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Installation and Operating Instructions

Wireless Interface

560 5715-X-DRX

Two-way (multipoint-to-point)
Monitoring and Control with
Expandable I/O Options

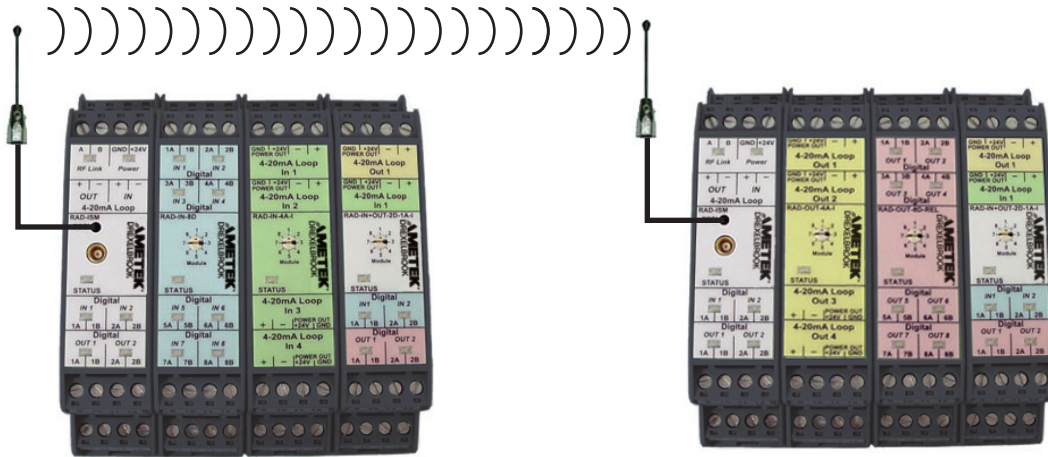
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Wireless Interface 560 5715-X-DRX

Two-way (multipoint-to-point) Monitoring and Control with Expandable I/O Options



These devices must be wired in accordance with Class I, Div. 2 wiring methods as described in the National Electrical Code, Article 501-4(b) or the authority having jurisdiction.

Transmitter unit is to be used with a purely resistive antenna when installed in Class I, Div. 2 areas.

AMETEK[®]
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An ISO 9001 Certified Company

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Section 1

Section 1: Introduction

- Modular DIN-rail mount transceiver and I/O
- No programming required
- Maximum thirty-three (33) analog or sixty-six (66) digital signals in one direction
- Class I, Div. 2 approved
- Dry contact RF LINK diagnostics output
- Up to eight (8) expandable I/O modules (passive / active inputs and outputs) per master transceiver or eight (8) slave transceivers on common power and communications bus with multiple combinations

The Drexelbrook 5605715-X-DRX is an integrated radio and I/O module designed for bidirectional interfacing of a 4-20mA current loop and two discrete signals in harsh industrial environments. This unique design also allows the user the flexibility to add on multiple channels of I/O to the transceivers in combinations. The Frequency Hopping Spread Spectrum (FHSS) utilizes the 902-928 MHz ISM band to guarantee a license free, interference free link between remote devices and the control room. The design is ideal for moving numerous signals within high interference environments without costly cable and conduit runs.



WARNING: EXPLOSION HAZARD

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



FCC Rules and Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference
- 2 this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Drexelbrook will void the user's authority to operate the equipment.

This product is intended for fixed installation applications. In order to comply with FCC / ISC adopted RF exposure requirements, installation of this transmitter system's antenna must be performed in a manner that will provide at least a six-foot (2 m) clearance from the front radiating aperture to any user or member of the public.

FCC Part 15.247

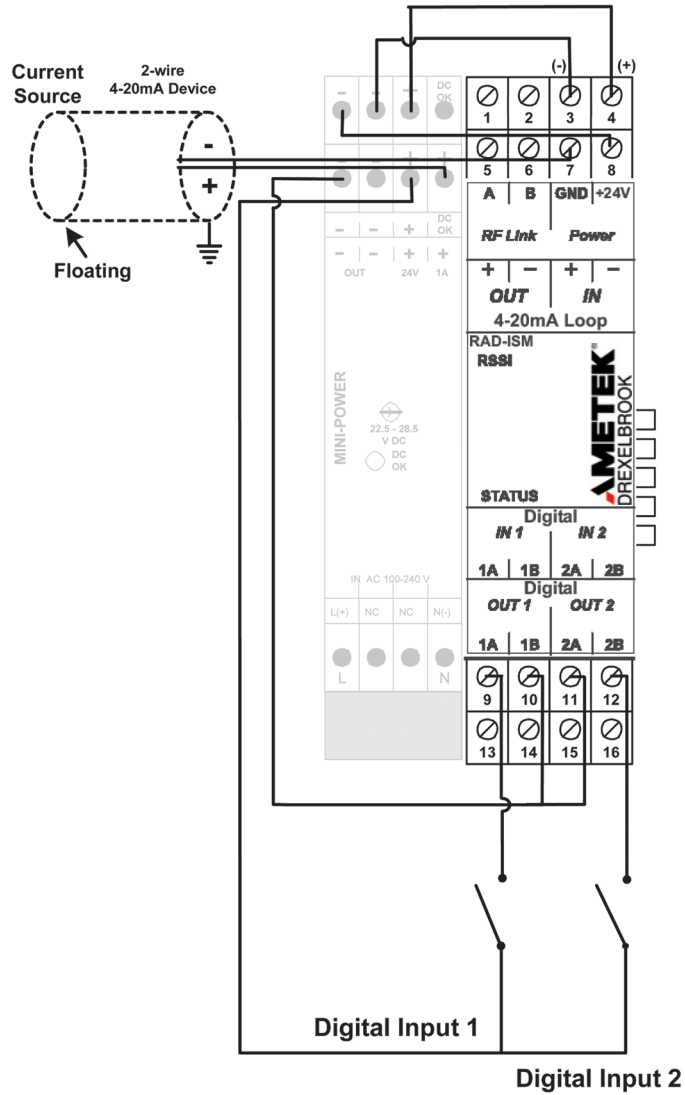
ISC RSS 210

UL Class I, Div. 2 (Groups A, B, C, D)

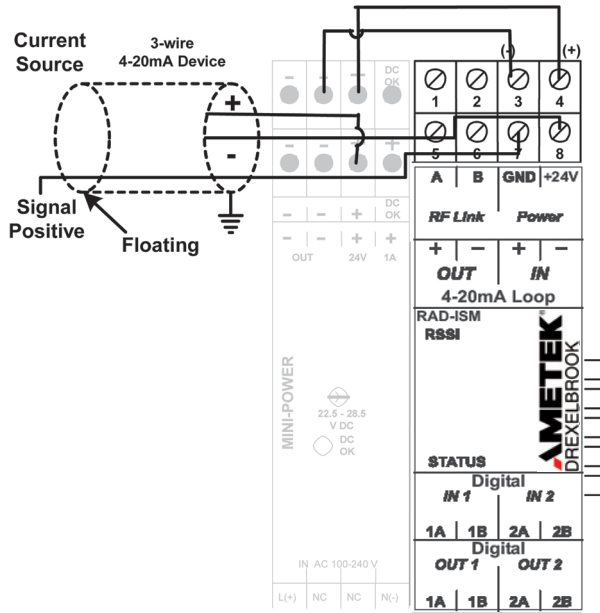
Section 2: Input / Output

2.1 Analog and Digital Inputs

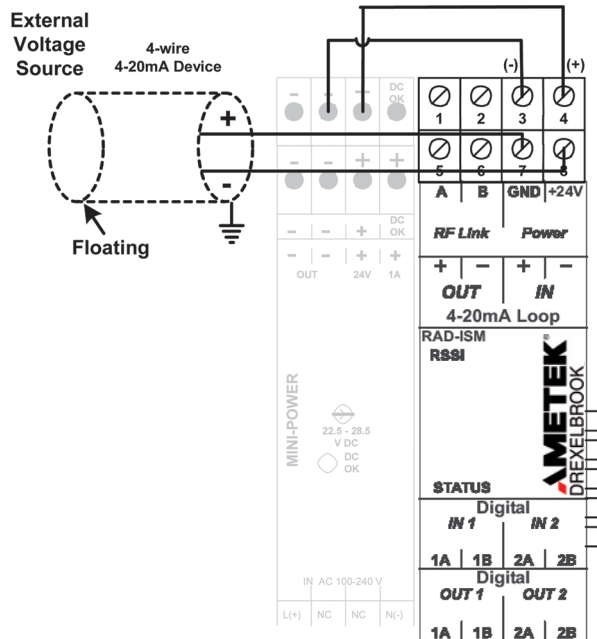
2.1.1 5605715-X-DRX , Two-Wire Device 4-20mA Current Loop



2.1.2 5605715-X-DRX, Three-Wire Device 4-20mA Current Loop

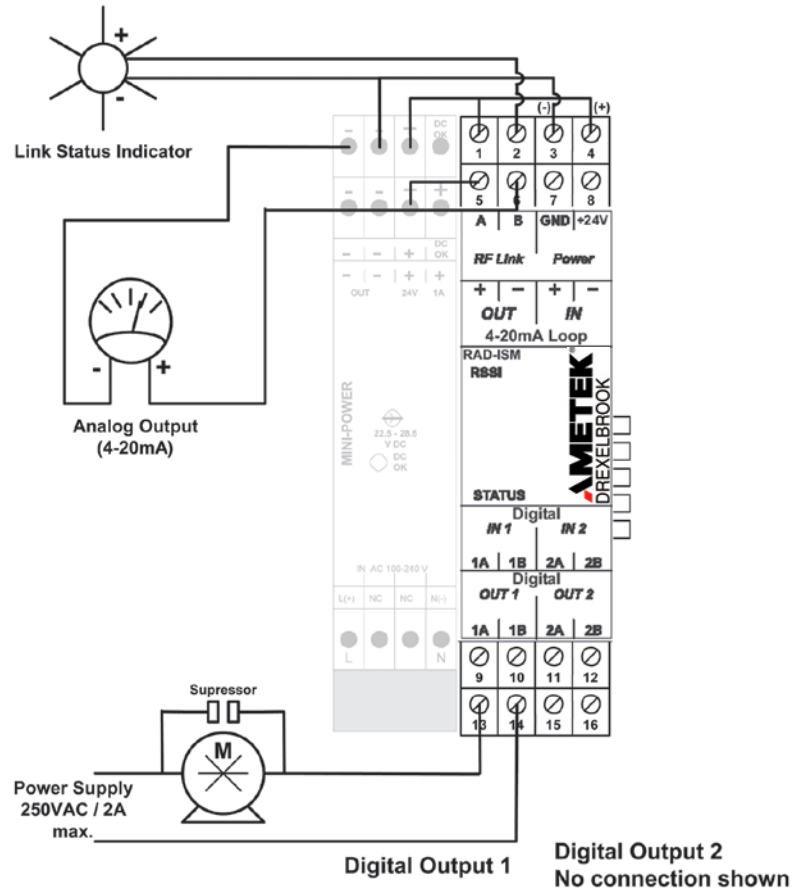


2.1.3 5605715-X-DRX, Four-Wire Device 4-20mA Current Loop



2.2 Analog and Digital Output

2.2.1 5605715-X-DRX Output Examples



2.3 RF Link and Choosing Output States

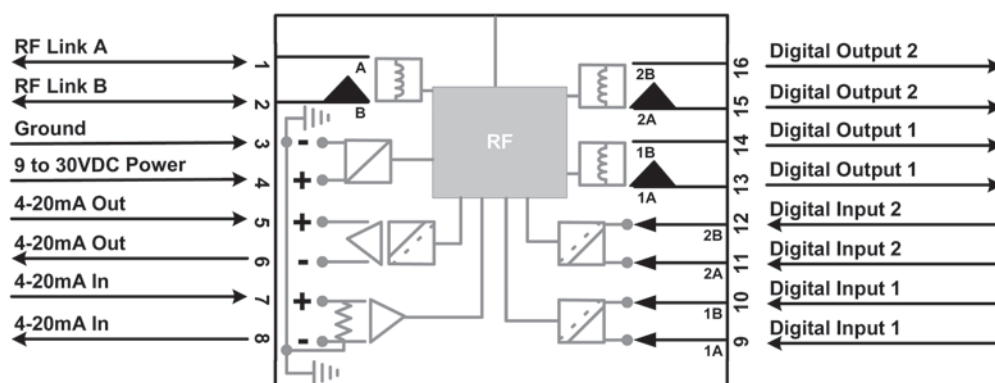
RF Link Output

The Link Status contact on the 5605715-X-DRX is Normally Open (NO) and closes when the radio establishes an RF Link. It can be used to switch either a STATUS light or a FAULT indicator.

Selecting State of Outputs Upon Loss of RF Link

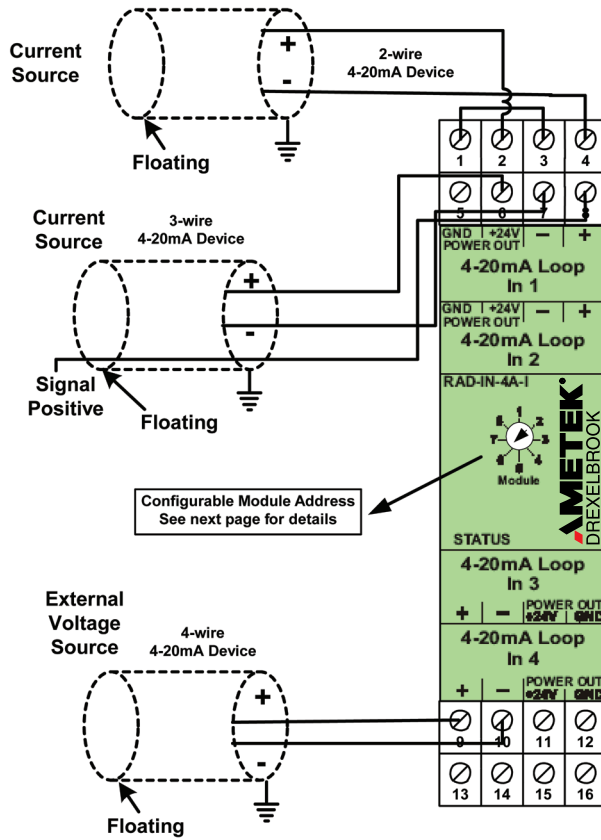
The default state upon loss of RF signal for the analog and digital outputs is MAINTAIN LAST STATE. They may be wired in series with the RF Link contact to provide a FAULT OFF when RF Link is terminated. 5605715-X-DRX Transceiver RF Link

2.4 5605715-X-DRX - Block Diagram



2.5 Passive Input and Output Expansion Modules

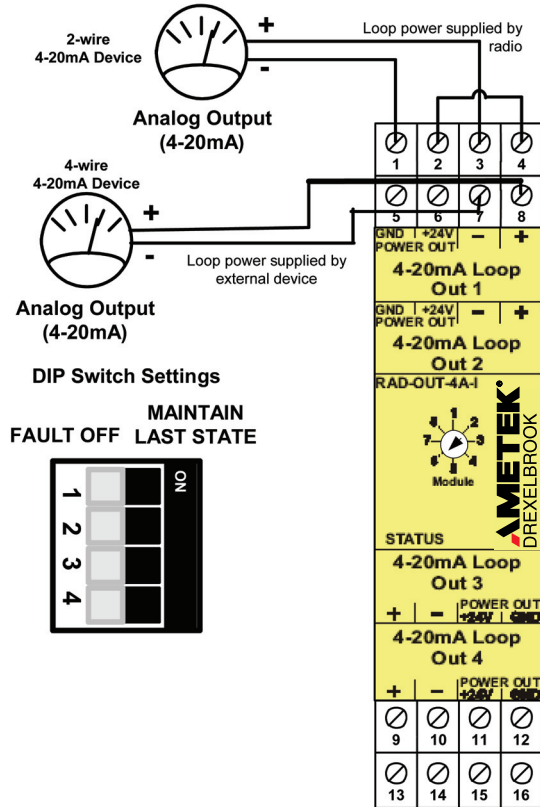
2.5.1 2867115-X-DRX, Passive Analog Input



Analog input channel 4 connection not shown

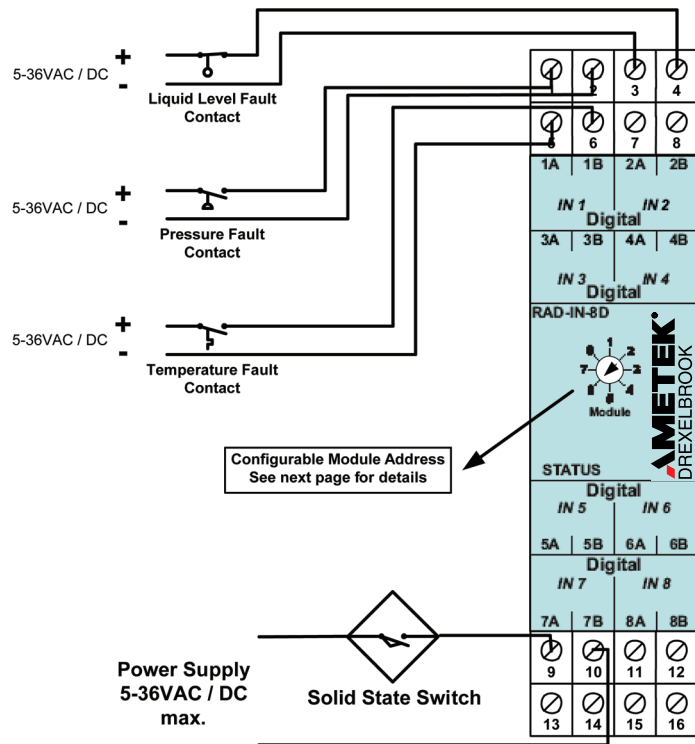
2.5.2 2867128-DRX, Passive Analog Output

By releasing the top part of the housing, the user may access DIP switches that allow selection between FAULT OFF or MAINTAIN LAST STATE for each of the four (4) analog outputs of the 2867128-DRX.



Analog Output channels 3 and 4 connections not shown

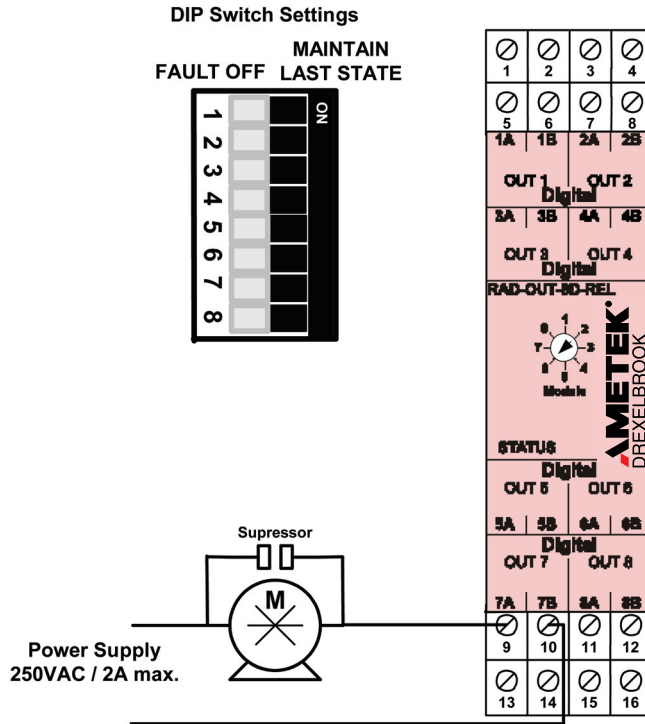
2.5.3 2867144-DRX, Passive Digital Input



Digital input channels 4,6,7 and 8 connections not shown

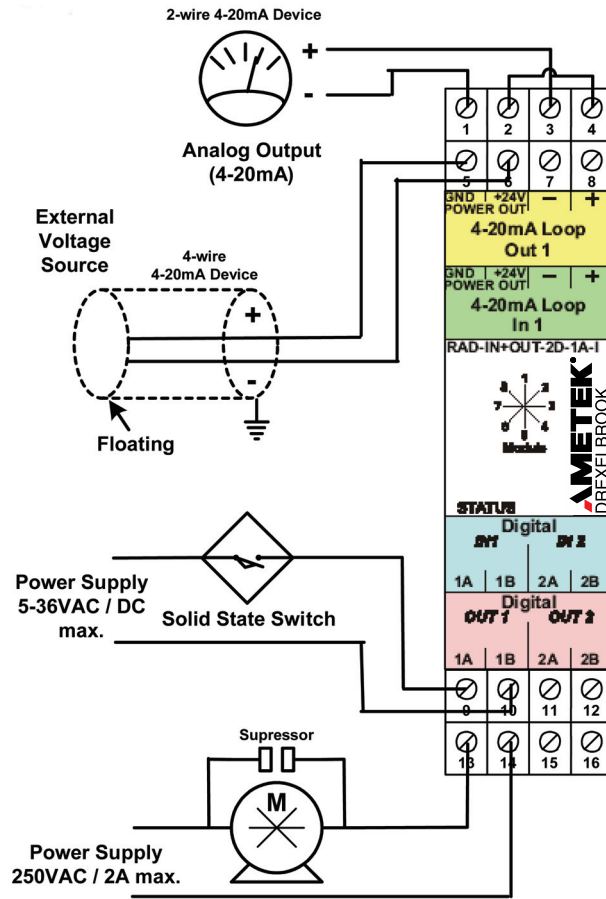
2.5.4 2867157-DRX, Passive Digital Output

By releasing the top part of the housing, the user may access DIP switches that allow selection between FAULT OFF or MAINTAIN LAST STATE for each of the eight (8) digital outputs of the 2867157-DRX.



Digital output channels 1, 2, 3, 4, 6, 7, and 8 connections not shown

2.6 Digital / Analog Input/Output - 2867322-DRX

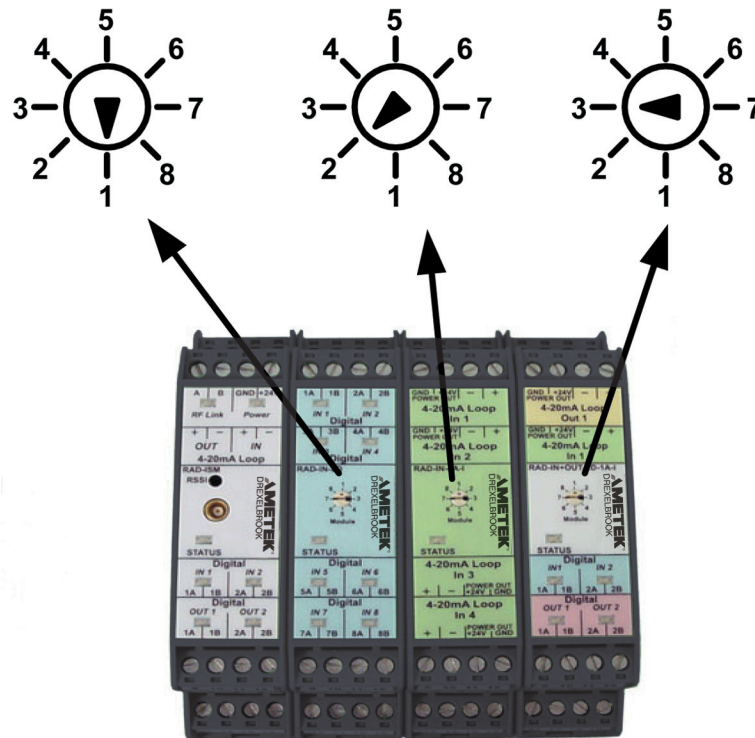


Section 3: Configuring I/O Module Addresses

Each pair of I/O modules, such as the 2867115-DRX and the 2867128-DRX, must share a unique module address. Once a module address has been assigned to a pair of I/O modules, that module address may not be used on any other pair of I/O modules on the same radio pair. Available addresses are numbers 1 through 8. If module addresses conflict, or are improperly set within a connected group, an indication will be given by the STATUS LED (see section below).

The 5605715-X-DRX Transceivers are designed to operate as groups and are factory programmed. Manual address configuration is not required for the transceiver units.

Module Addresses Selection Switches



Section 4: Power Budget Requirements - 5605715-X-DRX

The following table may be used as a reference when determining your power supply requirements. Total power requirements are shown per module, per side of the system. For example, the transmitter side may have one (1) transceiver, one (1) 2867115-DRX expansion module and one (1) 2867144-DRX expansion module. The total power requirement for this side of the system would be 213mA [75mA +26mA +32mA +(4x 20mA)].

The matching receiver side would have one (1) transceiver, one (1) 2867128-DRX expansion module and one (1) 2867157-DRX expansion module. The total power requirement for this side of the system would be 287mA [75mA +100mA +32mA + (4 x 20mA)].

(Assuming internal bus power is used for analog I/O****)

Table 1: 5605715-X-DRX Rail Builder Power Budget Worksheet*

	Quantity X Power Requirement (in mA)= Total Power Consumption (in mA)		
Transceiver**	1	75 ***	75
Digital Input Expansion Module	8 max	26	208
Digital Output Expansion Module	8 max	100	800
Analog Input Expansion Module	8 max	32	256
Analog Output Expansion Module	8 max	32	256
Analog I/O Using Internal Power *****	8 max	20	660
Total Power Supply Requirement (Sum of all devices used)			

* These currents are 24VDC.

** Allow for 200mA peak on the transceiver

*** 75mA (average), 200mA (peak)

**** If you are using internal power for the analog 4-20mA current loops, then you will need to add 20mA for each input and output being used in this fashion.

Section 5: Status LEDs - 5605715-X-DRX

Power LED Indicates presence of power to the device. It is ON when power is present and OFF when there is no power.

Status LED

When flashing rapidly, it indicates an internal error or a module type mismatch. A module type mismatch occurs when the module address selection for two different modules (i.e. one (1) digital module and one (1) analog module are set to the same address or two (2) pairs of modules are sharing the same address).

RF LED

- Flashes once every two seconds when there is no RF Link..
- Flashes rapidly when signal strength is marginal ((see RSSI graph below).
- ON steady indicates an exceptionally strong RF Link..
- Most systems will flash occasionally indicating the presence of intermittent interference in the area.

Digital

OFF means that the digital input or output is Open.

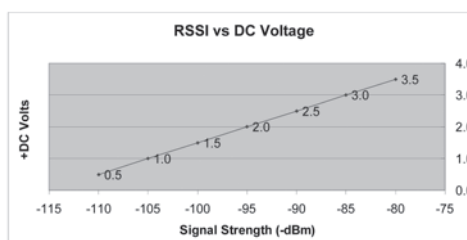
Input / Output

ON means that the digital input or output is Closed.

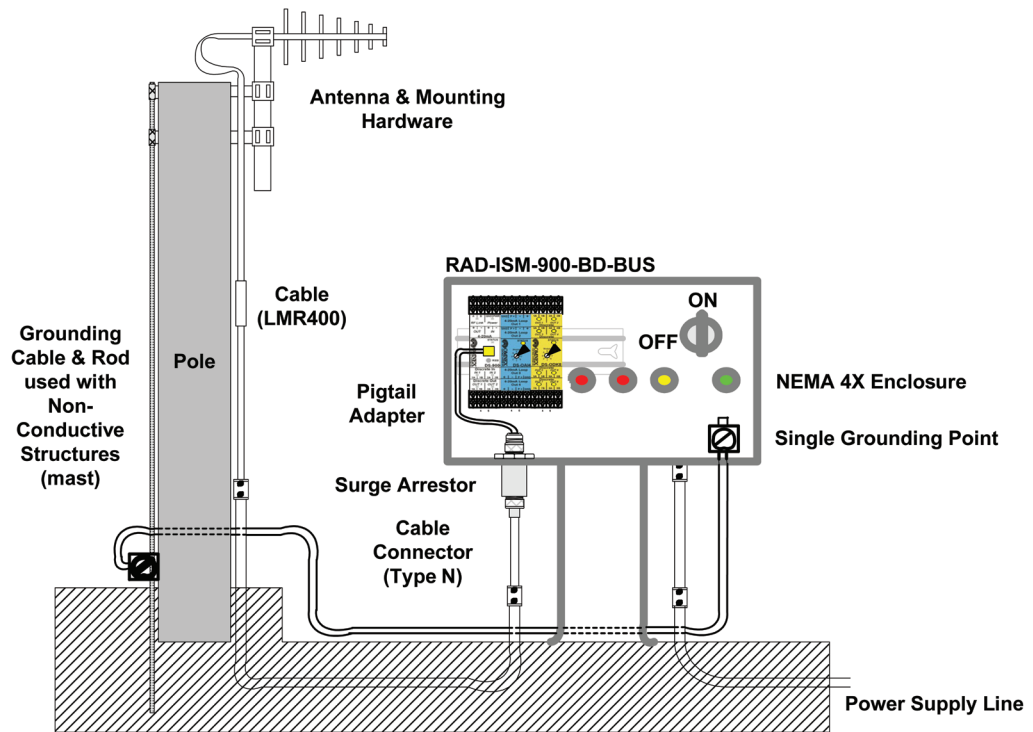
Section 6: RSSI Troubleshooting - 5605715-X-DRX

RSSI (Received Signal Strength Indicator) is measured using a DC Voltmeter between the test point and power supply ground. The test point is accessed by inserting a positive meter probe into the RSSI hole on the face of the 5605715-X-DRX and the negative meter probe to the Ground terminal.

The RSSI graph below may be used to test the Receive Signal Strength of the 5605715-X-DRX. The ideal voltage that should be read from the RSSI test point is 2.5VDC or more. This represents a 90 dB signal loss and typically indicates that the radio has 20 dB fade margin left until loss of link. It is recommended that the radios be set up with no less than 20 dB margin.



Section 7: Typical Components for a Remote Site - 5605715-X-



Section 8: Ordering Information - 5605715-X-DRX

Part Description	Part No.
RAD-ISM-900-SET-XD-BUS (master and slave transceiver -indicate number of slaves [1-8] on part number when ordering)	56 05 71 5 (1-8) - DRX
RAD-IN-4A-I (4-channel analog input module)	28 67 11 5 - DRX
RAD-OUT-4A-I (4-channel isolated analog output module)	28 67 12 8 - DRX
RAD-IN-8D (8-channel digital input module)	28 67 14 4 - DRX
RAD-OUT-8D-REL (8-channel digital output with relays)	28 67 15 7 - DRX
RAD-IN+OUT-2D-1A-I (2 digital /1 analog input / output module)	28 67 32 2 - DRX
RAD-ISM-900-ANT-4 (4-way splitter to cascade receivers in simplex mode)	28 67 05 0 - DRX

Accessories

Item	Part Description	Part No.
Antennas	RAD-ISM-900-ANT-OMNI-0-6 (¼ wave Omni antenna with 6 feet of cable &MCX (M) connector)	28 67 16 0 - DRX
	RAD-ISM-900-ANT-OMNI-5 (5 dB Omni base station, Larsen FB35 T900, full ground plain with type N (F) connector)	28 67 19 9 - DRX
	RAD-ISM-900-ANT-YAGI-6 (6 dB Yagi, Larsen 3 element with type N (F) connector)	28 67 20 9 - DRX
Cables	RAD-CAB-RG213-50 (RG2130 -50 feet with type N (M) connectors) - cable loss =7.6 dB / 100 feet	28 67 22 5 - DRX
	RAD-CAB-LMR400-100 (LMR400 -100 feet with EZ400 NMH type N (M) connectors) - cable loss = 3.9 db / 100 feet	28 67 23 8 - DRX
	RAD-CAB-RG58-10 (RG58 -10 feet with type N (M) connectors) - cable loss =16 dB / 100 feet	28 67 36 4 - DRX
Adapters	RAD-CON -N-BNC-BS (N (F) to BNC (F) adapter)	28 67 24 1 - DRX
	RAD-CON-MCX-N-SS (MCX (M) to N (M) fitting with 48 " of RG316 cable)	26 27 25 4 - DRX
	RAD-CON-MCX-BNC-SB (MCX (M) to BNC (F) with 24 " of RG174AU cable)	28 67 26 7 - DRX
	RAD-CON-SMA-N-SS (SMA (M) to N (M) with 48 " of RG316 cable)	28 67 40 3 - DRX
	RAD-CON-SMA-BNC-SB (SMA (M) to BNC (F) with 2' of RG174 cable)	28 67 72 0 - DRX
Surge Arrestor	CN-UB-280DC-BB (bulkhead mount COAXTRAB)	56 03 85 9 - DRX

Other types and variations of accessories are available. Please contact your local Representative or AMETEK Drexelbrook for more information.

Section 9: Specifications

9.1 5605715-X-DRX - Specifications

General	
Range	600 to 1,000 feet (180 to 305 m) in-plant (obstructed); 4-5 miles (6-8 km) LOS with Omni antenna; 20+miles (32+km) LOS with Yagi antenna
Inputs	One (1) 4-20mA analog input (16-bit, 125 ohms impedance) Two (2) digital inputs (5-30VDC)
Outputs	One (1) 4-20mA analog input (16-bit, short-circuit protected) Two (2) digital inputs (dry contact, NO, contact rating: 250VAC / 2 A)
I/O Expansion Capacity	Four (4) analog and eight (8) digital I/O modules
Repeatability	Current loop: 0.02%
Accuracy	Current loop: 0.2% of full scale at 77° F (25° C)
Wiring Connections	12-24 AWG screw-type terminals; removable terminal blocks
Mounting	DIN-rail mount
Primary Power	
Input Voltage	9 to 30VDC
Reverse Polarity Protection	Yes
Surge Protection	Yes
Power Consumption	75mA (avg) / 200mA (peak) @ 24VDC during transmission (plus I/O modules)
Transceiver	
Frequency	902 to 928 MHz -ISM band
Transmit Power	1 Watt (30 dBm)
RX Sensitivity	-110 dBm
Unit ID	Factory configured (unique); 16-bit coding of each transceiver pair allows multiple units to be used in the same area
Antenna Connector	MCX female
Antenna Impedance	50 ohms
Diagnostics	
Indicators	External LEDs (power, RF link, I/O status) / RF link relay 250VAC / 2 A

9.1 5605715-X-DRX - Specifications (Continued)

Environmental	
Humidity	20% to 90% (non-condensing)
Temperature	Operating: -40 ° to ++158° F (-40 ° to ++70° C)
Size	4.5 " x 3.9 " x 0.9 " ((114 mm x 99 mm x 23 mm)
Weight	5.3oz (150g)
Enclosure	NEMA 1 (equivalent to IP20)
Agency Approvals	
FCC	Part 15.247
ISC	RSS 210
UL/C	Class I, Div. 2 (Groups A, B, C, D)

9.2 I/O Modules - Specifications

Digital Input Module -Low Volt (28 67 14 4 - DRX)	
Channels	Eight (8)
Input Voltage Range	5 to 30VAC/DC
Input Impedance	20 K ohms
Channel Isolation	Optical
Reverse Polarity Protection	Yes
Over-voltage Rating	100VAC/DC max.
Power Consumption	30mA max.
Digital Output Module -8-ch Relay (28 67 15 7 - DRX)	
Channels	Eight (8)
Output Terminals	Dry contact (NO)
Contact Ratings	250VAC /2 A
Channel Isolation	Full
Power Consumption	160mA max.
4-20mA Analog Input Module -4-ch (28 67 11 5 - DRX)	
Channels Four	(4)
Resolution	16-bit
Input Impedance	<170 ohms
Channel Isolation	None (power supply connections are common with transceivers)
Reverse Polarity Protection	Yes
Compatibility	2-wire, 3-wire, 4-wire devices
Over-voltage Rating	42VDC max.
Accuracy	0.2% of full scale
Repeatability	0.02% of full scale
Power Consumption	130mA max.
4-20mA Analog Output Module -4-ch ISOL (28 67 12 8 - DRX)	
Channels Four	(4)
Resolution	16-bit
Channel Isolation	Optical
Short-circuit Protection	Yes
Compatibility	2-wire, 3-wire, 4-wire devices
Accuracy	0.12% of full scale
Repeatability	0.02% of full scale
Power Consumption	130mA max.
Min. Loop Voltage Drop	10 V

9.2 I/O Modules - Specifications (Continued)

Input / Output Module (p/n 28 67 32 2 - DRX)	
Channels	One (1) analog input One (1) analog output Two (2) digital inputs Two (2) digital outputs
Channel Isolation	All (except for analog input channel)
Reverse Polarity Protection	Yes
Analog Channel Input Impedance	<170 ohms
Analog Channel Repeatability	0.02% of full scale
Analog Channel Resolution	16-bit
Analog Channel Accuracy	0.2% of full scale
Analog Channel Compatibility	2-wire, 3-wire, 4-wire devices
Analog Input Channel Over-voltage Rating	42VDC max,
Digital Input Channel Input Impedance	20 K ohms
Digital Input Channel Over-voltage Rating	100VAC/DC max.
Digital Input Channel Voltage	5 to 30VAC/DC
Digital Output Channel Contact Ratings	250VAC /2 A
Digital Output Channel Type	Dry contact (NO)
Power Consumption	120mA max.



Section 10: Factory Assistance

10.1 Telephone Assistance



If you have questions about your AMETEK Drexelbrook equipment:

- Contact your local Drexelbrook representative
- Call the Drexelbrook Service department toll-free at:
1-800-527-6297 (US and Canada) or
215-674-1234 (Outside North America)
- Fax the following information to the Service department at:
215-443-5117.

To expedite assistance, please provide the following information:

Instrument Model Number: _____

Original Purchase order number: _____

Material being measured: _____

Temperature: _____

Pressure: _____

Agitation: _____

Brief description of the problem: _____

Checkout procedures that have failed: _____

10.2 Field Service

Trained field service personnel are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application or equipment problems, or in-plant training of personnel. Preventive Maintenance and Calibration Certification service contracts are also available to maintain plant efficiency. Contact the Service department for further information.

10.3 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved and have a return number issued by the factory.

In many applications, the equipment is exposed to hazardous materials.

- OSHA mandates that our employees be informed and protected from hazardous materials.
- Material Safety Data Sheets (MSDS) listing the hazardous material that the system has been exposed to must accompany any return.
- It is your responsibility to fully disclose all chemicals and decontaminate the returned items.



To obtain a return authorization number (RA#), contact the Service department at:

1-800-527-6297 (US and Canada) or
215-674-1234 (Outside North America).

Please provide the following information:

Model Number of Returned Equipment: _____

Serial Number: _____

Original Purchase Order Number: _____

Process Material that the equipment has been exposed: _____

MSDS for any hazardous materials

Billing Address: _____

Shipping Address: _____

Purchase Order Number for Repairs: _____

Please include a purchase order number even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

Ship equipment freight prepaid to:

AMETEK Drexelbrook
205 Keith Valley Road
Horsham, PA 19044

COD shipments will not be accepted.

TERMS AND CONDITIONS OF SALE

GENERAL: ALL ORDERS ARE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS. ANY ACCEPTANCE OF ANY OFFER OF BUYER FOR ANY GOODS OR SERVICES IS CONDITIONED UPON THESE TERMS AND CONDITIONS, AND SELLER OBJECTS TO ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY BUYER IN ANY DOCUMENT, WHICH SHALL NOT BE BINDING UPON SELLER. No salesman or other party is authorized to bind the AMETEK DREXELBROOK Division of AMETEK, Inc. (hereinafter "Seller") by any agreement, warranty, statement, promise, or understanding not herein expressed, and no modifications shall be binding on Seller unless the same are in writing and signed by an executive officer of Seller or his or her duly authorized representative. Verbal orders shall not be executed until written notification has been received and acknowledged by Seller.

QUOTATIONS: Written quotations are valid for thirty (30) days unless otherwise stated. Verbal quotations expire the same day they are made.

PRICES: All prices and terms are subject to change without notice. Buyer-requested changes to its order ("Orders"), including those affecting the identity, scope and delivery of the goods or services, must be documented in writing and are subject to Seller's prior approval and adjustments in price, schedule and other affected terms and conditions. Orders requiring certified test data in excess of commercial requirements, are subject to a special charge.

ORDER ACCEPTANCE: All Orders are subject to final approval and acceptance by Seller at its office located at 205 Keith Valley Road, Horsham, Pennsylvania 19044.

TERMS OF PAYMENT: Seller's standard terms of payment for Buyers who qualify for credit are net thirty (30) days from date of invoice. All invoices must be paid in United States dollars.

CREDIT: Seller reserves the right at any time to revoke any credit extended to Buyer or otherwise modify terms of payment if Buyer fails to pay for any shipments when due or if in Seller's opinion there is a material adverse change in Buyer's financial condition. Seller may, at its option, cancel any accepted Order if Buyer fails to pay any invoices when due.

DELIVERY: Shipments are F.O.B place of manufacture ("Shipping Point") and the Buyer shall pay all freight, transportation, shipping, duties, fees, handling, insurance, storage, demurrage, or similar charges from Shipping Point. Delivery of goods to common carrier shall constitute delivery and passing of title to the Buyer, and all risk of loss or damage in transit shall be borne by Buyer. Any claims or losses for damage or destruction after such delivery shall be the responsibility of Buyer.

Seller reserves the right to make delivery in installments which shall be separately invoiced and paid for when due, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept remaining deliveries.

Acknowledged shipping dates are approximate only and based on prompt receipt of all necessary information from Buyer and Buyer's compliance with terms of payment.

TAXES: All sales, excise and similar taxes which Seller may be required to pay or collect with respect to the goods and/or services covered by any Order, shall be for the account of the Buyer except as otherwise provided by law or unless specifically stated otherwise by Seller in writing.

TERMINATION AND HOLD ORDERS: No Order may be terminated by Buyer except upon written request by Buyer and approval by Seller, and if said request is approved by Seller, under the following conditions: (1) Buyer agrees to accept delivery of all of the units completed by Seller through the workday on which Seller receives the written termination request; (2) Buyer agrees to pay to Seller all direct costs and expenses applicable to the portion of the Order that is incomplete.

WARRANTY:

A. **Hardware:** Seller warrants its goods against defects in materials and workmanship under normal use and service for one (1) year from the date of invoice.

B. **Software and Firmware:** Unless otherwise specified, Seller warrants for a period of one (1) year from date of invoice that standard software or firmware, when used with Seller specified hardware, shall perform in accordance with Seller's published specifications. Seller makes no representation or warranty, expressed or implied, that the operation of the software or firmware shall be uninterrupted or error-free, or that functions contained therein shall meet or satisfy the Buyer's intended use or requirements.

C. **Services:** Seller warrants that services, including engineering and custom application, whether provided on a fixed cost or time and material basis, shall be performed in accordance with generally accepted industry practices.

D. **Remedies:** Seller's liability under this section is restricted to replacing, repairing, or issuing credit (at Seller's option) for any returned goods and only under the following conditions: (1) Seller must be promptly notified, in writing, as soon as possible after the defects have been noted by the Buyer, but not later than (1) year from date of invoice from Seller; (2) The defective goods are to be returned to the place of manufacture, shipping charges prepaid by the Buyer; (3) Seller's inspection shall disclose to its satisfaction that the goods were defective in materials or workmanship at the time of shipment; (4) Any warranty service (consisting of time, travel and expenses related to such services) performed other than at Seller's factory, shall be at Buyer's expense.

E. **Repaired/Reconditioned Goods:** As to out-of-warranty goods which Seller has repaired or reconditioned, Seller warrants for a period of sixty (60) days from date of its invoice only new components replaced in the most recent repair/reconditioning.

F. **Returns and Adjustments:** No goods may be returned unless authorized in advance by Seller and then only upon such conditions to which Seller may agree. Buyer must obtain an RMA (Return Material Authorization) number from Seller prior to any return shipment and such RMA number must appear on the shipping label and packing slip. Buyer shall be responsible for the returned goods until such time as Seller receives the same at its plant and for all charges for packing, inspection, shipping, transportation, or insurance associated with returned goods. In the event that credit for returned goods is granted, it shall be at the lesser of the then current prices or the original purchase price. Claims for shortage or incorrect material must be made within five (5) days after receipt of shipment.

ALL OTHER WARRANTIES, FOR ANY OF SELLER'S GOODS OR SERVICES, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE ARE EXCLUDED.

INTELLECTUAL PROPERTY: Seller's sale of goods or provision of related documentation or other materials to Buyer shall not transfer any intellectual property rights to Buyer unless Seller specifically agrees to do so in writing. Seller shall retain ownership of all applicable patents, trademarks, copyrights and other intellectual property rights. Buyer shall not use, copy or transfer any such items in violation of Seller's intellectual property rights or applicable law, or for any purposes other than that for which the items were furnished.

Seller shall defend any lawsuit brought against the Buyer based on a claim that the design or construction of the goods sold hereunder by Seller infringe any United States or Canadian Patent, Copyright or Mask Work Registration, provided that Buyer promptly notifies Seller of such claim in writing and further provided that, at Seller's expense, (1) Buyer gives Seller the sole right to defend or control the defense of the suit or proceeding, including settlement, and (2) Buyer provides all necessary information and assistance for that defense. In the event of a charge of infringement, Seller's obligation under the agreement shall be fulfilled if Seller, at its option and expense, either (i) settles such claim; (ii) procures for Buyer the right to continue using such goods; (iii) replaces or modifies goods to avoid infringement; or (iv) accepts the return of any infringing goods and refunds their purchase price; or (iv) defends against such claim.

If Buyer furnishes specifications or designs to Seller, the obligations of Seller set forth above shall not apply to goods made by Seller using such specifications or designs, and Buyer shall defend, indemnify and hold Seller harmless against any third party claims for infringement which arise out of Seller's use of specifications or designs furnished by Buyer.

SOFTWARE LICENSE: If goods purchased hereunder include software ("Software"), Buyer may use the Software only as part of the goods. Buyer may not use, copy, or transfer any of the Software except as may be permitted under the applicable License Agreement provided with the goods. Buyer's right to use, copy or transfer the Software shall terminate upon termination of Buyer's right to use the goods.

PACKAGING/WEIGHTS AND DIMENSIONS: Buyer specified packing or marking may be subject to additional charges not otherwise included in the price of the goods. Published weights and dimensions are estimates or approximate only and are not warranted.

FORCE MAJEURE: Seller shall not be responsible for delays in delivery or any failure to deliver due to causes beyond Seller's control, including but not limited to the following items: acts of God, war, terrorism, mobilization, civil commotion, riots, embargoes, domestic or foreign governmental regulations or orders, governmental priorities, port congestion, acts of the Buyer, its agents or employees, fires, floods, strikes, lockouts and other labor difficulties, shortages of or inability to obtain shipping space or transportation, inability to secure fuel, supplies or power at current prices or on account of shortages thereof, or due to limitations imposed by the extent of availability of Seller's normal manufacturing facilities.

If a delay excused per the above extends for more than ninety (90) days and the parties have not agreed upon a revised basis for continuing providing the goods or services at the end of the delay, including adjustment of the price, then Buyer, upon thirty (30) days' prior written notice to Seller may terminate the Order with respect to the unexecuted portion of the goods or services, whereupon Buyer shall promptly pay Seller its reasonable termination charges upon submission of Seller's invoices thereof.

LIMITATION OF LIABILITY: Seller's liability for any claim of any kind, except infringement of intellectual property rights, shall not exceed the purchase price of any goods or services which give rise to the claim. **SELLER SHALL IN NO EVENT BE LIABLE FOR BUYER'S MANUFACTURING COSTS, LOST PROFITS, LOSS OF USE OF THE GOODS OR SERVICES, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES, SERVICES OR REPLACEMENT POWER, DOWNTIME COSTS, CLAIMS OF BUYER'S CUSTOMERS FOR DAMAGES, OR OTHER SPECIAL, PROXIMATE, INCIDENTAL, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES.** Any action against Seller must be brought within eighteen (18) months after the cause of action accrues. These disclaimers and limitations of liability shall apply regardless of the form of action, whether in contract, tort or otherwise, and further shall extend to the benefit of Seller's vendors, appointed distributors and other authorized resellers as third-party beneficiaries.

PROHIBITION FOR HAZARDOUS USE: Goods sold hereunder generally are not intended for application in and shall not be used by Buyer in the construction or operation of a nuclear installation or in connection with the use or handling of nuclear material, or for any hazardous activity or critical application, where failure of a single component could cause substantial harm to persons or property, unless the goods have been specifically approved for such a use or application. Seller disclaims all liability for any loss or damage resulting from such unauthorized use and Buyer shall defend, indemnify and hold harmless the Seller against any such liability, whether as a result of breach of contract, warranty, tort (regardless of the degree of fault or negligence), strict liability or otherwise.

EXPORT CONTROL: Buyer shall comply with all export control laws and regulations of the United States, and all sales hereunder are subject to those laws and regulations. Seller shall not be named as shipper or exporter of record for any goods sold hereunder unless specifically agreed to in writing by Seller. At Seller's request, Buyer shall furnish Seller with end-user and end-user information to determine export license applicability. Buyer warrants, in accordance with U.S. Export Law, that goods sold hereunder shall not be destined for facilities or activities involving nuclear, chemical or biological weapons, or related missile delivery systems in named prohibited regions or countries.

GOVERNING LAW: Seller intends to comply with all laws applicable to its performance under any order. All matters relating to interpretation and effect of these terms and any authorized changes, modifications or amendments thereto shall be governed by the laws of the Commonwealth of Pennsylvania. No government contract regulations or clauses shall apply to the goods or services, this agreement, or act to bind Seller unless specifically agreed to by Seller in writing.

NON-WAIVER BY SELLER: Waiver by Seller of a breach of any of these terms and conditions shall not be construed as a waiver of any other breach.

SEVERABILITY AND ENTIRE AGREEMENT: If any provision of these terms and conditions is unenforceable, the remaining terms shall nonetheless continue in full force and effect. This writing, together with any other terms and conditions Seller specifically agrees to in writing, constitutes the entire terms and conditions of sale between Buyer and Seller and supercedes any and all prior discussions, and negotiations on its subject matter.

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