

HUB SM|UG

Technical Reference Manual

Hardware Version: v1.0



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Devex HUB SM|UG Technical Reference v2.0

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Revision History

Date	Document Version	Hardware Version	Author	Revision
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15 JAN 2017	2	1.0	Gustavo Henrique L.Severino	Addition in the description of items 2.2, 5.1.2, and 5.2. Obsolescence of Ethernet Input and Ethernet POE Output ports.

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1 Document Introduction

The HUB SM|UG Technical Reference Manual is part of SmartMine|UG Documentation Suite.

This manual is intended to serve as a guide to the hardware and components of the HUB SM|UG module. This manual provides all instructions required in order to operate the HUB SM|UG product to a basic level. This manual provides an overview of the system together with technical data and safety directions.

WARNING:

Operators must be aware of the physical surroundings of their equipment and drive to conditions and mine requirements at all times.

It is assumed an operator using this manual is familiar with:

- Site-specific safety procedures, Safe Work Procedures (SWPs) and Standard Operating Procedures (SOPs).

Note:

The document uses generic images to show general layout and generic information for various procedures. The site-specific screen layout, menu, and procedure information may vary from what is displayed in the manual.

1.1 Contacting Support

For all Devex Mining product support:

Contact Method	Details
Web portal	http://www.hexagonmining.com/downloads/HxM_Active_Customer_Care_Portal_Manual.V.01.pdf and Follow the steps of document to support

1.2 Document Conventions

This document uses basic conventions to indicate actions:

Convention Example	Description
See xxx Refer to	“See” indicates a reference to another section of this document. “Refer to” indicates reference to another document.
WARNING	Warnings alert the user to dangerous procedures which could cause injury or death.
CAUTION	Cautions alert the user to dangerous procedures which could cause damage to equipment.
Note	Notes supply important information about a procedure which is not covered in the procedure text.

2 HUB SM|UG Overview

The HUB SM|UG is a communication and location interface that allows to a communication between the mine's asset and SmartMine|UG management system through Leaky Feeder.

2.1 System Information

Note:

The document uses generic images to show general layout and generic information for various procedures. The site-specific screen layout, menu, and procedure information may vary from what is displayed in the manual.

HUB SM|UG performs the following functions:

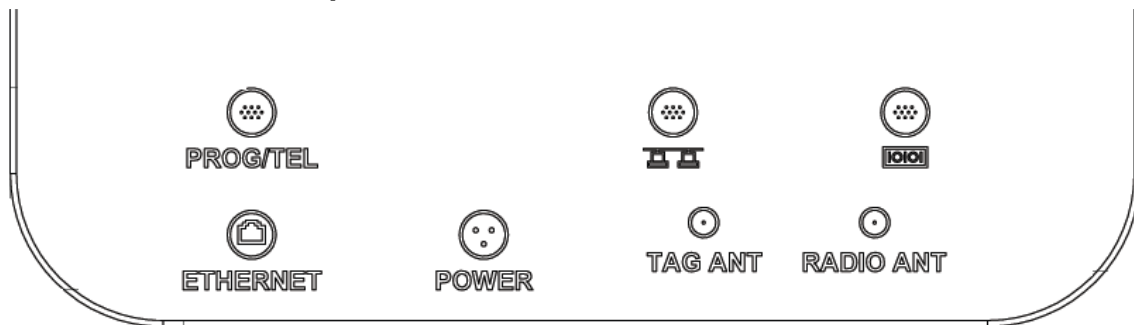
- Convert serial information in RFID signals to reading of Tag's
- Convert serial information in RF signals to exchange information with Leaky Feeder system.

HUB SM|UG software provides:

- Intuitive set up and operation.
- CaLAMP and Analyzer softwares configuration.
Upgrade through debug cable.



See [Software Installation](#) for more information

2.2 Product Description

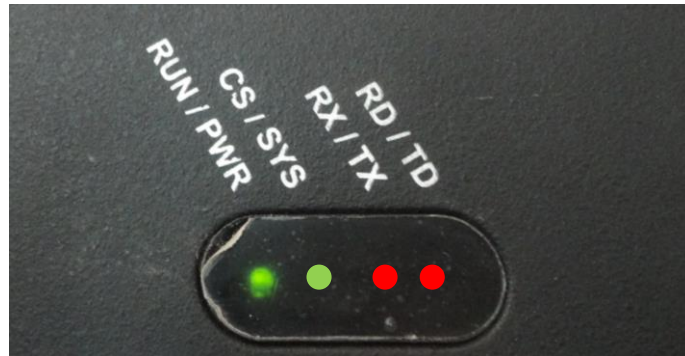


The figure above shows the indication of the connections of the HUB SM|UG with details.

Description	Icon	Function
PROG/TEL		<ul style="list-style-type: none"> • Radio Programming
ETHERNET		<ul style="list-style-type: none"> • POE Ethernet Output – Obsolete port (Not Used)
POWER		<ul style="list-style-type: none"> • Power Supply
		<ul style="list-style-type: none"> • Ethernet connection – Obsolete port (Not Used)
		<ul style="list-style-type: none"> • Serial input

TAG ANT		<ul style="list-style-type: none"> RF signal of UHF Antenna
RADIO ANT		<ul style="list-style-type: none"> RF signal of VHF Antenna

2.3 LEDs



Description	LED	Function
RUN/PWR	GREEN	<ul style="list-style-type: none"> Green LED light indicates the HUB SMUG is powered
CS/SYS	GREEN ORANGE	<ul style="list-style-type: none"> Green LED light indicates the radio is OK Red LED light indicates the radio is being programmed
RX/TX	GREEN RED	<ul style="list-style-type: none"> Green LED light indicates the radio is receiving data Red LED light indicates the radio is transmitting data
RD/TD	GREEN RED	<ul style="list-style-type: none"> Green LED light indicates the radio is receiving data Red LED light indicates the radio is transmitting data

2.4 Labels

The HUB is composed by two labels: Identified label and compliance label.

The identified label indicate the product is compatible with the technologies adopted in country and meets technical requirements of operation and warranty conditions, technical support and quality.

The compliance label shows the origin, production batch, serial number and part number.

As the HUB SMUG has an internal module already certified, it must inform the module label, its location and that Contains Transmitter Module FCC ID: NP444018450.

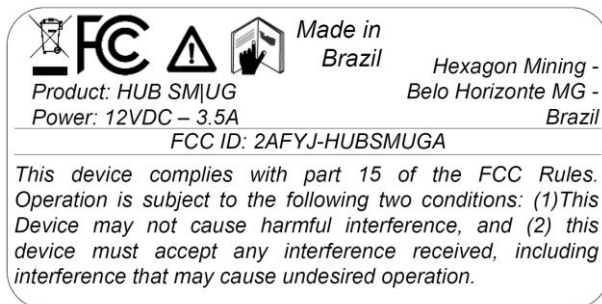
2.4.1 HUB SM|UG Serial Number Label.



2.4.2 HUB SM|UG Compliance Label

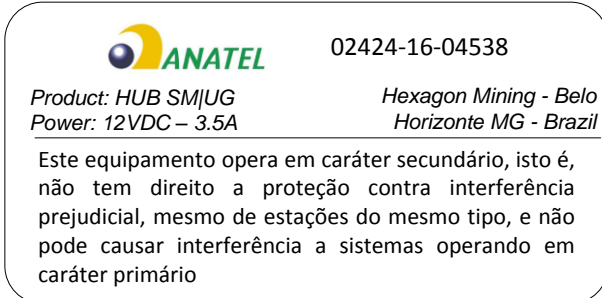
2.4.2.1 FCC Certification Label

(Used in countries adopting FCC as telecommunications standard)



2.4.2.2 Anatel Certification Label

(Used in Brazil)



2.4.2.3 Certification Label of Internal Transmitter Module

Contains Transmitter Module FCC ID: NP444018450



2.4.3 Labels Location

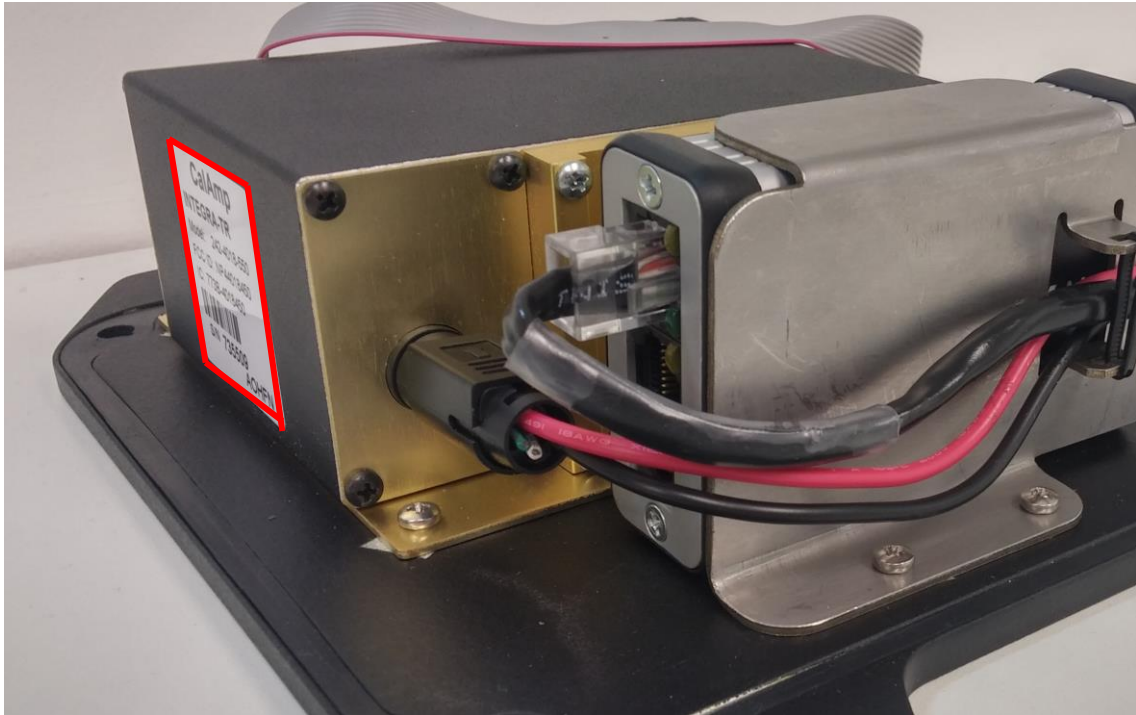
2.4.3.1 Serial Number Label Locations



2.4.3.2 Certification Label Locations



2.4.3.3 Label Location of Internal Transmitter Module



3 Commissioning HUB SM|UG

3.1 Commissioning Workflow

1. See [Chapter 4 Hardware Installation](#).
2. See [Chapter 5 Software Installation](#).

4 Hardware Installation

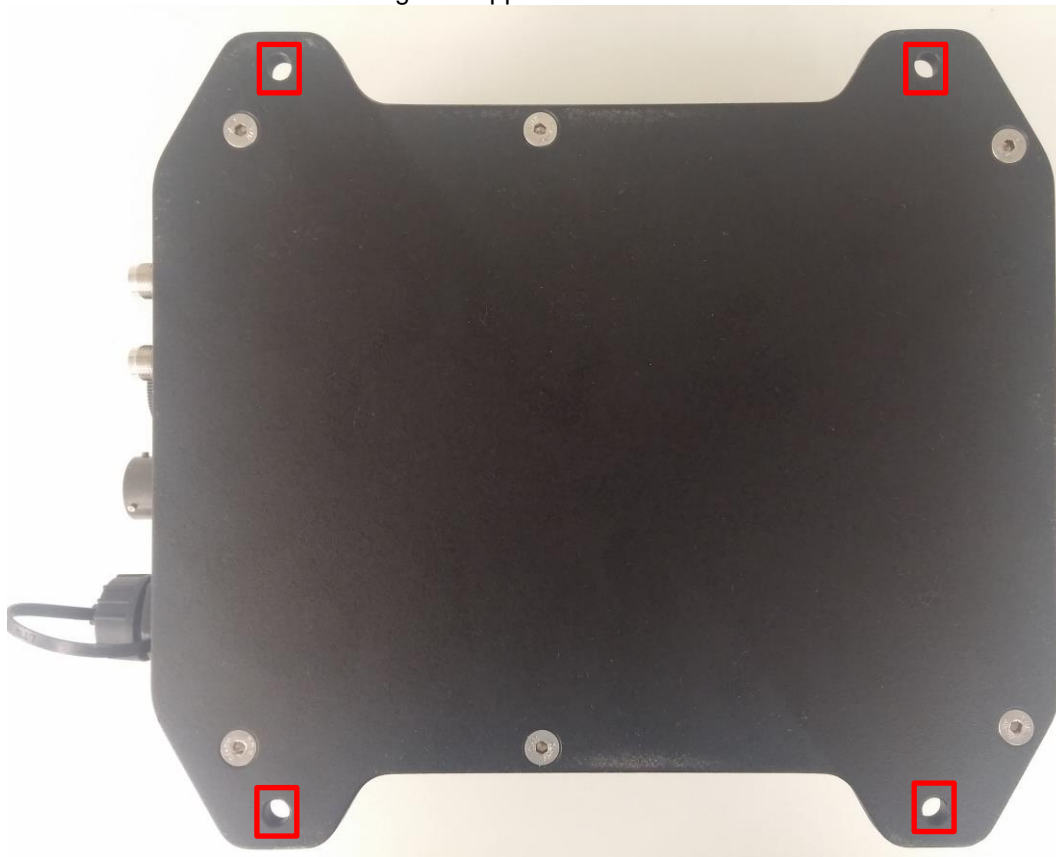
4.1 Before Installation

Installation requires specialized knowledge and must be installed by a Hexagon Mining Authorized Installer. Hexagon Mining recommends that installation of the HUB SM|UG equipment be performed by a qualified technician because installation requires marking electrical connections.

- Install the system in a clean and workshop environment. Failure to do so may cause the system to short or promote product malfunction.
- Route and secure all cables and wiring to ensure that they not chafe or rub premature failure
- The average installation time varies, but should take approximately one hour per asset. The time of installation may be more, or less, based on asset type and options purchased.

4.2 HUB SM|UG Installation

- Select an appropriate place to mount the HUB SM|UG module.
- Four mount holes are provided in the metal housing, these should be used to firmly mount the UHP to the machine using the supplied bolt.



WARNING:

Do not mount the module where it may obscure the driver's view of the road.

WARNING:

Do not mount the module where it may be struck by a deploying airbag.

4.2.1 Front View

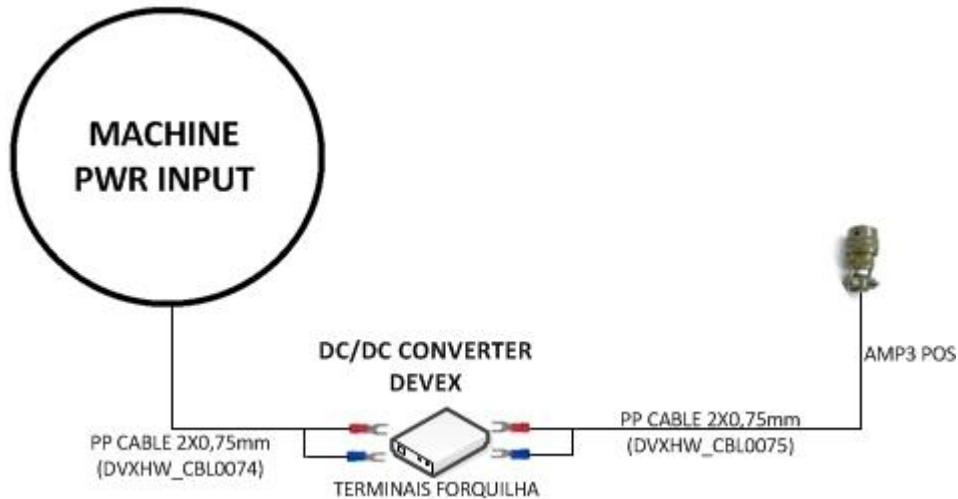


4.2.2 Top View



4.3 Power Cable Installation

1. Connect the supplied power cable of DC-DC Converter (Refer to: DVXHW_CBL0074) to a reliable source, for example, the vehicle's main power system
 - a. Connect the DC-DC converter to a 12 or 36-volt positive source capable of delivering a constant current of 2 A.
 - b. Connect the black wire to the vehicle's earth ground.
2. Connect the supplied power cable of HUB SM|UG to converter DC-DC (Refer to: DVXHW_CBL0075 - Cabo Externo Alimentação – HUB). As shown below.
3. Connect the Installation Kit for Tracker+ according to the document DVXHW_RMT0027 – Wiring Diagram – Installation Kit For Tracker+.



1. Route and secure all cables and wiring to ensure that there is no rubbing, which can cause premature failure.
2. Connect the power cable to the Power connector on the front of the HUB SM|UG module.



4.4 Antenna Installations

4.4.1 Antenna Application

- VHF
 - ANTENA PHANTOM VHF 156-160
 - Communication with Leaky Feeder
 - Part Number Devex - 101030025
- UHF
 - ANTENA PHANTOM UHF 440 NMO BK
 - Communication with TAG RFID
 - Part Number Devex - 101030024

4.4.2 VHF Antenna Installation

Note:

Read all instructions prior to assembly and installation.

The HUB SM|UG module's VHF Antenna must be mounted with a clear view of the sky and free from any obstruction from machine components, and must meet the following criteria:

1. The HUB SM|UG module VHF Antenna must be on the flat level part of the machine or mast.

2. The HUB SM|UG module VHF Antenna must not be obstructed by exhausts, flashing lights, masts, trays, or any other objects. It must be mounted such that it has an unobstructed view of the sky and is as high on the equipment as possible.
3. The HUB SM|UG module VHF Antenna must not be mounted within 50 cm of any other antenna.
4. Route the cables through bulkheads using the existing grommets if possible; if not, modification may be required to route the cables to the required location. If creating a new entry point, use a grommet to protect the cables.
5. The cables must not be cut, kinked, or bent tightly, as their performance degrades and a system failure may result.
6. Route the cables back to the HUB SM|UG module.
7. If cables are not terminated, terminate the cable and check connectivity before connecting to the antenna
8. A universal mounting magnetic base is provided to secure the VHF antenna.
9. Mount the VHF antenna with magnetic base cleaning the contact location prior to fixation.
10. Route the cable to the HUB SM|UG module and connect to TNC in the TAG ANT port.

4.4.3 UHF Antenna Installation

Note:

Read all instructions prior to assembly and installation.

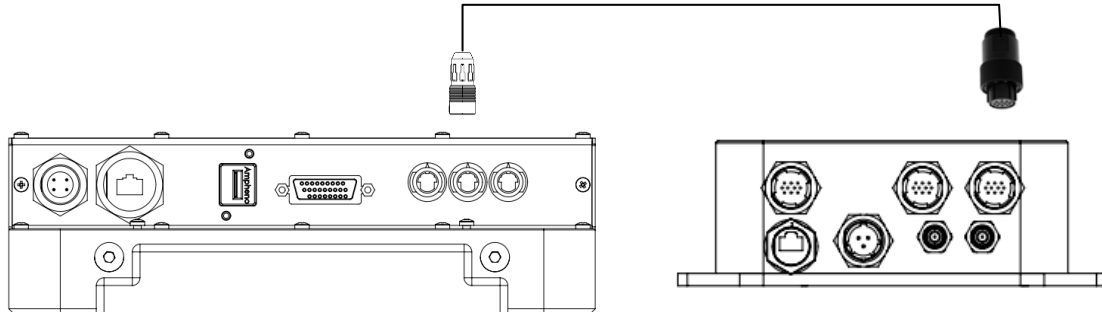
The HUB SM|UG module's UHF Antenna must be mounted with a clear view of the sky and free from any obstruction from machine components, and must meet the following criteria:

1. The HUB SM|UG module UHF Antenna must be on the flat level part of the machine or mast.
2. The HUB SM|UG module UHF Antenna must not be obstructed by exhausts, flashing lights, masts, trays, or any other objects. It must be mounted such that it has an unobstructed view of the sky and is as high on the equipment as possible.
3. The HUB SM|UG module UHF Antenna must not be mounted within 50 cm of any other antenna.
4. Route the cables through bulkheads using the existing grommets if possible; if not, modification may be required to route the cables to the required location. If creating a new entry point, use a grommet to protect the cables.
5. The cables must not be cut, kinked, or bent tightly, as their performance degrades and a system failure may result.
6. Route the cables back to the HUB SM|UG module.
7. If cables are not terminated, terminate the cable and check connectivity before connecting to the antenna
8. A universal mounting magnetic base is provided to secure the UHF antenna.
9. Mount the UHF antenna with magnetic base cleaning the contact location prior to fixation.
10. Route the cable to the HUB SM|UG module and connect to TNC in the TAG ANT port.

4.5 Communication Cable Installation

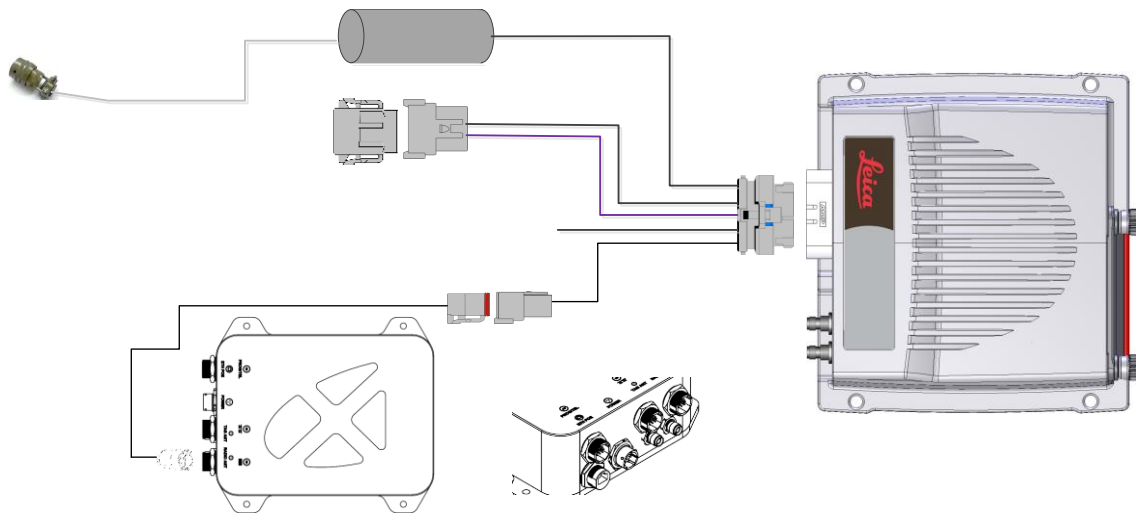
4.5.1 Tracker360

Connect the communication cable TRACKER360_HUB (Refer to: DVXHW_CBL0145R03 - TRACKER360_HUB - CABLE) to serial connector of HUB SM|UG (IOIOI) and to serial connector of Tracker360 (POS) as show below.



4.5.2 Jasset

Connect the communication cable JASSET_HUB (Refer to: DVXHW_CBL0169R00 - JASSET_HUB - CABLE) to serial connector of HUB SM|UG (IOIOI) and to serial connector of Jasset (Automotive connector of 6 way) as show below.



5 Software Configuration

The following procedure is used for software upgrades and checks of HUB SM|UG.

Note:

Contact Hexagon Mining for the required files.

5.1 Installation and Configuration Verification

Since the HUB SM|UG is already installed in the equipment must be done a check all set that is connected to it.

In this step the following tests are described:

- 5.1.1. Tag's Reader
- 5.1.2. Integra Radio(VHF)

5.1.1 Tag's Reader

To check the tag's reader test, the connection diagram part shown below will be tested.



For Tag Reading test should use the HUB SM|UG script for Tag's Reader (Refer to: DVXHW_TST0017), but must be connected to the tag antenna cable in the HUB for this test is done. The Tag's reader antenna cable must be connected to the "ANT TAG" connector of HUB as the following figure.



Must be performed all steps of DVXHW_TST0017 script, but must place a tag with known ID at least five meters away from the equipment that tag reader antenna is able to read. With a smaller distance, the tag's reader antenna will not be tested properly.

5.1.2 Integra Radio (VHF)

For the VHF radio test, besides the hub power supply must be connected also the radio VHF antenna connector (ANT) as shown in below.

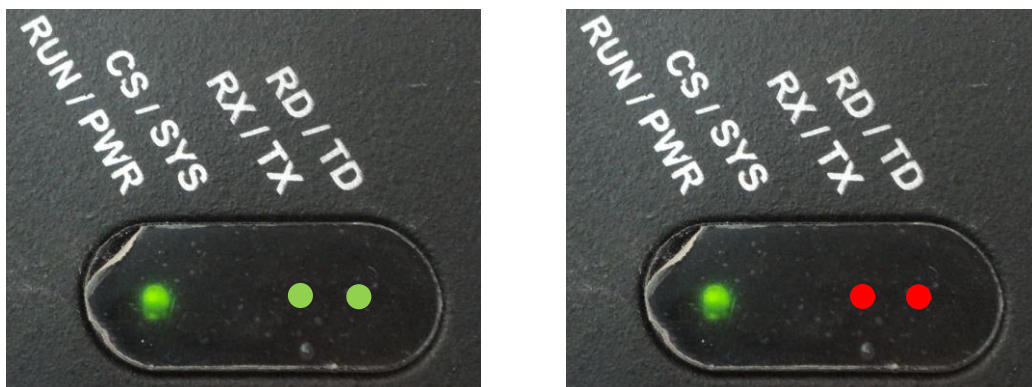


The components to be tested in this step of the test are shown in the figure below. In the Integra radio test, it is not impossible for the RS232 Serial – Radio programming port to be functioning during the radio operation in test and/or field.



For Integra radio test should use the HUB SMJUG script for Integra Radio (Refer to: DVXHW_TST0018). Contact Hexagon Mining support for the required files of the Integra Radio. It should be remembered that after the radio programming must be placed the connector protective cover shown in the above.

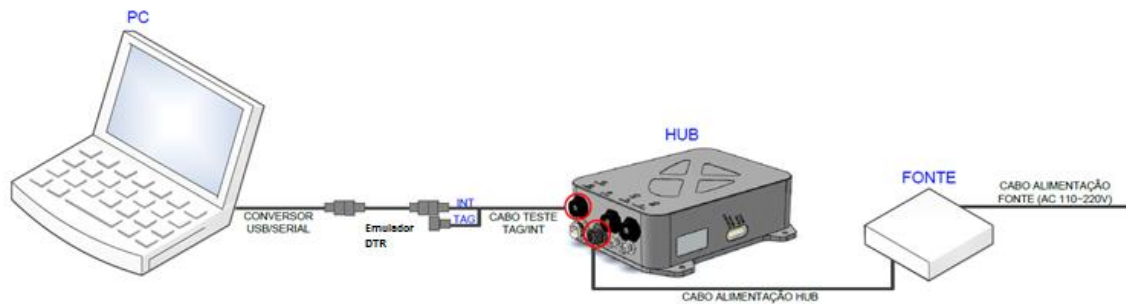
After the test verification, may also be noted the communication by the HUB SMJUG display, the LEDs indicated as RX/TX and RD/TD illuminate almost simultaneously in green when a data is received by VHF radio and in red color when a data is sent. This can facilitate the diagnosis of communication if it has any problems with the radio test. The colors of the radio LEDs as its state of communication are represented in the following figures.



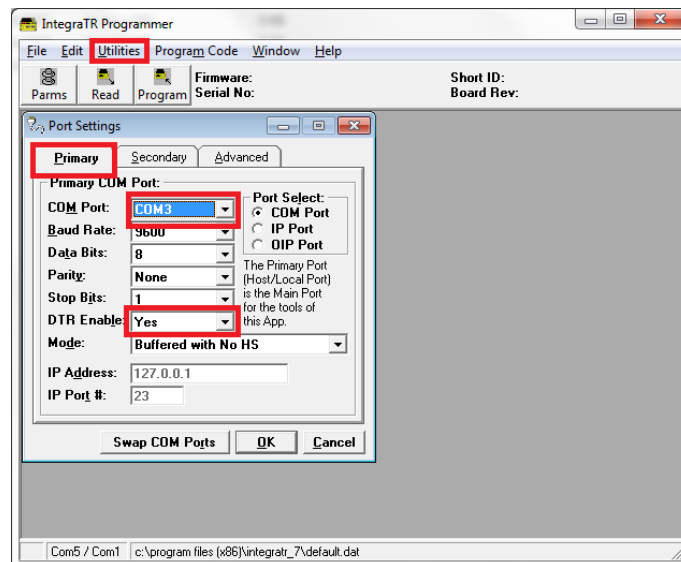
Reception (green LEDs) and Transmission (red LED) of data - VHF radio

5.2 Integra radio Configuration

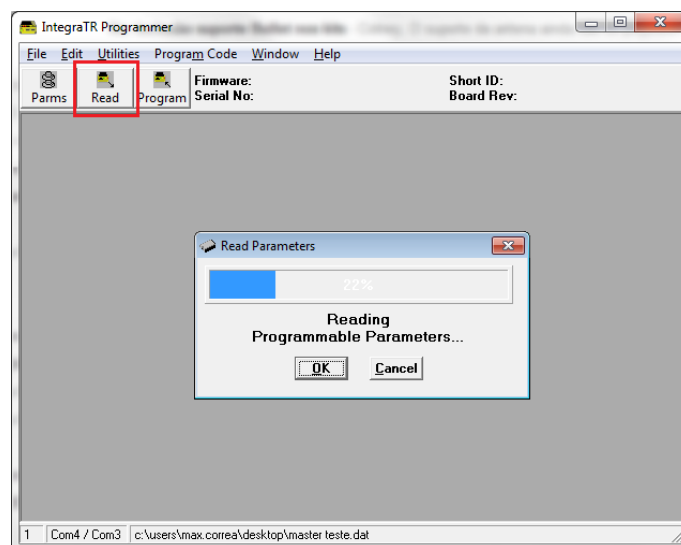
Below can be seen the connection diagram, for configure Integra radio. In the configuration procedure of Integra radio, it is not impossible for the RS232 Serial – Radio communication port to be functioning during the radio configuration.



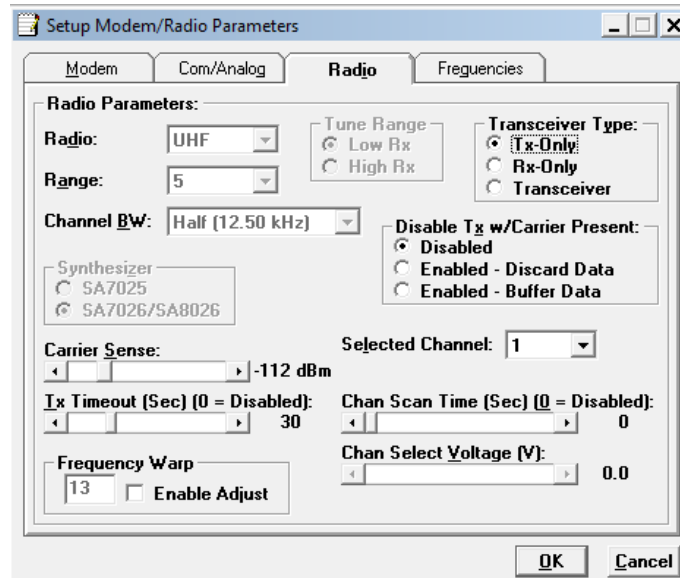
Run the program “INTEGRA CALLAMP” and configure the serial port that is being used. Click in “Utilities>Port Settings” in Primary tab and select the port that was identified and select “YES” in DTR enable options, click OK.



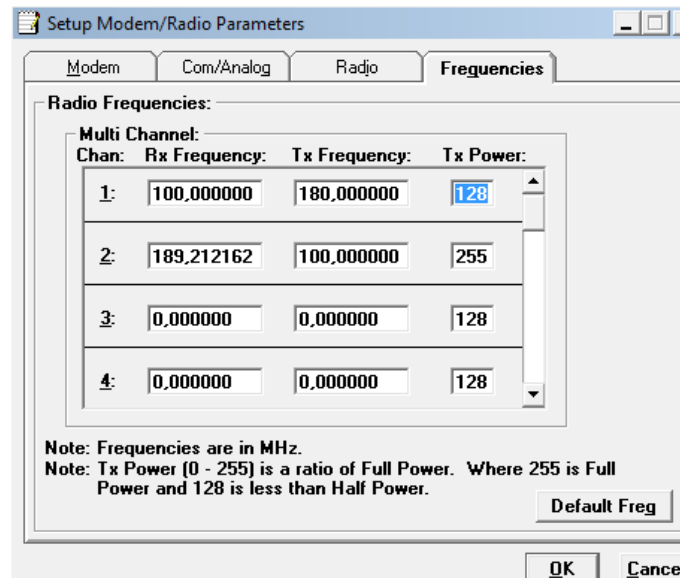
After the port configuration, the program should recognize the radio used and its configuration. Click "Read" and waits for the complete program.



After reading the parameters click “Parms” and waits for the radio setup screen.



In "Radio" tab, we can configure the "transceiver Type" mode as "Transceiver". In "Frequencies" tab, we can configure the power in item "TX power", according to figure below: The frequencies used are the same used in the Leaky Feeder, but the TX and RX must be exchanged.



6 Technical Data

6.1 Design

Industrial metal housing

6.1.1 User interface

- Console RS-232 serial

6.1.2 Dimensions

Length (cm)	Width (cm)	Height (cm)
22,50	26,58	7,55

6.1.3 Weight

Weight (Kg)
3

6.1.4 Power

Consumption	External Supply Voltage
42 W	Voltage 12 VDC

6.2 Environmental Specifications

6.2.1 Temperature

Operating Temperature (°C)	Storage Temperature (°C)
-20 a +60	-30 a +70

6.2.2 Protection Against Water, Dust and Sand

Protection
IP65

6.2.3 Protection Against Vibration

Protection
The tests were done according to the international standard EN 600068-2-64

6.2.4 Humidity

Protection
5% a 90%

6.3 Communication Interfaces

Communication Interface name	Quantity
------------------------------	----------

RS-232 Serial - TAG Reader	1x
RS232 Serial – Radio communication	1x
RS232 Serial – Radio programming	1x
Ethernet POE Output	1x - Obsolete port (Not Used)
Ethernet Input	1x - Obsolete port (Not Used)

6.4 Wireless Module Technical Data

6.4.1 RFID Tag Reader

- UHF – Frequency 433.92 MHz

6.4.2 Leaky Feeder Radio

- VHF – Frequency - 136-162 MHz e 148-174 MHz
- Maximum Transmission Power - 36dbm

6.4.3 Antenna Technical Data

6.4.3.1 Antena RFID

- Frequency: 430 - 450 MHz
- Gain: 3 dBi

6.4.3.2 Antena Leaky Feeder

- Frequency: 156-172 MHz
- LNA Gain: 2.15 dB

6.5 FCC Statement (Applicable for U.S.)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

6.5.1 Antenna Technical Data

7 Glossary

Term	Definition
DC	Direct Current
FCC	Federal Communications Commission
HUB SM UG	HUB SmartMine Underground
IP	Protection Index
LED	Light Emitting Diode
POE	Power Over Ethernet
RFID	Radio-Frequency IDentification
RF	Radio Frequency
VCD	Voltage current continue
VHF	Very High Frequency
SOPs	Standard Operating Procedures
SWPs	Safe Work Procedures
USB	Universal Serial Bus
UHF	Ultra High Frequency



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