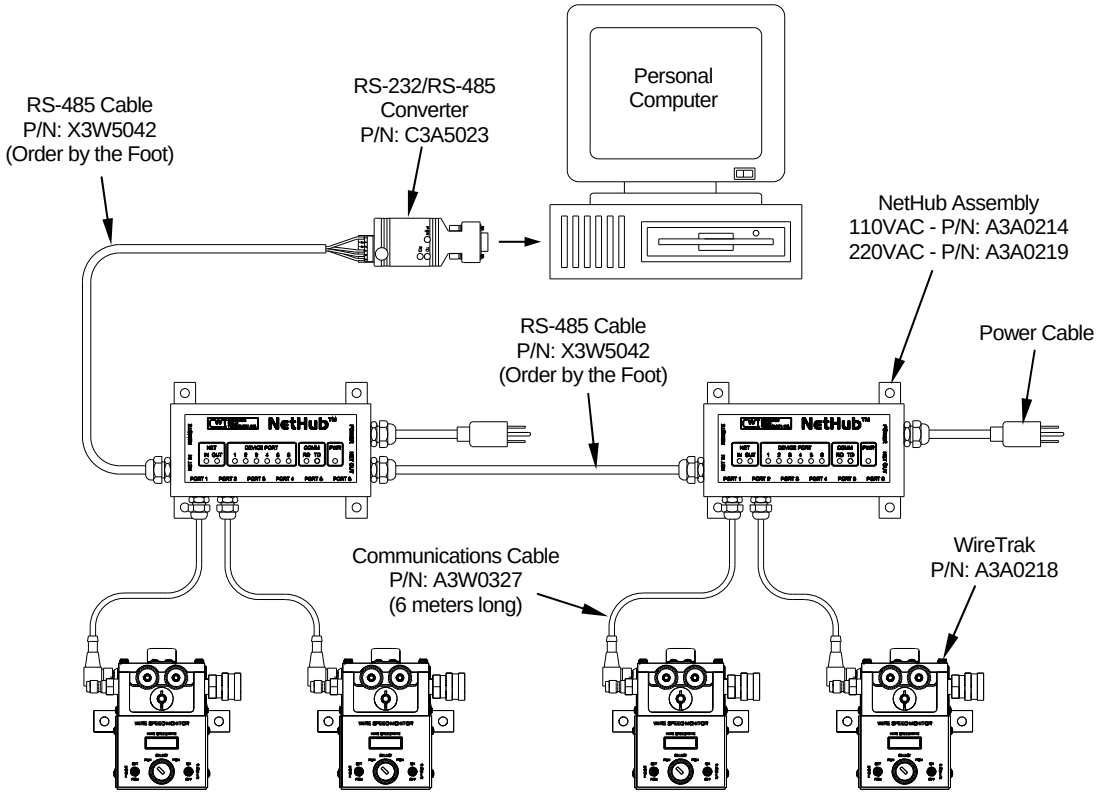
POWER JUMPERS (JP4)

POWER	JUMPER
External**	Yes
Internal	No

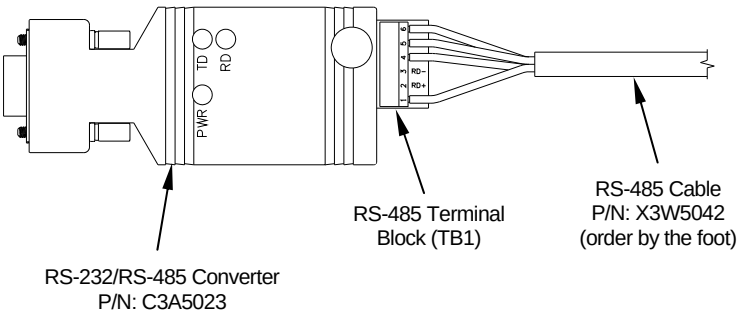
** Denotes the default jumper

RS-485/RS-232 CONVERTER JUMPER LOCATION DIAGRAM

A.4 Multiple Unit Network Installation



SYSTEM INSTALLATION DIAGRAM

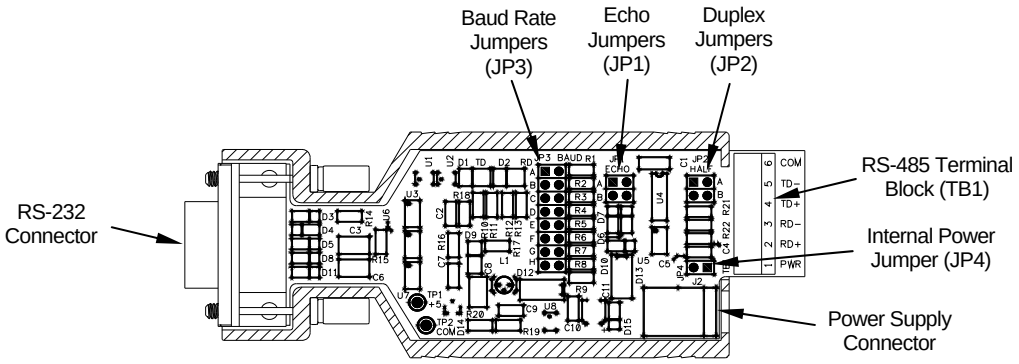


RS-485 CABLE HOOKUP

TERMINAL	LABEL	WIRE COLOR
1	PWR	Orange
2	RD+	N/C
3	RD-	N/C
4	TD+	Blue
5	TD-	White/Blue
6	COM	White/Orange

Note: Cable shield to be clipped off.

COMMUNICATIONS CABLE INSTALLATION DIAGRAM



ECHO JUMPERS (JP1)

ECHO	JUMPER
On**	A
Off	B

** Denotes the default jumper

DUPLEX JUMPERS (JP2)

DUPLEX	JUMPER
Full**	None
Half	A and B

** Denotes the default jumper

BAUD RATE JUMPERS (JP3)

BAUD	JUMPER
1200	A
2400	B
4800	C
9600	D
19200**	E
38400	F
57600	G
115200	H

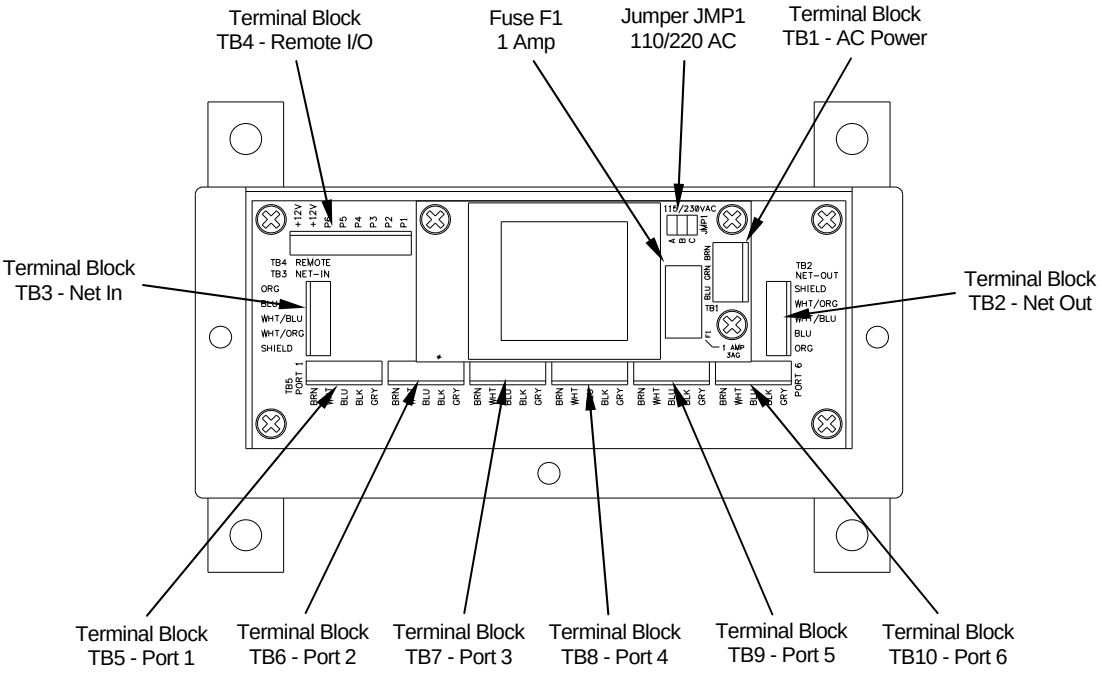
** Denotes the default jumper

POWER JUMPERS (JP4)

POWER	JUMPER
External**	Yes
Internal	No

** Denotes the default jumper

RS-485/RS-232 CONVERTER JUMPER LOCATION DIAGRAM



JUMPER JMP1 - 110/220VAC

VOLTAGE	JUMPERS
110VAC	A and B
220VAC	C

The next two jumpers (JP1 and JP2) are for whether the RS-485 Converter is powered from an external power source or uses the power supplied by the NetHub.

JUMPER JP1 - NPWR

POWER	JUMPERS
External Powered	A
NetHub Powered	A and B

JUMPER JP2 - NCOM

POWER	JUMPERS
External Powered	A
NetHub Powered	A and B

TERMINAL BLOCK TB1 – AC POWER

PIN	REFERENCE	WIRE COLOR
1	HOT	BLU
2	EARTH	GRN/YEL
3	NEU	BRN

TERMINAL BLOCK TB2 – NET OUT
TERMINAL BLOCK TB3 – NET IN

PIN	REFERENCE	WIRE COLOR
1	NET PWR	ORG
2	NET+	BLU
3	NET-	WHT/BLU
4	NET COM	WHT/ORG
5	EARTH GND	SHIELD

Note: Cable shield to be clipped off.

TERMINAL BLOCK TB4 – REMOTE

PIN	REFERENCE	WIRE COLOR
1	RMT P1	WHT
2	RMT P2	BRN
3	RMT P3	GRN
4	RMT P4	YEL
5	RMT P5	GRY
6	RMT P6	PNK
7	+12 VDC	BLU
8	+12VDC	RED

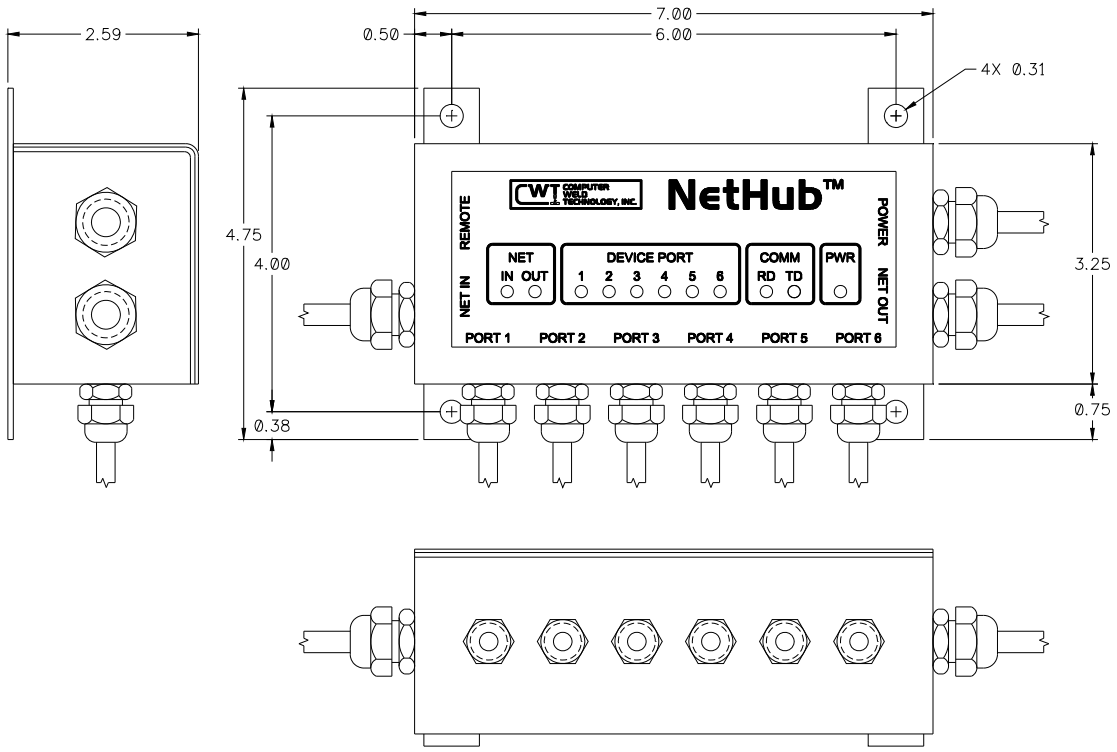
TERMINAL BLOCK TB5 – PORT 1
TERMINAL BLOCK TB6 – PORT 2
TERMINAL BLOCK TB7 – PORT 3
TERMINAL BLOCK TB8 – PORT 4
TERMINAL BLOCK TB9 – PORT 5
TERMINAL BLOCK TB10 – PORT 6

PIN	REFERENCE	WIRE COLOR
1	+12V	BRN
2	NET+	WHT
3	NET-	BLU
4	REMOTE ON	BLK
5	GND	GRY

Note: Cable shield to be clipped off.

NetHub JUMPER and TERMINAL BLOCK LOCATION DIAGRAM

A.5 NetHub™ Mounting Dimensions



A.6 Communications Cable P/N: A3W0327

This part includes both a cable and a strain relief.
The strain relief is to be used for a NetHub installation.

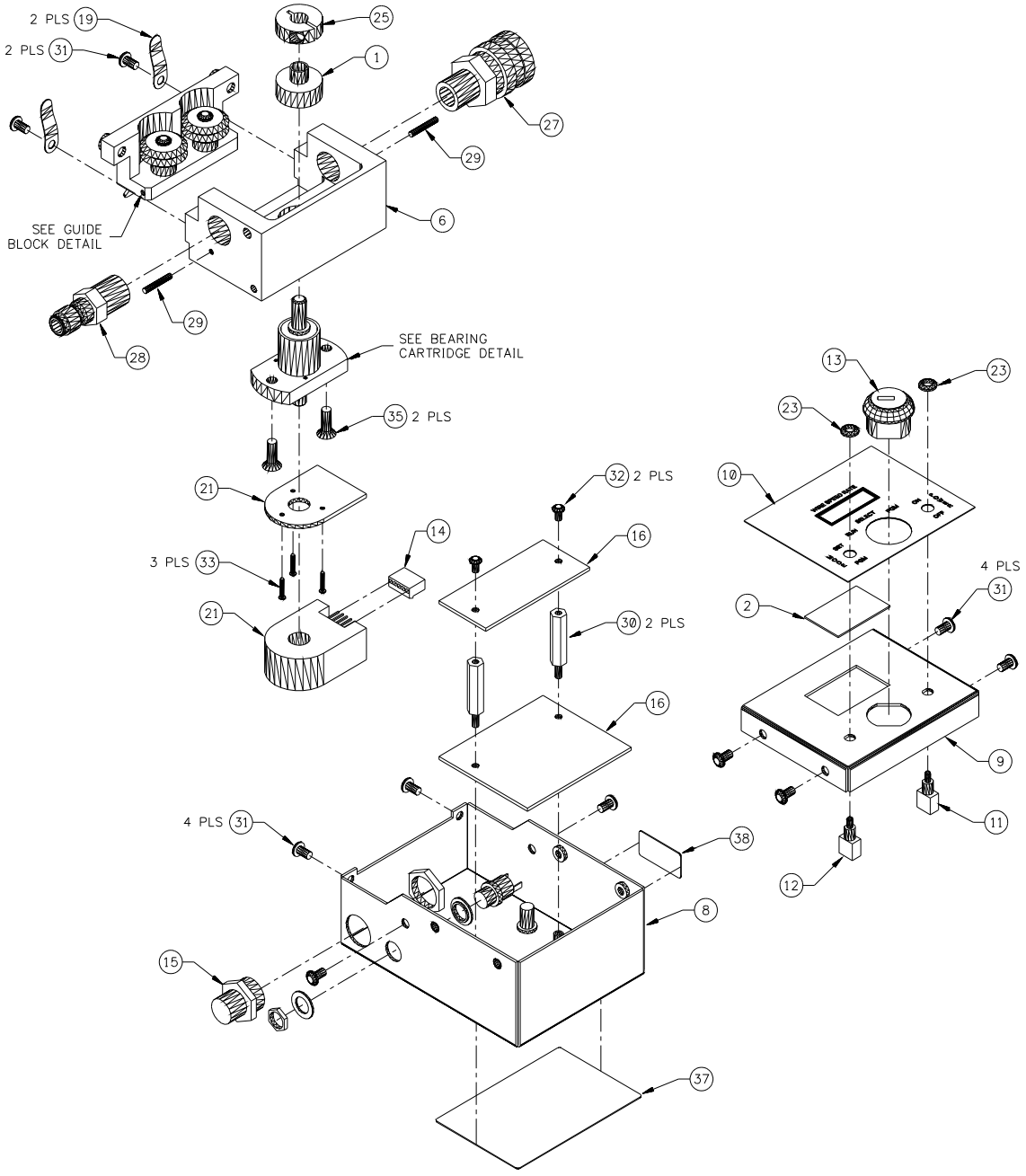
WIRE LIST

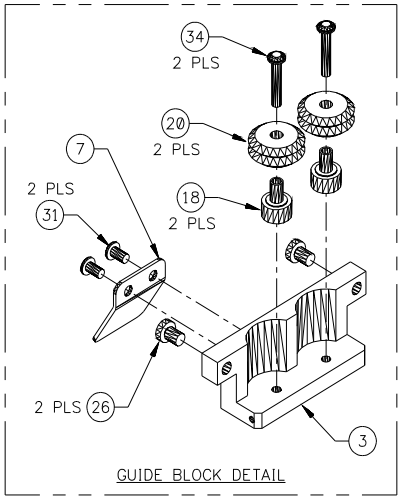
WIRE COLOR	FROM	REFERENCE
BROWN	ITEM 1 PIN 1	+24 VDC
WHITE	ITEM 1 PIN 2	NET+
BLUE	ITEM 1 PIN 3	NET-
BLACK	ITEM 1 PIN 4	REMOTE OND
GRAY	ITEM 1 PIN 5	24VDC GROUND
SHIELD		CABLE SHIELD

6-Meter Long Cable

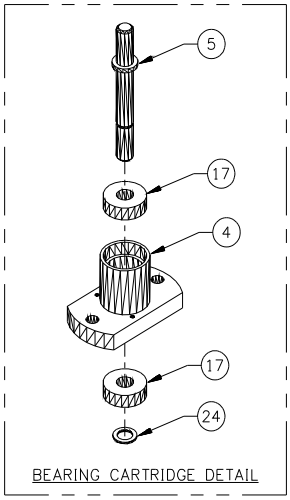
Appendix B Wire*Trak*™ Parts List

B.1 Wire*Trak*™ Sensor Assembly P/N: A3A0218





GUIDE BLOCK DETAIL



BEARING CARTRIDGE DETAIL

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	A2A0014	Driven Wheel
2	1	A2M0193	Display Lens
3	1	A2M0203	Guide Block
4	1	A2M0204	Bearing Cartridge
5	1	A2M0205	WFS Shaft
6	1	A2M0206	Transducer Block
7	1	A3E0141	Guide Handle
8	1	A3E0146	Bottom Cover
9	1	A3E0147	Top Cover
10	1	A3E0148	WireTrak Overlay
11	1	A3W0318	Power Switch Assembly
12	1	A3W0319	Mode Switch Assembly
13	1	A3W0320	Select Switch Assembly
14	1	A3W0321	Encoder Wire Harness
15	1	A3W0328	Power Supply Wire Harness
16	1	A5A0112	WireTrak PCB Assembly
17	2	X2B0373	Bearing #R4ZZ MRC
18	2	X2B5002	Stationary Bushing #B-1 Dua-L-Vee
19	2	X2N5023	Flat Spring #U-FS-2 Small Parts
20	2	X2P5004	Wheel #W1-X Dua-L-Vee
21	1	X3M5044	Encoder, Optical 256 cpr #HEDS-5500F06 Agilent
22			
23	2	X3S5093	Nut, Switch Dress #465701201 C&K
24	1	X6B5025	Retaining Ring, ¼" External #5100-25 Thruarc
25	1	X6B5054	Shaft Collar #DSCA-5 Small Parts
26	2	X6B5055	Locator Button #CL-1-SLB Carr Lane
27	1	X6F5090	Fitting, Quick Disconnect #BST-2M Parker
28	1	X6F5102	Fitting, Nipple #BST-N2M Parker
29	2	X6P5007	Dowel Pin, 0.093" diameter ¾" long #D2-6 Berg
30	2	X6S5058	Spacer, M-F #4-40 x 1-1/16" long #4515-440-SS-0 RAF
31	10		#6-32 x 5/16" long Pan Head Screw w/ Internal Lock Washer
32	2		#4-40 x 5/16" long Pan Head Screw w/ Internal Lock Washer
33	3		#0-80 x 3/8" long Philips Pan Head Screw
34	2		#6-32 x ¾" long Socket Button Head Screw
35	2		#8-32 x ½" long Socket Flat Head Screw
36	1		WireTrak Serial Number Label
37	1		Warning #1 Label
38	1		Node Address Label

Appendix C Device ID MSB and LSB Decode Table

Node ID	MSB	LSB	Node ID	MSB	LSB	Node ID	MSB	LSB	Node ID	MSB	LSB
1	0	1	63	3	F	124	7	D	187	B	B
2	0	2	64	4	0	125	7	E	188	B	C
3	0	3	65	4	1	126	7	F	189	B	D
4	0	4	66	4	2	127	8	0	190	B	E
5	0	5	67	4	3	128	8	1	191	B	F
6	0	6	68	4	4	129	8	2	192	C	0
7	0	7	69	4	5	130	8	3	193	C	1
8	0	8	70	4	6	131	8	4	194	C	2
9	0	9	71	4	7	132	8	5	195	C	3
10	0	A	72	4	8	133	8	6	196	C	4
11	0	B	73	4	9	134	8	7	197	C	5
12	0	C	74	4	A	135	8	8	198	C	6
13	0	D	75	4	B	136	8	9	199	C	7
14	0	E	76	4	C	137	8	A	200	C	8
15	0	F	77	4	D	138	8	B	201	C	9
16	1	0	78	4	E	139	8	C	202	C	A
17	1	1	79	4	F	140	8	D	203	C	B
18	1	2	80	5	0	141	8	E	204	C	C
19	1	3	81	5	1	142	8	F	205	C	D
20	1	4	82	5	2	143	9	0	206	C	E
21	1	5	83	5	3	144	9	1	207	C	F
22	1	6	94	5	4	145	9	2	208	D	0
23	1	7	85	5	5	146	9	3	209	D	1
24	1	8	86	5	6	147	9	4	210	D	2
25	1	9	86	5	7	148	9	5	211	D	3
26	1	A	87	5	8	149	9	6	212	D	4
27	1	B	88	5	9	150	9	7	213	D	5
28	1	C	89	5	A	151	9	8	214	D	6
29	1	D	90	5	B	152	9	9	215	D	7
30	1	E	91	5	C	153	9	A	216	D	8
31	1	F	92	5	D	154	9	B	217	D	9
32	2	0	93	5	E	155	9	C	218	D	A
33	2	1	94	5	F	156	9	D	219	D	B
34	2	2	95	6	0	157	9	E	220	D	C
35	2	3	96	6	1	158	9	F	221	D	D
36	2	4	97	6	2	159	A	0	222	D	E
37	2	5	98	6	3	160	A	1	223	D	F
38	2	6	99	6	4	161	A	2	224	E	0
39	2	7	100	6	5	162	A	3	225	E	1
40	2	8	101	6	6	163	A	4	226	E	2
41	2	9	102	6	7	164	A	5	227	E	3
42	2	A	103	6	8	165	A	6	228	E	4
43	2	B	104	6	9	166	A	7	229	E	5
44	2	C	105	6	A	167	A	8	230	E	6
45	2	D	106	6	B	168	A	9	231	E	7
46	2	E	107	6	C	170	A	A	232	E	8
47	2	F	108	6	D	171	A	B	233	E	9
48	3	0	109	6	E	172	A	C	234	E	A
49	3	1	110	6	F	173	A	D	235	E	B
50	3	2	111	7	0	174	A	E	236	E	C
51	3	3	112	7	1	175	A	F	237	E	D
52	3	4	113	7	2	176	B	0	238	E	E
53	3	5	114	7	3	177	B	1	239	E	F
54	3	6	115	7	4	178	B	2	240	F	0
55	3	7	116	7	5	179	B	3	241	F	1
56	3	8	117	7	6	180	B	4	242	F	2
57	3	9	118	7	7	181	B	5	243	F	3
58	3	A	119	7	8	182	B	6	244	F	4
59	3	B	120	7	9	183	B	7	245	F	5
60	3	C	121	7	A	184	B	8	246	F	6
61	3	D	122	7	B	185	B	9	247	F	7
62	3	E	123	7	C	186	B	A			