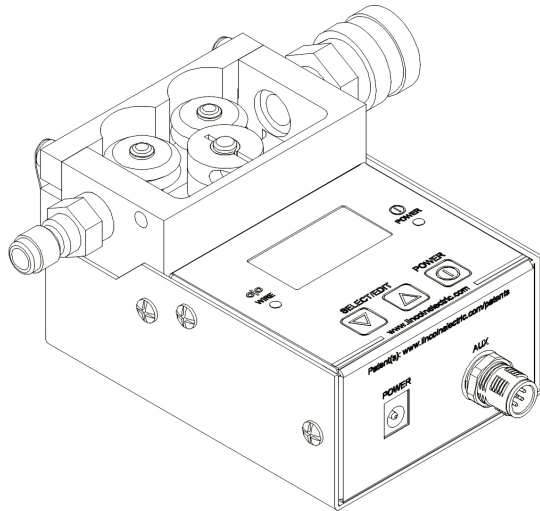


Operator's Manual

CWT[™] WIRETRAK



For use with machines having Numbers:
A0A0233, A0A0234,
A0A0236, A0A0237



Register your machine:
www.lincolnelectric.com/register

Authorized Service and Distributor Locator:
www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.



KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

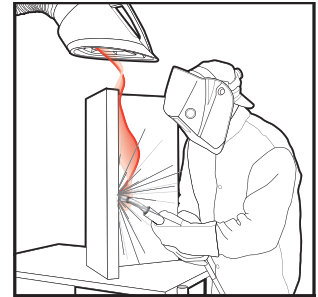
READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.



WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**



SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.



SECTION A: WARNINGS



CALIFORNIA PROPOSITION 65 WARNINGS



WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to
www.P65warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.*)



WARNING: Cancer and Reproductive Harm
www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.



FOR ENGINE POWERED EQUIPMENT.

- 1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- 1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- 1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact



with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

- 1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- 1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- 1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- 1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
- 1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS



- 2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines
- 2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
- 2.c. Exposure to EMF fields in welding may have other health effects which are now not known.
- 2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:
 - 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
 - 2.d.2. Never coil the electrode lead around your body.
 - 2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
 - 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
 - 2.d.5. Do not work next to welding power source.



ELECTRIC SHOCK CAN KILL.



- 3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
 - 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
 - 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
 - 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
 - 3.g. Never dip the electrode in water for cooling.
 - 3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
 - 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
 - 3.j. Also see Items 6.c. and 8.



ARC RAYS CAN BURN.



- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



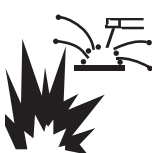
FUMES AND GASES CAN BE DANGEROUS.



- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**
- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer's safety practices. SDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.



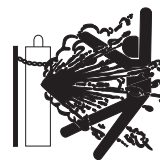
WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 02269-9101.
- 6.j. Do not use a welding power source for pipe thawing.



CYLINDER MAY EXPLODE IF DAMAGED.



- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.



FOR ELECTRICALLY POWERED EQUIPMENT.



- 8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- 8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- 8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to
<http://www.lincolnelectric.com/safety>
for additional safety information.

ELECTROMAGNETIC COMPATIBILITY (EMC)

CONFORMANCE

Products displaying the CE mark are in conformity with European Community Council Directive. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

INTRODUCTION

All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc.

WARNING: This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electro-magnetic compatibility in those locations, due to conducted as well as radiated disturbances.

INSTALLATION AND USE

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions.

If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

NOTE: The welding circuit may or may not be earthed for safety reasons. Follow your local and national standards for installation and use. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

ASSESSMENT OF AREA

Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;
- b) radio and television transmitters and receivers;
- c) computer and other control equipment;
- d) safety critical equipment, e.g., guarding of industrial equipment;
- e) the health of the people around, e.g., the use of pacemakers and hearing aids;
- f) equipment used for calibration or measurement;
- g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the

environment is compatible. This may require additional protection measures;

- h) the time of day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

METHODS OF REDUCING EMISSIONS

Public Supply System

Welding equipment should be connected to the public supply system according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the system. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential Bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g., ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.¹

¹ Portions of the preceding text are contained in EN 60974-10 "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

Table of Contents

1.0	SYSTEM OVERVIEW	1
1.1	GENERAL OVERVIEW	1
1.2	THE WIRETRAK GENERAL SPECIFICATION:.....	1
1.3	SENSOR SPECIFICATIONS:	2
2.0	INSTALLATION.....	3
2.1	GENERAL GUIDELINES	3
2.2	SENSOR INSTALLATION GUIDELINES	3
2.3	CONFIGURE MODBUS™ DEVICE ID	4
3.0	OPERATION	5
3.1	WIRETRAK OPERATION	5
3.2	SENSOR SETUP	6
3.3	PARAMETERS	6
3.2	EMBEDDED FIRMWARE	9
3.3	HOST SYSTEM INTERFACE.....	9
4.0	WIRETRAK MODBUS MEMORY MAP.....	11
4.1	GENERAL DESCRIPTION	11
4.2	SUPPORTED MODBUS COMMANDS	11
4.3	MEMORY MAP FOR SENSOR.....	11
4.4	COIL DEFINITIONS AND OPERATION	13
4.5	REGISTER DEFINITIONS	14
APPENDIX A	WIRETRAK INSTALLATION SPECIFICATIONS.....	16
A.1	WIRETRAK ENCLOSURE DIMENSIONS	16
APPENDIX B	BILLS OF MATERIAL	17
B-1	WIRETRAK ENCLOSURE ASSEMBLY P/N: A3A0313.....	17
B-2	8 PIN COMMUNICATIONS CABLE P/N: A3W0415	19
APPENDIX C	COMMUNICATION DIAGRAMS	20
C-1	SINGLE WIRETRAK WITH ETHERNET COMMUNICATION.....	20
C-2	SINGLE WIRETRAK WITH USB COMMUNICATION	20
C-3	MULTIPLE UNITS WITH ETHERNET COMMUNICATIONS	21
C-4	MULTIPLE UNITS WITH USB COMMUNICATIONS.....	22
C-5	NETHUB WIRING DIAGRAM	24
C-6	NETHUB MOUNTING DIMENSIONS	25
APPENDIX D	DEVICE ID MSB AND LSB DECODE TABLE.....	26

1.0 SYSTEM OVERVIEW

1.1 General Overview

The WIRETRAK is a lightweight; compact sensor unit designed for monitoring the wire feed speed in a welding environment. The WIRETRAK 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 WIRETRAK at the GMAW wire feeder inlet guide using industry standard quick disconnect conduit fittings or to a fixed surface with the optional mounting bracket (A3E0104).

The WIRETRAK provides two isolated Solid State Relay outputs CR1 and CR2. The CR1 output is active whenever the WIRETRAK is active. CR2 is a wire fault output and is active if the measured wire speed is below the user defined Min Limit. The SSR is rated for 48 VDC @ 0.25 amps max.

The unit is powered by a user supplied external 24 VDC power source via the sensor interface cable (A3W0415). This cable also provides the RS-485 MODBUS™ communication to an external system (data acquisition or PLC).

1.2 The WIRETRAK General Specification:

Listed below are the general system specifications:

Dimensions:	4.951" L x 3.093" W x 2.437" H (126 mm L x 79 mm W x 62 mm H)
Weight:	1.4 lbs (0.64 kg)
Power Input:	24 vdc @ 0.2 amp, ripple 200 mv

1.3 Sensor Specifications:

Wire Diameter (min/max)	0.030" / 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

2.0 INSTALLATION

2.1 General Guidelines

The WIRETRAK 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 WIRETRAK:

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 WIRETRAK 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 WIRETRAK be mounted as close to the wire feeder as possible (**not to exceed 1 meter**).
- The sensor cable must be mounted in such a manner as to prevent stress on the sensor cable connector.
- When mounting the WIRETRAK, position it so the operator or maintenance personnel can see the sensor Display if possible.
- If using the optional mounting bracket (A3E0104) to mount the WIRETRAK, 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 WIRETRAK is a simple 2-step process regardless of the selected mounting method.

1. Feed the wire through the WIRETRAK 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 WIRETRAK to the wire feeder inlet.**

2. To connect the Sensor Cable (A3W0415) to the WIRETRAK, insert the connector on the WIRETRAK Sensor Cable to the receptacle on the WIRETRAK and screw the connector retainer nut until the connect is fully seated. Connect the other end to the appropriate weld data acquisition system or PLC. To remove the WIRETRAK Sensor Cable, unscrew the retainer nut and unplug from the receptacle. A diagram of the connections for the cable can be found in Appendix B.

2.3 Configure MODBUS™ Device ID

A user menu item is provided to allow user definition of 1 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 press the *UP/DOWN* arrows simultaneously on the front panel. This will enable the user menu screen. Press the Down arrow button until the “*Device ID*” menu is displayed. Press the *UP/DOWN* arrows to invoke the edit function. Use the UP or Down arrows to increment/decrement the Device ID number to the desired value. Press the *UP/DOWN* arrow simultaneously to save the new Device ID value. The maximum Device ID is restricted to 247 as specified by the MODBUS™ Protocol standard.

3.0 OPERATION

3.1 WIRETRAK Operation

Operation of the WIRETRAK 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 WIRETRAK is installed (see Chapter 2 for installation procedures) apply power to the sensor by placing the Power switch in the ON position. The WIRETRAK will then perform a series of self-checks. During the self-check procedure the WIRETRAK will display the following:

```
**** WIRETRACK II ***  
'P/N A5Z0057 Ver 1.10 '  
' Copyright (c) 2020 '  
' CWT, a Lincoln '  
' Electric Brand '  
' All Rights Reserved '
```

The Start wire feed speed (0) will be displayed until the WIRETRAK 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.

```
0 IPM  
Last Weld .0 SEC
```

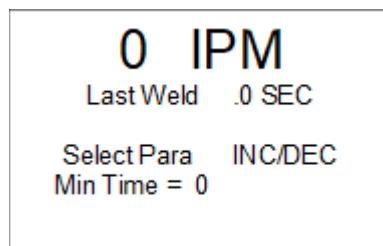
Once the wire feed speed is detected the WIRETRAK will display the actual running wire speed and arc on time.

```
286 IPM  
Run Time 23.2 SEC
```


The WIRETRAK is programmed to AUTO Detect an Arc On condition based on detecting a wire speed greater than 5 (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 5 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.

3.2 Sensor Setup

To program the High/Low limits and test parameters press both “▼” and “▲” switch simultaneously to enter the “**Select Para INC/DEC**” mode. The first programmable parameter will appear on the display.



To increment through the program menus press the “▲” button. To decrement through the menus press the “▼” button. To edit a menu option press both “▼” and “▲” switch simultaneously to enter the “**Edit Para INC/DEC**” mode. To increment the parameter press the “▲” button. To decrement the parameter press the “▼” button. To end the “**Edit Para INC/DEC**” press both “▼” and “▲” switch simultaneously to exit and return to the normal display mode. The user can edit only one parameter at a time. To edit other parameters repeat the above sequence.

3.3 Parameters

The following is the list of the parameters and system configurations that can be modified by the user:

- **Min Time = ##.#** - Min time for a valid weld. This is the minimum amount of time that the wire speed must be on in order for the WIRETRAK to include the data into the run time accumulators and store the data in memory. (Value range 0.0 – 60.0 sec)
- **MIN Limit = ###** - Minimum wire speed that must be exceeded to prevent a wire fault output when the “Enable Testing” function is enabled. Setting the value to zero will disable the wire fault output.
- **RTC Hour = ##** - This sets the WIRETRAK internal Real Time Clock hour. The RTC is configured in 24 hour format. (Note: The RTC does not have a battery backup. When powered down the clock will stop.)

- **RTC Min = ##** - This sets the WIRETRAK internal Real Time Clock minute. The RTC is configured in 24 hour format. *(Note: The RTC does not have a battery backup. When powered down the clock will stop.)*
- **RTC Sec = ##** - This sets the WIRETRAK internal Real Time Clock second. The RTC is configured in 24 hour format. *(Note: The RTC does not have a battery backup. When powered down the clock will stop.)*
- **RTC Month = ##** - This sets the WIRETRAK internal Real Time Clock month. *(Note: The RTC does not have a battery backup. When powered down the clock will stop.)*
- **RTC Day = ##** - This sets the WIRETRAK internal Real Time Clock day. *(Note: The RTC does not have a battery backup. When powered down the clock will stop.)*
- **RTC Year = ##** - This sets the WIRETRAK internal Real Time Clock year. *(Note: The RTC does not have a battery backup. When powered down the clock will stop.)*
- **Save Average?** – This option is used to enable wire summary data to be stored in the NV RAM. Each wire speed record will include the current weld count, date time stamp and the average wire speed. This data can then be download via the Modbus serial port. The data stored will be time stamped and the current weld count will be saved with the data record.
- **Clear Welds?** – This option is used to reset the internal weld counter. The weld counter will be saved with each average sample stored in NV-RAM. It will be incremented when the wire feed is stopped and the run time exceeds the “Min Time” set by the user.
- **DEVICE ID=** - This parameter sets the Modbus address ID number for the WIRETRAK. This address is used to identify the Device when using the Modbus® serial communications protocol. Each sensor connected to the Modbus® network must have a unique ID number assigned. (Value Range 1 to 247)
- **Clear Total?** – This Option is used to reset the accumulated wire feed active timer used when the log option is enabled. It will also clear the accumulated wire deposited. When set to “Yes” the timer will be reset to 00:00:00 and the accumulated weld deposited will be set to 0.00.
- **Metric Units?** – This parameter is used to select the units of measure for the wire speed rates. When set to “Yes” the units of measure is in Millimeters per second (MM/S). When set to no, the units of measure are Inch per minute (IPM).

- **0.8mm/ .030 Wire** – This option sets the wire diameter to 0.8 mm/.030.
- **0.9mm/ .035 Wire** – This option sets the wire diameter to 0.9 mm/.035.
- **1.2mm/ .045 Wire** – This option sets the wire diameter to 1.2 mm/.045.
- **1.3mm/ .052 Wire** – This option sets the wire diameter to 1.3 mm/.052.
- **1.6mm/ .062 Wire** – This option sets the wire diameter to 1.6 mm/.030.
- **Steel Density?** – This option sets the wire density for steel.
- **Aluminum?** – This option set the wire density for aluminum.
- **User Density?** – This option set the wire density to the user defined value.
- **User Density = #.###** - This is the user defined material density value used to calculate the deposition rate when enabled. The units of measure are in lbs./inch³ (g/cm³)
- **Enable Testing?** - Allows the user to enable or disable the Low limit testing. Setting this option to “No” will disable the alarm relay output. Setting this option to “Yes” will enable the alarm relay output. (Status Yes or No)
- **Enable Logging?** –This parameter is used to enable the totalize accumulators and it will enable the “**Deposited = ###.#**” and the “**Total Time = HR:MN:SS**” display. Where **###.#** is the total accumulated volume and **HR:MN:SS** is the total time of wire feed since the last user reset. When disabled the volume display will be inactive and the wire feed accumulator will be disabled.
- **Display Dep?** – This Option is used to enable the deposition rate to display on the screen. The deposition rate is calculated at the end of the weld cycle using the weld time, average wire speed and the wire density selected.
- **Display Total?** – This option is used to enable the totalized time and volume to be displayed on the screen at the end of the weld cycle.

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 average data storage. The Run time data will be generated based on the averaging sample filter time constant specified by the user. The Wire feed conversion time will be based on the actual wire feed rate (17 Hz – 17.6 KHz).

Configuration of the filter parameters will be possible through the MODBUS network port. The user may specify the filter time constant to be used to generate the averaged value before saving the data point in memory for later play back. The WIRETRAK 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 650 weld summaries may be stored before downloading. The WIRETRAK provides continuous filtered averaging of the 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.

The WIRETRAK also provides two solid state relay outputs CR1 and CR2. CR1 is a sensor ready output that will be active when the sensor is active. CR2 will be set whenever the wire speed exceeds the Min Value set by the user. The relay are isolated and are dry contacts. They can switch up to 48 VDC @ 0.25 amps.

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 rate is supported 19.2K no parity and one stop bit. The following is the general specification for the RS-485 port:

Serial	
Physical support	Twisted Pair
Connector	M12 8 pin circular
Network	RS 485 – Half Duplex
Data exchange protocol	MODBUS RTU 19.2Kbaud no Parity and one stop bit

The RS-485 is a M12 type connector and will provide the RS-485 connections and the power to operate the sensor. The Host controller will provide the necessary power to operate the sensor. The sensor power can 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 connection for the two Isolated Solid State relays are brought out in this cable. These are dry SSR contacts and are capable of switching any 48 VDC @ 0.25 amp max load. The sensor I/O connector will Pin out as follows:

Pin	Function
1	(WHT) Net_High RS-485 Signal High (NET+)
2	(BRN) Sensor Power +(12 – 36 VDC)
3	(GRN) CR1-A Ready SSR1 Dry Output contact
4	(YEL) CR1-B Ready SSR1 Dry Output contact
5	(GRY) Sensor (12 – 24 vdc) Common (NET COM)
6	(PNK) CR2-a SSR2 Dry output contact
7	(BLU) Net_Low RS-485 Signal Low (NET-)
8	(RED) CR2-B SSR2 Dry output contact

4.0 WIRETRAK MODBUS MEMORY MAP

4.1 General Description

This document provides the basic MODBUS memory map and command structure for the WIRETRAK RS-485 communications port. The WIRETRAK supports the MODBUS Protocol as specified in the Modicon Technical publications “MODBUS Protocol” ([intr7.html](#)). The WIRETRAK 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 MODBUS 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 WIRETRAK 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	Min wire speed value. When testing is enable the running wire speed is compared to this value if the running value is less than the min then the CR2 SSR will be active
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	None filtered run time wire speed value (REG 21 = 0 when 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 WIRETRAK 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 WIRETRAK support both single and group force coil commands. Refer to Section 4.3 for summary of the Coil functions.

To clear the WIRETRAK weld and average counters or reset the total arc timer, force the specific coil to the “ON” condition. The WIRETRAK 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 WIRETRAK 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 WIRETRAK 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 than the total number of saved welds as indicated by Register 15.
2. Set Coil 7 to the "ON" condition. The WIRETRAK 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 WIRETRAK 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 5-10: 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 Binary Coded Decimal format.

Register 11–13: 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 14: The current weld count since the last weld count reset. This counter is incremented when the total arc time for a weld is greater than 0.5 seconds. This prevents false arc starts from being counted as a valid weld.

Register 15: Indicates the number of weld summaries stored in the weld memory. The maximum number of welds stored is 650. 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 16: 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 17: 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 650.

Register 18 – Minimum time for a valid weld. When the wire speed stops the run time is compared to this value if the run time is greater than this value than the weld count is incremented. If the weld summary is enabled then the average date will be stored in the NV-RAM as a valid record.

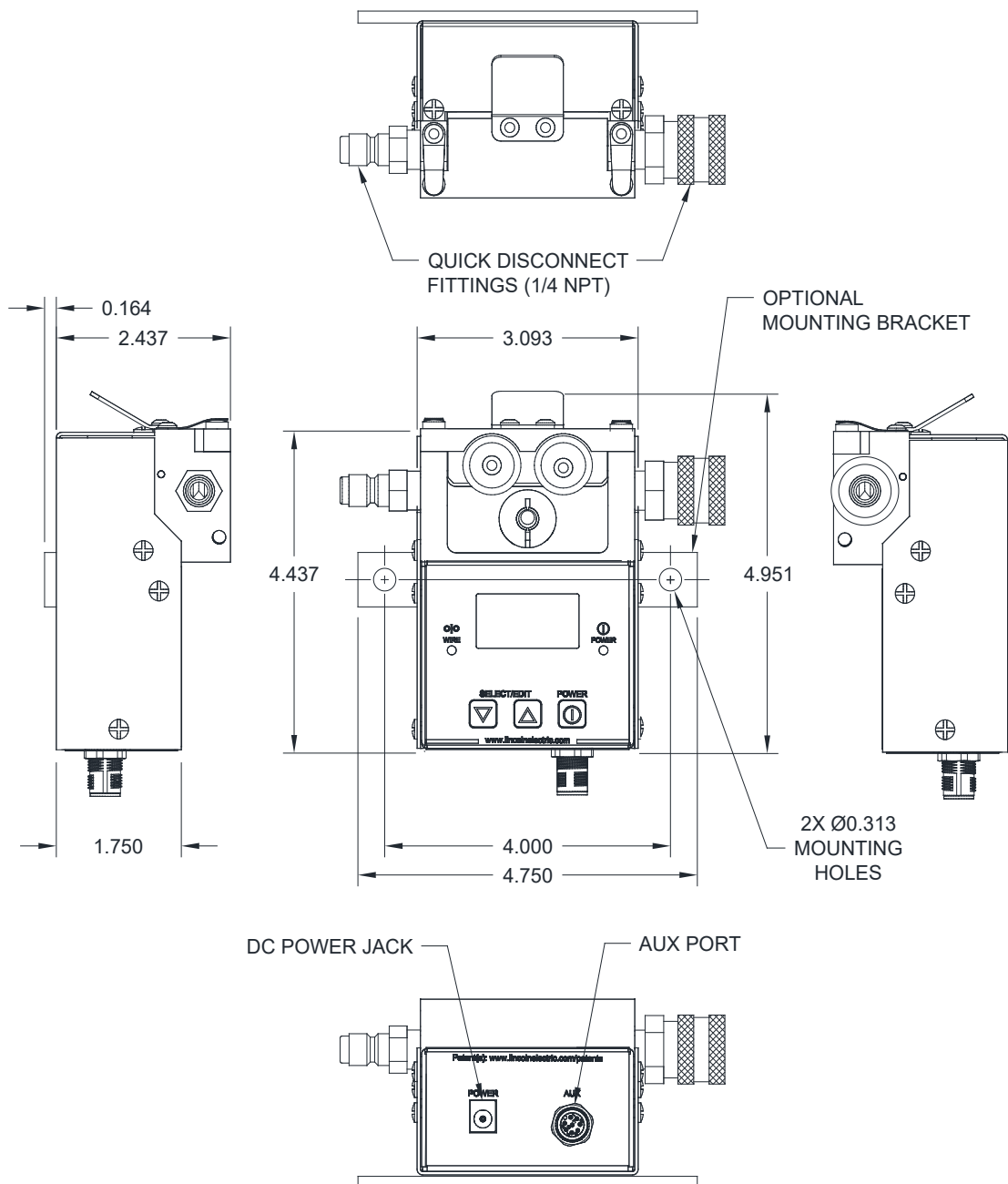
Register 19: This register is used to set the user defined density value. The value must be in Kgmm³ or Lbs/inch³.

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

Register 21: This register will display the run time wire speed value and will be reset to zero when the wire speed is idle. Same as REG 3 but will not display the last average value when the wire speed is idle.

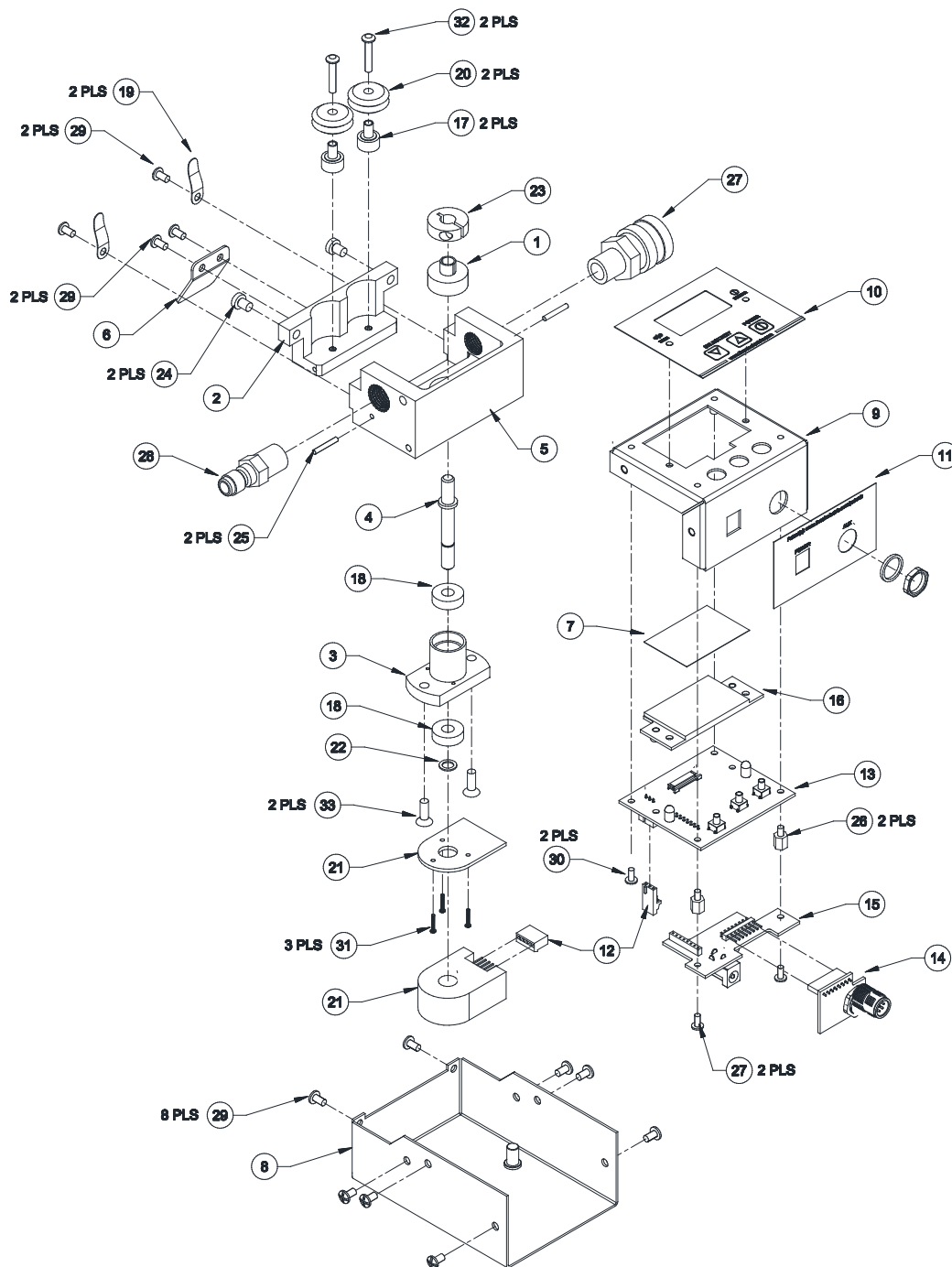
Appendix A WIRETRAK Installation Specifications

A.1 WIRETRAK Enclosure Dimensions



Appendix B Bills of Material

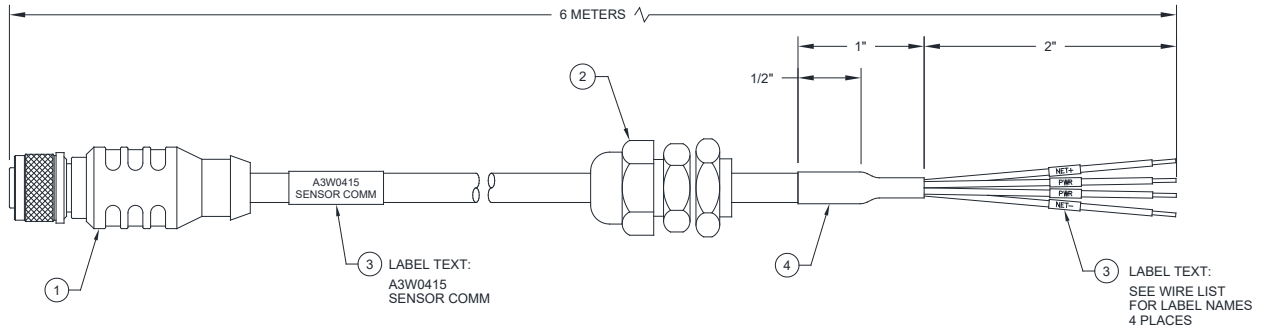
B-1 WIRETRAK Enclosure Assembly P/N: A3A0313



PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	A2A0014	Driven Wheel
2	1	A2M0203	Guide Block
3	1	A2M0204	Bearing Cartridge
4	1	A2M0205	WFS Shaft
5	1	A2M0206	Transducer Block
6	1	A3E0141	Guide Handle
7	1	A3e0179	Display Lens
8	1	A3E0224	Enclosure Base
9	1	A3E0225	Enclosure Cover
10	1	A3E0226	Front Overlay
11	1	A3E0227	Bottom Overlay
12	1	A3W0413	Encoder Wire Harness
13	1	A5A0192	CPU PCB Assembly
14	1	A5A0193	Conn PCB Assembly
15	1	A5A0194	Power PCB Assembly
16	1	A5A0195	Display PCB Assembly
17	2	X2B5002	Stationary Bushing #B-1 Dua-L-Vee
18	2	X2B5070	1/4" ID 5/8" OD Shielded Ball Bearing
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	1	X6B5025	Retaining Ring, 1/4" External #5100-25 Thruarc
23	1	X6B5054	Shaft Collar #DSCA-5 Small Parts
24	2	X6B5055	Locator Button #CL-1-SLB Carr Lane
25	2	X6P5007	Dowel Pin, 0.093" diameter 3/4" long #D2-6 Berg
26	2	X6S5081	M3 x 0.5 x 7 mm Long Male-Female Spacer
27	1	X6F5090	Fitting, Quick Disconnect #BST-2M Parker
28	1	X6F5102	Fitting, Nipple #BST-N2M Parker
29	12		#6-32 x 5/16" Long Pan Head Screw w/ Internal Lock Washer
30	2		M3 x 0.5 x 6 mm Long Pan Head Screw
31	3		#0-80 x 3/8" Long Philips Pan Head Screw
32	2		#6-32 x 3/4" Long Socket Button Head Screw
33	2		#8-32 x 1/2" Long Socket Flat Head Screw

B-2 8 Pin Communications Cable P/N: A3W0415



WIRE LIST

WIRE COLOR	FROM	REFERENCE	LABEL	NETHUB CONNECTION
WHITE	ITEM 1 PIN 1	NET+	NET+	YES
BROWN	ITEM 1 PIN 2	+24 VDC	PWR	YES
GREEN	ITEM 1 PIN 3	CR1-A		NO
YELLOW	ITEM 1 PIN 4	CR1-B		NO
GRAY	ITEM 1 PIN 5	COM	COM	YES
PINK	ITEM 1 PIN 6	CR2-A		NO
BLUE	ITEM 1 PIN 7	NET-	NET-	YES
RED	ITEM 1 PIN 8	CR2-B		NO
SHIELD	CONN RING	EARTH		NO

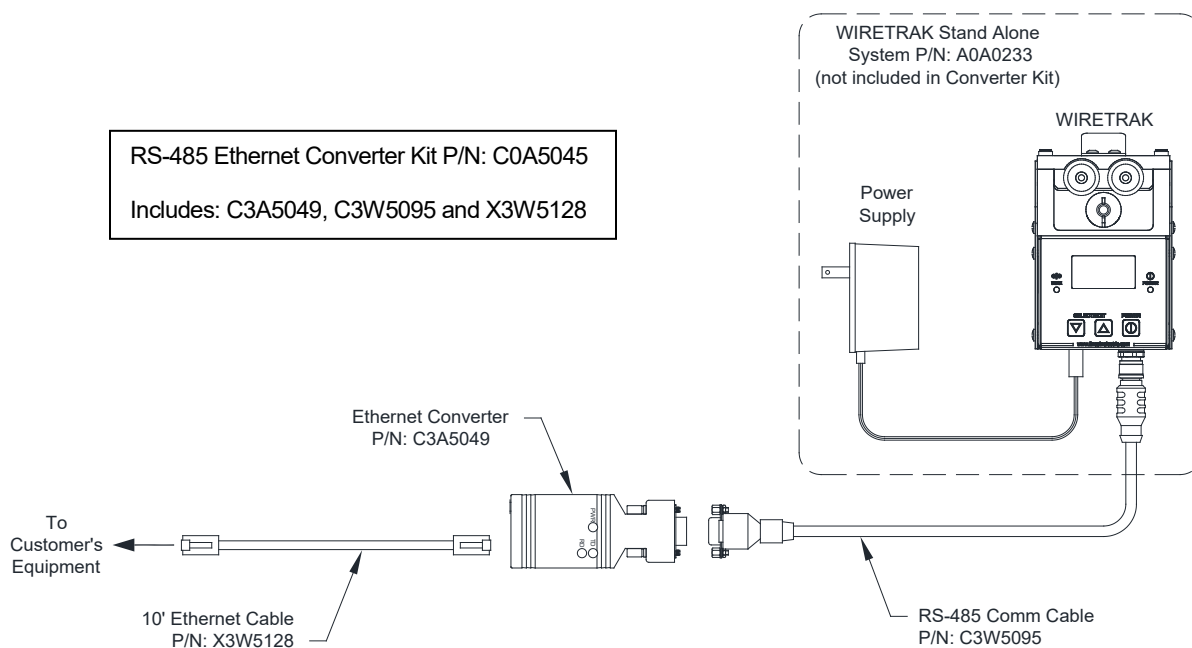
** Only the White, Brown, Gray and Blue Wires are used. All other wires will be terminated where the outer cable casing is cut.

PARTS LIST

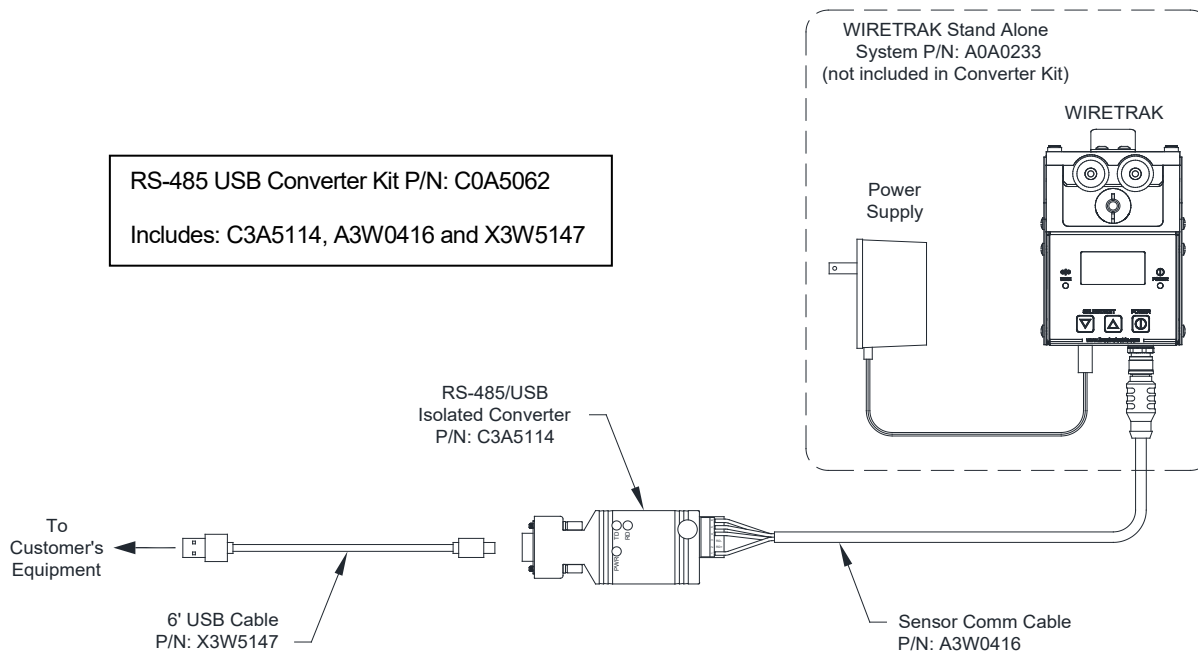
ITEM	QTY	PART NUMBER	REFERENCE
1	1	X3W5118	Cable, 8 Circuit Female Single Ended
2	1	X3Z5088	Relief, Strain
3	1		Sleeve, Wire Heat Shrink
4	4		Sleeve, Wire Heat Shrink
5	1		Tubing, Heat Shrink 3/8" Diameter x 1" Long

Appendix C Communication Diagrams

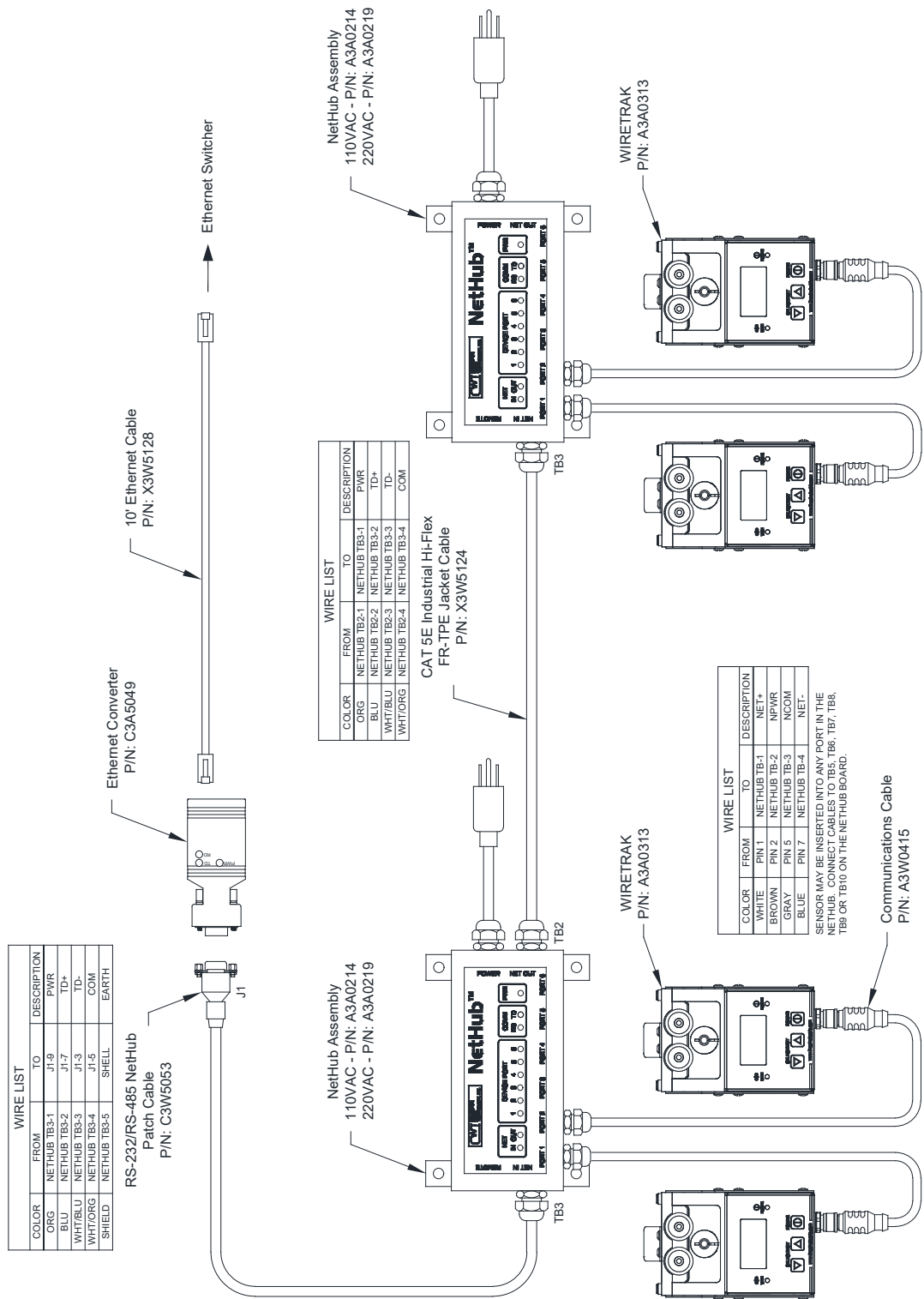
C-1 Single Wiretrak with Ethernet Communication



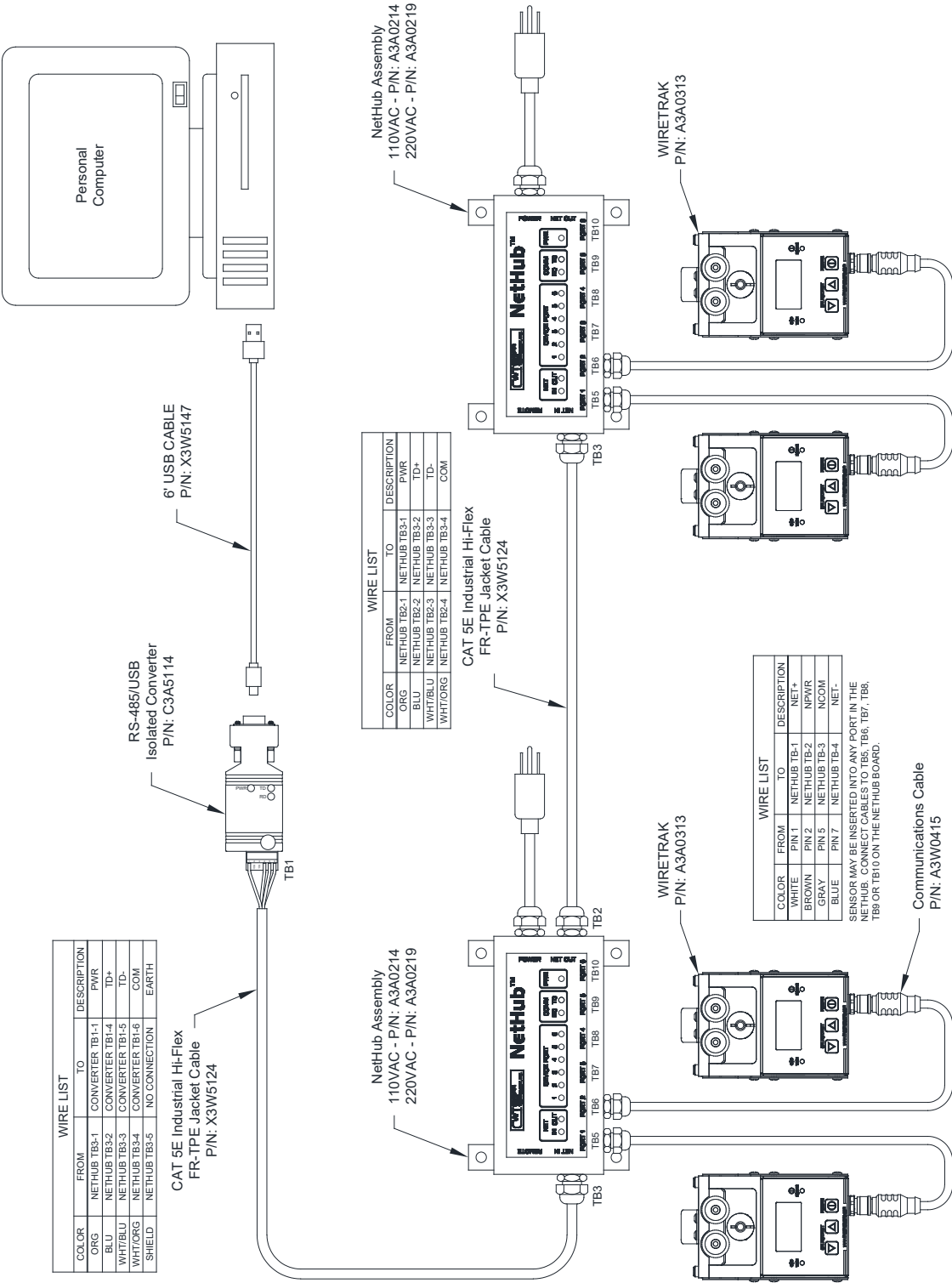
C-2 Single Wiretrak with USB Communication

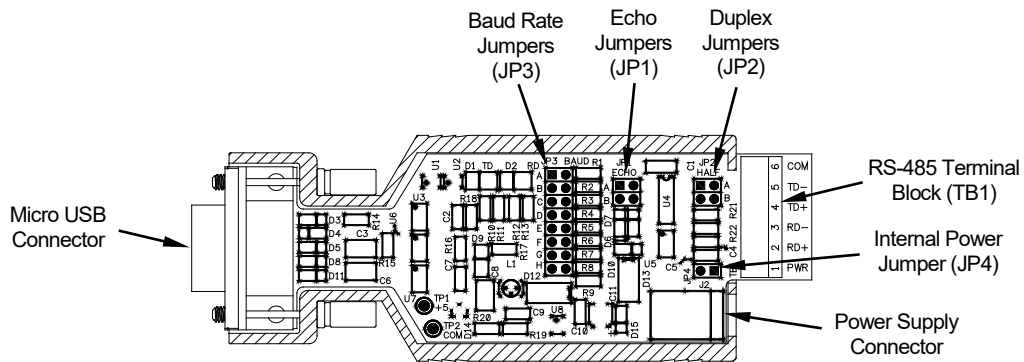


C-3 Multiple Units with Ethernet Communications



C-4 Multiple Units with USB Communications





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

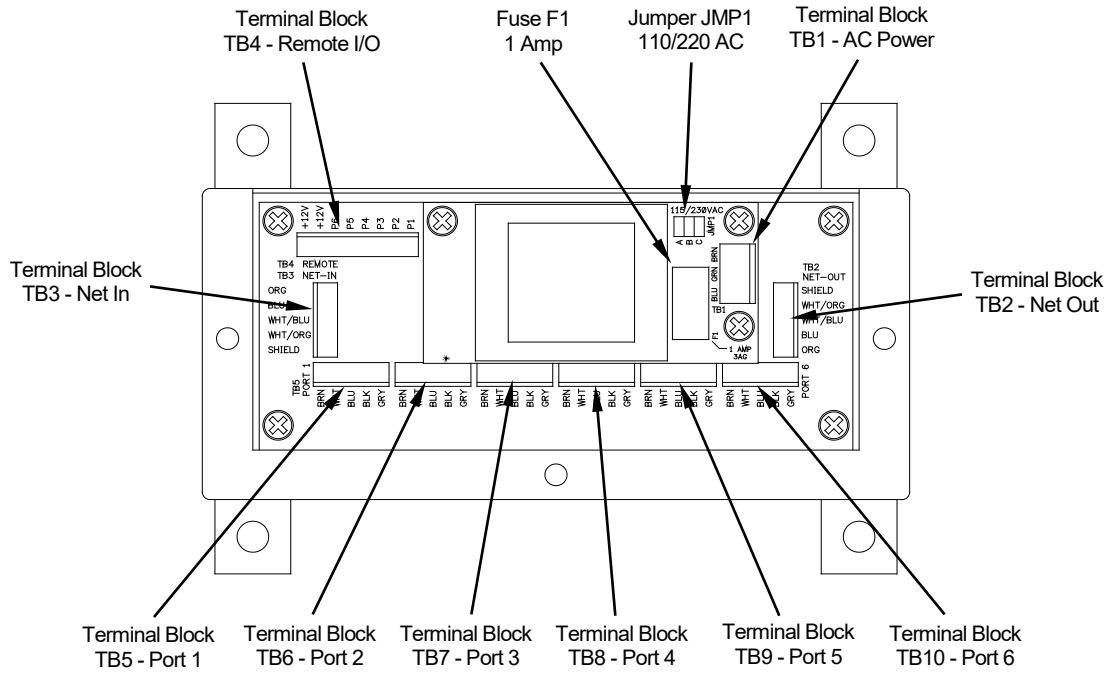
** Denotes the default jumper

POWER JUMPERS (JP4)	
POWER	JUMPER
External**	Yes
Internal	No

** Denotes the default jumper

RS-485/USB CONVERTER JUMPER LOCATION DIAGRAM

C-5 NetHub Wiring 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.

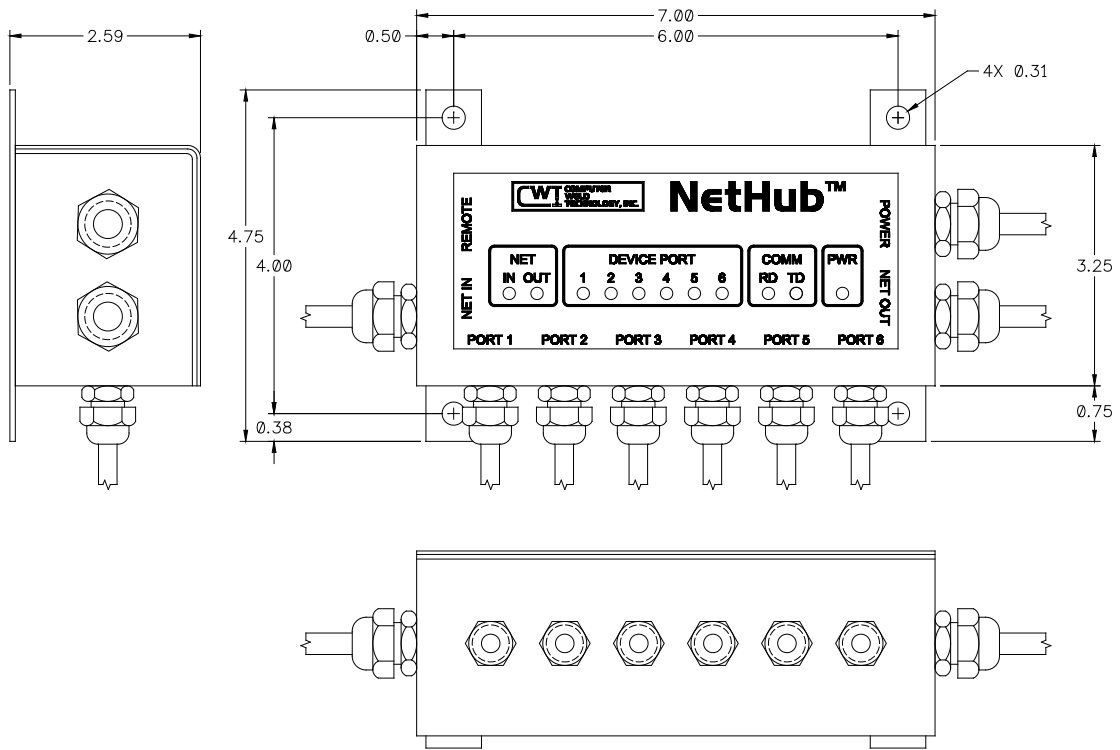
TERMINAL BLOCK TB4 - REMOTE		
PIN	REFERENCE	WIRE COLOR
1	RMT P1	WHT
2	RMT P2	BRN
3	RMT P3	GRN
4	RMT P4	YEL
5	RMT P5	GRY
6	RMT P6	PNK
7	+12 VDC	BLU
8	+12VDC	RED

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.

C-6 NetHub Mounting Dimensions



Appendix D 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			

WARNING	<ul style="list-style-type: none"> Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground. 	<ul style="list-style-type: none"> Keep flammable materials away. 	<ul style="list-style-type: none"> Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> No toque las partes o los electrodos bajo carga con la piel o ropa mojada. Aíslese del trabajo y de la tierra. 	<ul style="list-style-type: none"> Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. Isolez-vous du travail et de la terre. 	<ul style="list-style-type: none"> Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> Não toque partes elétricas e electrodos com a pele ou roupa molhada. Isole-se da peça e terra. 	<ul style="list-style-type: none"> Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> Use proteção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 施工物やアースから身体が絶縁されている様にして下さい。 	<ul style="list-style-type: none"> 燃えやすいものの側での溶接作業は絶対にしてはなりません。 	<ul style="list-style-type: none"> 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> 皮肤或湿衣物切勿接触带电部件及焊条。 使你自己与地面和工件绝缘。 	<ul style="list-style-type: none"> 把一切易燃物品移离工作场所。 	<ul style="list-style-type: none"> 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> 인화성 물질을 접근시키지 마십시오. 	<ul style="list-style-type: none"> 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسد الجسم أو بالملابس المبللة بالماء. ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。 	<ul style="list-style-type: none"> ● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切して下さい。 	<ul style="list-style-type: none"> ● パネルやカバーを取り外したまま機械操作をしないで下さい。 	Japanese 注意事項
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 儀表板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 판넬이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● اقطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه. 	Arabic تحذير

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

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