SwiftComm™ Explosion Proof Incremental Wireless Interface Installation Instructions

The SwiftComm Explosion Proof Wireless Encoder Interface allows for wireless transmission of encoder data in hazardous environments. The transmitter is housed in an industry standard instrument case, which is rated for use in Class I, Groups B,C,D and Class II, Groups E,F,G hazardous environments. This rating includes a majority of gas and explosive dust groups including hydrogen, ethylene, propane, metals, coal and grain. Additionally, the SwiftComm Explosion Proof transmitter holds the CENELEC/ATEX Exd IIB flameproof approval.

A robust and secure wireless interface, SwiftComm has the built-in reliability needed for real-time industrial control. SwiftComm allows critical position, speed and velocity feedback data to be transmitted to control systems without expensive cabling. The SwiftComm system includes the transmitter-receiver pair, which communicates using a point-to-point frequency-hopping 2.4 GHz RF protocol.

GENERAL MOUNTING GUIDELINES

IMPORTANT NOTE: The Transmitter module is shipped disassembled to facilitate mounting the explosion proof case to the customer's equipment prior to wiring the transmitter electronics assembly. Do not remove the transmitter electronics assembly from its static protection bag without proper ESD protection (see use of supplied disposable wrist strap described below).

TRANSMITTER

Mount using the two 0.31 inch diameter thru-hole mounting tabs located on the explosion proof housing. The explosion proof antenna assembly is attached to the explosion proof case using one of the ¾"-14 NPT threaded conduit holes. The other conduit hole is for connecting the customer supplied conduit. The antenna can be attached to either conduit hole. Make sure to orient the case so the antenna is clear of any metal obstructions. Also, the transmitting and receiving antennas should be oriented in the same relative vertical or horizontal direction for optimal signal strength. See below for step-by-step instructions.

RECEIVER

This module has two 1/4-20 UNC tapped holes on the back of enclosure for mounting to flat surfaces. In addition, mounting ears are available with front mount screws. For DIN rail mounting, a DIN rail kit is available.

EXPLOSION PROOF TRANSMITTER MOUNTING

The Transmitter module mounting and wiring steps are typically done in this order:

1) Mount the explosion proof case to suitable frame or cabinet. Remove windowed cover and set aside.
2) Attach conduit to explosion proof case using one of the ¾"-14 NPT holes.
3) Pull power supply and encoder signal cables to explosion proof case.
4) Install antenna fitting into unused ¾"-14 NPT hole. (Use torque similar to a conduit fitting) Use care when handling coaxial wire and connector.
5) Attach the supplied wrist strap to a bare metal surface on the explosion proof case or antenna fitting.
6) Wrap the other end of the wrist strap around your wrist.
7) Remove the transmitter electronics assembly from the static proof bag.
8) With the plastic wire barrier facing the conduit side of the case, insert the electronics assembly into the explosion proof case until the steel ends of the standoffs contact the magnetic inserts in the bottom of the case.
9) Attach power and encoder signal wires to the 9 pin barrier strip using the transmitter wiring chart (Table 1, page 2). Connect antenna RF connector. Neatly route coaxial without kinks and attach antenna.
10) Securely screw windowed cover onto case body. Use small set screw to prevent cover movement. CAUTION: COVER MUST BE TIGHTLY CLOSED TO PRESERVE EXPLOSION PROOF RATING.

This completes the mounting and wiring of the transmitter.

WIRING AND PINOUT

TRANSMITTER

Transmitter Barrier Strip Wiring - TABLE 1	
Label	**Function**
A	Encoder Channel A
B	Encoder Channel B
Z	Encoder Channel Z (Index)
+V	Power Input 6-24VDC
0V	Power Input Common
CG	Case Ground
A/	Encoder Channel A/
B/	Encoder Channel B/
Z/	Encoder Channel Z/

Note: Case Ground (CG) and Power Input Common (0V) are connected together internally. This is because the antenna requires a solid electrical ground, referenced to the case, for best performance. Consult the factory to discuss your particular installation requirements, if this is an issue.

RECEIVER

Receiver Pinout - TABLE 2	
PIN	**Function**
A	Channel A
B	Channel B
C	Channel Z
D	+V (Supply Voltage)
E	B.I.T. Output*
F	0V (Circuit Common)
G	---
H	Channel A/
I	Channel B/
J	Channel Z/

* If transmission is interrupted for longer than 0.13 seconds the status of this pin will change from LO to HI. B.I.T. is Hi at +V level.

RECEIVER FRONT PANEL INDICATORS

The SwiftComm Receiver Module has a set of six indicators that show internal operation and RF status.
The following table summarizes the function of each light

FUNCTION	COLOR	DESCRIPTION
Power	Green	ON Indicates input power is supplied to the module
A	Red	Indicates quadrature signal A status
B	Red	Indicates quadrature signal B status
Z	Red	Indicates index signal Z status
Link	Green	ON indicates SwiftComm modules have established a reliable RF link. OFF indicates the RF link has been lost and the B.I.T. signal is active
Status	Red	Blinks ON each time RF packets are lost. Rate of blinking indicates relative quality of the RF link. Useful when setting up antennas and troubleshooting interference problems.

The LINK and STATUS lights indicate the quality of RF connection between the modules. On startup, both Transmitter and Receiver modules search their assigned RF spectrum for another module with the same address. When the modules locate each other, they exchange frequency hopping sequence and other housekeeping information. Once finished with this exchange, the LINK light is turned on. From that point on, the Transmitter sends the quadrature data from the encoder as a packet over the RF connection to the Receiver. The Receiver reconstructs the encoder's signal from the received packet and informs the Transmitter of a successful packet exchange. This series of events repeats each 600 microseconds. If a packet is lost because of RF interference then the STATUS light will blink (see page 3 for STATUS description). If many packets are lost, SwiftComm will dynamically alter its frequency hop sequence to find channels with less RF interference.

SECURITY CODE

SwiftComm radios are paired in a point-to-point configuration. Encoder quadrature data is sent from the Transmitter module to the Receiver module, where the data is passed on to the user's equipment. Because of this architecture, only one Transmitter and one Receiver can share the same security code. Over 500 billion unique security codes are available, assuring no address will ever be repeated. Additionally, all radio pairs are programmed with their security code at the factory and are not publicly available, which provides enhanced security of each pair.

ENCRYPTION AND DATA SECURITY

Data security was highly considered in the design of the SwiftComm architecture. SwiftComm deploys three layers of protection to the data.

1. The radios use a pseudo-random adaptive frequency hopping sequence, changing frequency every 600 uS. This random hopping helps prevent unauthorized monitoring of the data stream.
2. The data sequence being transmitted between the SwiftComm radios is proprietary, unlike common radio protocols such as Wi-Fi, Zigbee or BlueTooth. These publicly known protocols are susceptible to outside monitoring. SwiftComm's protocol further enhances the security of the data while being transmitted wirelessly.
3. SwiftComm uses a 40-bit encryption algorithm for an additional layer of data protection from external monitoring.

TROUBLESHOOTING

Most troubleshooting can be accomplished by observing the state of SwiftComm's front panel lighted indicators. Following is a description of the indicator lights and how to utilize them for troubleshooting:

POWER: This indicator will turn on (green), if power between 5 and 28 VDC is being provided to the module. If this indicator is off, check the power supply connections.

A, B, Z: These indicators turn on and off as the encoder's quadrature signals change state. While slowly turning the encoder, observe if the A, B and Z indicators toggle on and off in a pattern. If these indicators don't respond, check the wiring to the encoder. A differential encoder signal is required as an input to the module.

LINK: If a SwiftComm radio pair with the same security code establishes radio contact with each other, then the LINK indicator will turn on (green). The LINK indicator will turn off if continuous radio contact is lost for more than 0.13 seconds (about 200 successive packets). The B.I.T output follows the state of the LINK indicator. Generally, the LINK indicator turns off for three reasons.

1. The RF signal is too weak. This can happen if the radios are too far apart, or there is some obstruction, such as a building, between the radios. Try reorienting the radios to avoid obstructions and/or locating them closer together. Orient the antennas so they are both either vertical or horizontal. In a factory setting, Swiftcomm can typically transmit reliably up to approximately 300 feet. In an outdoor setting, that distance can increase to 1,000 feet. Contact the factory to discuss your specific application environment.

2. The antenna is broken or not attached correctly. The antenna should be securely tightened to the RF connector on both SwiftComm modules. Also, inspect the coax wire inside the swivel base of the antenna to make sure it is not frayed or broken.

3. A source of RF interference exists. Turn off different equipment in the vicinity to see if the interference decreases, such as Programmable Logic Controllers (PLC) and variable speed drives (VFD). If interference subsides when equipment is turned off, try moving the source of interference or the SwiftComm modules to another location. Also check that equipment covers and doors are secured and the equipment is properly grounded to earth ground.

STATUS: Every 600 uS, the Transmitter sends a packet to the Receiver with the current encoder data. The STATUS indicator "flashes" if an acknowledgment packet is lost. The more packets lost, the more the STATUS indicator flashes. This makes the STATUS indicator a good measure of signal quality. Normally you may see about 1 or 2 flashes per second, although a higher flash rate is still acceptable. Flashes every 1 to 2 seconds indicates over a 99% packet success rate. This feature can be used during initial set-up to optimize the location of the antennas, investigate intervening obstructions and minimizing sources of interference.

SwiftComm Licensing
United States FCC IC: VSR-SWIFTCOMM07
Canadian IC: 7445A-SWIFTCOMM07

To satisfy RF exposure requirements, this device and its antenna must operate with a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This device has been designed to operate with an antenna having a maximum gain of 5.5dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated (EIRP) is not more than the required for successful communication.