TECHNICAL DESCRIPTION

APCO P25

EZPRO25 RF – INSTALLATION GUIDE

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1. INTRODUCTION

The EZPRO25 RF module (Base Station Repeater) are a modular design, high performance products used as APCO repeaters.

The radio system is available in the 806-870Mhz frequency band.

The proper functioning of any electronic device depends on its correct use. It is therefore recommended that the instructions in this manual be followed.

2. UNPACKING AND CHECKING

The following elements are supplied in the box:

EZPRO25 RF
2 cables SMB RF
Installation manual

The equipment is supplied with all the modules already assembled in the rack and with

the RF cables connected. The modules in the basic configuration are: Control (RCPU P25), Transmitter (RTX P25), power module (RPA P25), Receiver (RRX P25) and the power supply module (RPS P25).

IMPORTANT: if any of these elements is missing or damaged, contact your dealer and / or installer.

3. PREVIOUS CONSIDERATIONS

This manual contains information on instructions for installation, maintenance and use. Read the following pages before using this equipment.

It is inadvisable to switch on the equipment without having previously connected the antenna or, in case of the EZPRO25 RF, the 50Ω load to the TNC connector. Doing so may seriously damage the equipment and even cause irreparable damage to the transmitter circuits. It is important to use an antenna adjusted to the work frequency.

4. INFORMATION ON SAFETY AND ELECTROMAGNETIC COMPATIBILITY

The equipment has been designed according to the following standards:

- ETSI ETS 300 392-2 - V2.5.2 (2005-11)
- ETSI ETS 300 394-1 - V2.4.0 (2005-10)
- ETSI EN 301 489-18 - V1.3.1 (2002-08)
- EN 60950-1 - 2001
- EN 60950-1:2001/A11:2004
- EN 60215-1989
- EN 60215:1989/A1:1992
- EN 60215:1989/A2:1994

These standards ensure the essential requirements established in article 3 of directive 1999/5/CE.

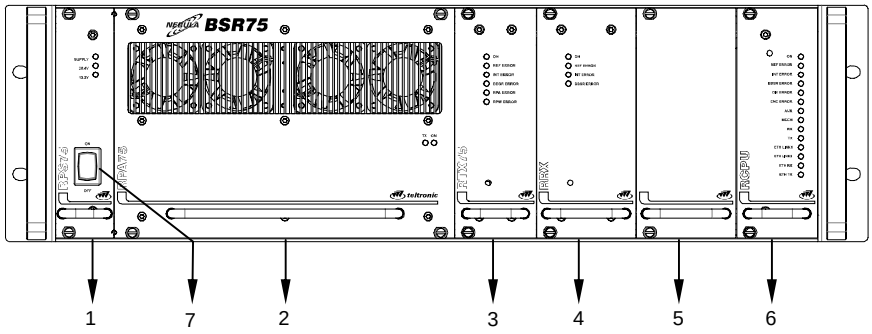
In any case, take the following points into consideration:

- Most electronic equipment is susceptible to electromagnetic interference if it is not duly protected. If the EZPRO25 RF is placed near unprotected electronic devices, they may malfunction.
- The EZPRO25 RF must not transmit without its antenna connected or, in case of the EZPRO25 RF, without the 50Ω load in the TNC connector.
- When installing the antenna, follow the guidelines for exposure of the human body to high and low frequency electromagnetic fields. Follow the supplier's / manufacturer's instructions.
- Burns may be suffered if the antenna connector output of the power module (RPA P25) is touched by bare skin when the EZPRO25 RF are transmitting with the antenna disconnected.
- Take care when handling the EZPRO25 RF. It has sharp edges, which may cut if handled incorrectly.
- Maintenance and repair of these repeaters must be carried out by qualified personnel only.
- Connect the EZPRO25 RF chassis to the earth intake in the cabinet where it is to be installed.
- Switch off the EZPRO25 RF before inserting/removing any of its modules.

5. EQUIPMENT DESCRIPTION

5.1 FRONT VIEW

- **EZPRO25 RF**



1.- RPS P25 (Repeater Power Supply)

2.- RPA P25 (Repeater Power Amplifier)

3.- RTX P25 (Repeater Transmitter)

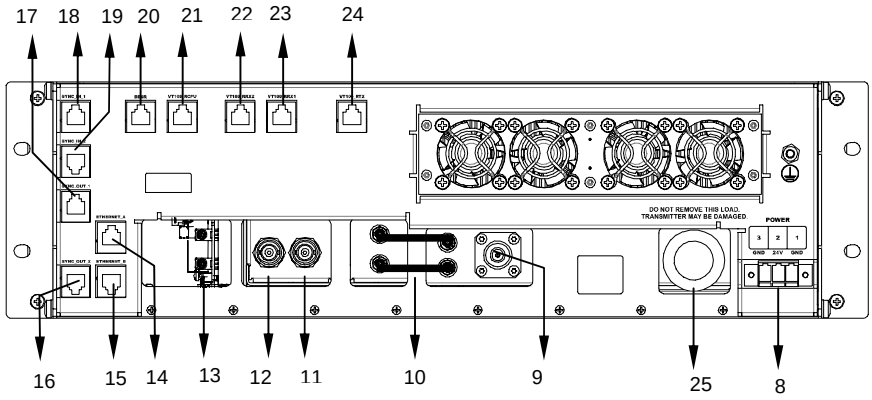
4.- RRX P25 (Repeater Receiver)

5.- Option RRX2 P25/BSYNC P25 (Repeater Receiver 2 / EZPRO25 RF Synchronism)

6.- RCPU P25 (Repeater Control Processing Unit)

5.2 REAR VIEW

- **EZPRO25 RF**



5.3 MODULES

1. RPS P25 (REPEATER POWER SUPPLY)

LEDs to indicate module status.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
SUPPLY	Green	On	There are 26.4V at the RPS P25 input
24V or 26.4V	Green	On	There are 26.4V at the RPS P25 output
13.2V	Green	On	There are 13.2V at the RPS P25 output

Power on switch (Ref. 7): ON/OFF switch to connect to and disconnect from the EZPRO25 RF

2. RPA P25 (REPEATER POWER AMPLIFIER)

LEDs to indicate module status.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
TX POWER	Green	On	Module transmitting

3. RTX P25 (REPEATER TRANSMITTER)

LEDs to indicate module status.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
INT. ERROR	Red	Off	Internal failure
BBSR ERROR	Red	Off	Communication failure with the RCPU P25 module
RPA ERROR	Red	Off	RPA P25 failure
RPW ERROR	Red	Off	Reflected power failure

4. RRX P25 (REPEATER RECEIVER)

LEDs to indicate module status.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
INT. ERROR	Red	Off	Internal failure
BBSR ERROR	Red	Off	Communication failure with the RCPU P25 module

5. SLOT OPTION: RRX2 / BSYNC (REPEATER RECEIVER 2/ BSR SYNCHRONISM)

LEDs to indicate the status of option RRX2.P25

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
INT. ERROR	Red	Off	Internal failure
BBSR ERROR	Red	Off	Communication failure with the RCPU P25 module

LEDs to indicate the status of option BSYNC P25.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
WARM UP	Red	Off	Oscillator in warming up phase
TIME GPS	Green	Flashing	There is NMEA signal from GPS
PPS GPS	Green	Flashing	There is PPS signal from GPS
TIME LOCAL	Green	Flashing	There is NMEA local signal (without GPS)
PPS LOCAL	Green	Flashing	There is PPS local signal (without GPS)

NOTE: this slot is not used in the EZPRO25 RF basic configuration.

6. RCPU P25 (REPEATER CONTROL)

LEDs to indicate the module status.

LED	TYPE	NORMAL STATUS	FUNCTIÓN
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
INT. ERROR	Red	Off	Internal failure
BBSR ERROR	Red	Off	BSR bus failure
DIV ERROR	Red	Off	Diversity failure
CNC ERROR	Red	Off	Communication failure with the CNC
AUX	Green	Off	Not used
MCCH	Green	Off / On	Main carrier indicator
RX	Green	Flickering	APCO P25 information received
TX	Green	On	APCO P25 information transmission
ETH LINK1	Yellow	On	Link between the local network switch and the RCPU P25 module in Ethernet port 1
ETH LINK2	Yellow	Off	Link between the local network switch and the RCPU P25 module in Ethernet port 1
ETH RX	Green	Flashing	Reception of an Ethernet packet
ETH TX	Green	Flashing	Transmission of an Ethernet packet

5.4 CABLING AND CONNECTORS

- **BSR75**

8.- Power supply connector.

9.- Transmission power antenna connector.

10.- SMB RF cables.

11.- Reception antenna connector (receiver chain 1)

12.- Reception antenna connector (receiver chain 2)

13.- Reception antenna connectors for the RRX2 P25 option / antenna connectors for the GPS, depending on the inserted module.

14.- Ethernet B connector.

15.- Ethernet A connector.

16.- SYNC IN2 connector.

17.- SYNC IN1 connector.

18.- SYNC OUT1 connector.

19.- SYNC OUT2 connector.

20.- Maintenance connector for BSR bus.

21.- Connector for VT100 for RCPU P25module maintenance.

22.- Connector for VT100 for RRX2 P25 module maintenance.

23.- Connector for VT100 for RRX1 P25 module maintenance.

24.- Connector for VT100 for RTX P25 module maintenance.

25.- TNC connector for 50Ω load.

6. INSTALLATION GUIDE

The following recommendations must be followed closely before starting up the EZPRO25 RF module.

6.1 LOCATION

The EZPRO25 RF have been designed in the standard format of 19" / 3 units high, and so they must be installed in cabinets with this format.

The EZPRO25 RF site must be permanent, well-ventilated and without vibrations.

6.2 POWER SUPPLY CONNECTION

DC power supply: check that the power supply source and/or the battery to be used meets the voltage and current requirements necessary to supply the equipment:

Nominal voltage: 26.4VDC (range: from 21.6 to 28VDC)

Minimum source current: 10 A

- There is a 15 A internal fuse in the RPS module (Ref. 1 of BSR) to protect the equipment from over-voltage. There is a power control circuit in the RPS P25 module in order to avoid an overcurrent condition.
- If lead batteries are used, they are to be placed as far from the EZPRO25 RF as possible to prevent corrosion in the repeater due to battery vapours. They should be situated in a well-ventilated place.
- Use the power supply connector provided (D013000) to connect the EZPRO25 RF to the power supply source. Use a cable with 2.5 mm2 minimum diameter (or AWG-12). Ensure that the connection is made with the correct polarity.
- Ensure that the earth connection is made. Make this connection with a cable of maximum diameter and minimum length.

NEVER use a gas or electricity conduit as an earth.

6.3 ANTENNA CONNECTION

- Choose the most adaptable antenna for the installation. The antenna must have an impedance of 50 ohms to the equipment transmission frequency. Install the antenna in accordance with the manufacturer's instructions.
- Use a cable coaxial, avoiding as much as possible large cable lengths. Cable impedance is 50 ohms.
- Measure the ROE of the installation. Never accept a ROE greater than 2.
- If a duplexer module or a band pass filter is required, adjust them to the work frequency before starting up.

6.4 SWITCHING ON THE EZPRO25 RF

- Check the connections between the modules.
- Check that the power supply source is connected correctly.
- Check that the RF SMB cables are connected correctly (see Rear View diagram Ref. 10).
- Check the connections of the antennas in the RPA P25 and RRX modules.
- Only in case of the EZPRO25 RF check the 50Ω load is connected to the rear TNC connector in the RPA P25.
- Check that the Ethernet connections to the CNC/Gateway are in accordance with the configuration.
- Check that the RPS P25 module LED SUPPLY is on.
- Activate the power on switch on the RPS P25 module.
- Check that the 24V LED and the 13.2V LED on the RPS P25 module or the 26.4V LED and 13.2V LED on the RPS P25 module are on and check that the LEDS ON are switched on for the other modules.
- Wait for the EZPRO25 RF to start up.
- Check that the mobile equipment is registered in the EZPRO25 RF.

Note: see section 5 for more information on references for the different modules and LEDs.

7. CONFIGURATION

A EZPRO25 RF is configured via an NMS (Network Management System). To configure the EZPRO25 RF, consult the NMS manual.

8. INCIDENTS

The repeater must be repaired by authorized technical personnel only. If a EZPRO25 RF failure occurs, the entire EZPRO25 RF must be replaced. If transmitter module is damaged and there is not an entire EZPRO25 RF available to replace, set RTX P25 and RPA P25 modules previously calibrated jointly. In last case and if is not possible to carry out one of the two previous options, replace one of these two modules and make the gain calibration again.

If an error or alarm occurs in the EZPRO25 RF, this is indicated in the corresponding LED for each one of the modules. The following list shows the possible failures and their solutions.

8.1 ALARMS

	Led indication	*Status*	*Failure / Solution*
RPS P25	SUPPLY	OFF	POWER SUPPLY FAILURE. CHECK THAT THE SOURCE AND THE POWER SUPPLY CABLE ARE CORRECTLY CONNECTED. CHECK THE INTERNAL FUSE OF THE RPS P25. CONTACT TECHNICAL SERVICES IF UNSOLVED.
	24V or 26.4V	OFF	Power supply failure. Contact Technical services.
	13.2V	OFF	Power supply failure. Contact Technical services.

RPA P25	ON	OFF	POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.

	TX POWER	OFF	No power transmission in the antenna. Wait for EZPRO25 RF to be started up by the CNC. Check other LED indications. Contact Technical Services if unsolved.

RTX P25	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF. ERROR	ON	Failure in the 10MHz reference. Contact Technical services.
	INT. ERROR	ON	Internal failure. Contact Technical services.
	BBSR ERROR	ON	Communication failure with the RCPU P25 module. Check that all the modules are correctly installed. Contact Technical services if still unsolved.
	RPA P25 ERROR	ON	FAILURE IN THE RPA P25 MODULES. CHECK THAT THE RF SMB CABLES (REF. 10) ARE CORRECTLY CONNECTED. CONTACT TECHNICAL SERVICES I STILL UNSOLVED.
	RPW ERROR	ON	Reflected power alarm. Check that the antenna is correctly installed. Contact Technical services.

RRX P25	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF. ERROR	ON	Failure in the 10MHz reference. Contact Technical services.
	INT. ERROR	ON	Internal failure. Contact Technical services.
	BBSR ERROR	ON	Communication failure with the RCPU P25 module. Check that all the modules are correctly installed. Contact Technical Services if still unsolved.

BSYNC P25	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF. ERROR	OFF	Failure in the 10MHz reference. Contact Technical services.
	TIME GPS	OFF	IF GPS IS ACTIVATED, THERE IS FAILURE IN THE DATA FRAME. CONTACT TECHNICAL SERVICES.

	PPS GPS	OFF	IF GPS IS ACTIVATED, THERE IS FAILURE IN THE PPS SIGNAL OF THE GPS: - CHECK THAT THE STARTING UP PERIOD HAS BEEN EXCEEDED (ABOUT 10 MINUTES AFTER SWITCHING ON) - CHECK THE GPS ANTENNA CONNECTION. - CHECK THE CORRECT POSITIONING OF THE GPS ANTENNA, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. CONTACT TECHNICAL SERVICES IF STILL UNSOLVED.
	TIME LOCAL	OFF	IF GPS IS NOT ACTIVATED, THERE IS FAILURE IN THE LOCAL REFERENCE DATA FRAME. CONTACT TECHNICAL SERVICES.
	PPS LOCAL	OFF	IF GPS IS NOT ACTIVATED, THERE IS FAILURE IN THE LOCAL PPS SIGNAL. CONTACT TECHNICAL SERVICES.

RCPU P25	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF ERROR	ON	Failure in the 10MHz reference. Check that the BSYNC P25 module is installed or that the SYNC IN cable is correctly connected. Contact Technical services if still unsolved.
	INT ERROR	ON	Internal failure. Contact Technical Services.
	BBSR ERROR	ON	Communication failure by the EZPRO25 RF bus. Check that all the modules are correctly installed. Contact Technical services if still unsolved.
	DIV ERROR	ON	Error in diversity: occurs when the difference in received power between received paths exceeds a level (20 dBs by default) for a consecutive number of receptions. These receptions on the received paths which do not have sufficient power are not counted. This alarm does not disappear until there are no receptions with the sufficient power, and until the difference of received power between received paths does not exceed the level previously mentioned. Check diversity configuration in the CNC. Check that the reception antennas are correctly installed. Contact Technical services if still unsolved.
	CNC ERROR	ON	Communication failure with the CNC. Check the Ethernet connections. Check that the CNC is working correctly. Contact Technical Services if still unsolved.
	RX	Continuous ON	Interference detection. Check the installation. Check that the work frequencies are correct.
	ETH LINK1	OFF	Failure in Ethernet link 1. Check Ethernet connection 1 and the Switch A.
	ETH LINK2	OFF	Failure in Ethernet link 2. Check Ethernet connection 2 and the Switch B.
	ETH RX	OFF	Packets are not received by Ethernet. Check the Ethernet connections.
	ETH TX	OFF	Packets are not sent by Ethernet. Check the Ethernet connections.

8.2 ALARMS WITHOUT STATUS LEDS

8.2.1 Interference at the bsr.

This alarm is monitored in APCO P25 Network Management System (NMS). See “APCO P25 Event List” in NMS help.

An interference in the EZPRO25 RF is activated when a high number of invalid consecutive receptions occurs at a EZPRO25 RF. An invalid reception is that which has a signal level higher than the minimum level of reception of the carrier, but it is not recognised as a APCO P25 signal.

This alarm is switched off upon correct reception.