



# RF Unit USER AND INSTALLATION MANUAL

**PRODUCT:** RF Unit

**CODE:** D168X01\_DDS09

**VERSION:** 01

**REVISION:** 04

**DATE:** 09/03/10

**CLASSIFICATION:**

General information

Internal document

## DOCUMENT MAINTENANCE

THIS DOCUMENT HAS 17 PAGES

EDIT.	DATE	AUTHOR	DESCRIPTION
1.0	27/12/07	José Roman	RF Unit User and Installation Manual.
1.1	09/10/08	Javier Córdova	General revision.
1.2	04/11/08	Javier Córdova	Correction of subclauses 6.2, 6.3.
1.3	16/06/09	José Román	Add FCC RF Exposure Requirements:
1.4	09/03/10	A. Narvaiza	Change logo & change in 1 (409-430 MHz).

## DOCUMENT APPROVAL

ACTIVITY	NAME	DATE	SIGNATURE
Prepared			
Revised Project Manager			
Approved R&D Director			



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### 1. INTRODUCTION

The RF Unit is the RF transceiver of Teltronic P25 systems, with a transmitter output power of 100W. Therefore, this is a mandatory module in the infrastructure P25 network. It is manufactured following a robust mechanical modular design which allows simple and economic maintenance.

The RF Unit is available in the following frequency bands:

- 380 - 400 MHz
- 409 - 430 MHz
- 450 - 470 MHz
- 764 - 806 MHz
- 806 - 870 MHz

The modules that form the RF Unit are:

- RPS (Repeater Power Supply P25)
- RPA P25 (Repeater Power Amplifier P25)
- RTX P25 (Repeater Transmitter P25)
- RRX P25(Repeater Receiver P25)
- BSYNC (RF Unit Synchronism) - OPTIONAL
- RCPU P25(Repeater Control Processing Unit P25)

The proper operation of any electronic device depends on its correct use. It is therefore recommended to follow the instructions in this manual.



**CAUTION:** Switch the RF Unit off before inserting/removing any of its modules.



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### 2. UNPACKING AND CHECKING

The following elements are supplied in the box:

RF Unit
50Ω / 20W load termination
Power Supply Cable
Maintenance Cable
Two Ethernet Cables

The equipment is supplied with all the modules already assembled in the rack. The modules in the basic configuration are: Power Supply module (RPS), Power Amplifier (RPA P25), Transmitter (RTX P25), Receiver (RRX P25) and Control (RCPU P25). Synchronism module (BSYNC) is necessary for testing purposes.

**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.

Do not switch on the RF Unit without having previously connected the TX antenna and the 50Ω load to the TNC connector. The equipment may be seriously damaged. It is important to use an antenna adjusted to the RF Unit transmitter frequency band.

### 4. INFORMATION ON SAFETY AND ELECTROMAGNETIC COMPATIBILITY

The equipment has been designed to fulfil the applicable compliance regulations.

The equipment complies with Part 15 of the FCC Title 47 of the Code of Federal Regulations. Operation is subject to the condition that this device does not cause harmful interference.

The equipment complies with the applicable Part 90 of the FCC Title 47 of the Code of Federal Regulations.



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### FCC RF Exposure Requirements:

#### **CAUTION:**

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This device is approved with emissions having a source-based time-averaging duty factor not exceeding 50%.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.



In any case, take the following points into consideration:

- ❑ Most electronic equipments are susceptible to electromagnetic interference if they are not duly protected. If the RF Unit is placed near unprotected electronic devices, they may malfunction.
- ❑ The RF Unit must not transmit without its antenna connected or 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 RF Unit is transmitting with the antenna disconnected.
- ❑ Take care when handling the RF Unit. 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 RF Unit chassis to the earth intake in the cabinet where it is to be installed.
- ❑ Switch off the RF Unit before inserting/removing any of its modules



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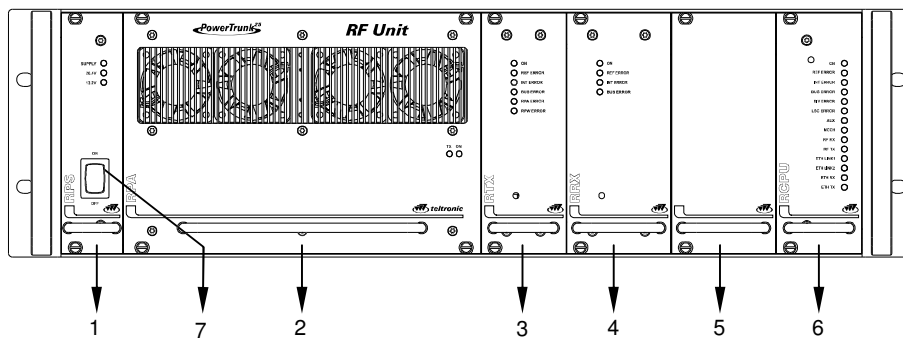
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## 5. EQUIPMENT DESCRIPTION

### 5.1. FRONT VIEW



- 1.- RPS (Repeater Power Supply).
- 2.- RPA P25 (Repeater Power Amplifier).
- 3.- RTX P25 (Repeater Transmitter).
- 4.- RRX P25 (Repeater Receiver).
- 5.- BSYNC (RF Unit Synchronism) - OPTIONAL
- 6.- RCPU P25 (Repeater Control Processing Unit).
- 7.- Power Supply switch.



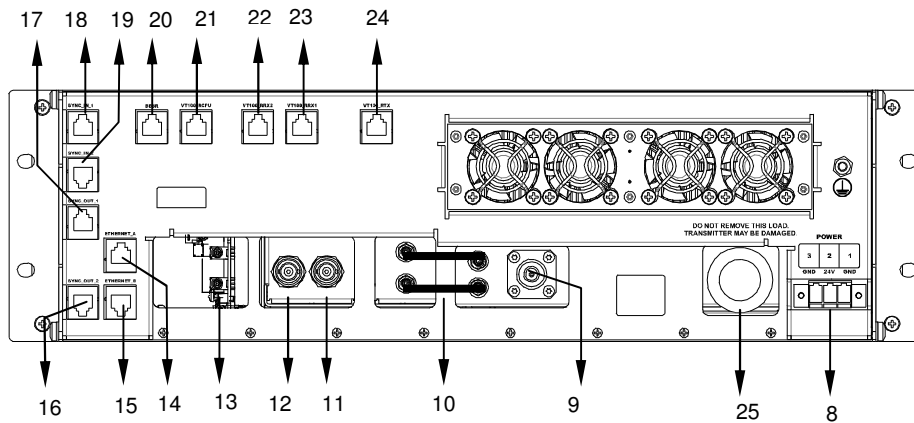
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### 5.2. REAR VIEW



- 8.- Power Supply Connector.
- 9.- TX Antenna Connector (type N).
- 10.- RF cables between RTX P25 and RPA P25.
- 11.- RX Antenna Connector (type BNC).
- 12.- RX Diversity Antenna Connector (not used).
- 13.- BSYNC Connectors (not used).
- 14.- Ethernet Connector "ETHERNET\_A".
- 15.- Ethernet Connector "ETHERNET\_B".
- 16.- Synchronism Output Connector "SYNC\_OUT\_2".
- 17.- Synchronism Output Connector "SYNC\_OUT\_1".
- 18.- Synchronism Input Connector "SYNC\_IN\_1".
- 19.- Synchronism Input Connector "SYNC\_IN\_2".
- 20.- Bus BSR maintenance connector.
- 21.- RCPU P25 maintenance connector (VT-100).
- 22.- RRX2 maintenance connector (Not used).
- 23.- RRX P25 maintenance connector (VT-100).
- 24.- RTX P25 maintenance connector (VT-100).
- 25.- 50Ω / 20W load termination (TNC connector).





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### 5.3. MODULES

#### 1.- RPS (REPEATER POWER SUPPLY)

LEDs to indicate module status.

LED	TYPE	NORMAL STATUS	FUNCIÓN
SUPPLY	Green	On	There are 26.4V at the RPS input
26.4V	Green	On	There are 26.4V at the RPS output
13.2V	Green	On	There are 13.2V at the RPS output

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

#### 2.- RPA P25 (REPEATER POWER AMPLIFIER)

LEDs to indicate module status.

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



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### 4.- RRX P25 (REPEATER RECEIVER)

LEDs to indicate module status.

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

### 5.- SLOT OPTION: BSYNC (RF Unit SYNCHRONISM)

LEDs to indicate the status of option BSYNC.

LED	TYPE	NORMAL STATUS	FUNCIÓN
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 RF Unit basic configuration.



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### 6.- RCPU P25 (REPEATER CONTROL)

LEDs to indicate the module status.

LED	TYPE	NORMAL STATUS	FUNCION
ON	Green	On	Power supply correct
REF. ERROR	Red	Off	Failure in the 10 MHz reference
INT. ERROR	Red	Off	Internal failure
BUS ERROR	Red	Off	RF Unit bus failure
DIV ERROR	Red	Off	Diversity failure
LSC ERROR	Red	Off	Communication failure with the LSC
AUX	Green	Off	Not used
MCCH	Green	Off / On	Main carrier indicator
RF RX	Green	Flickering	APCO P25 information received
RF 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



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### 6. INSTALLATION GUIDE

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

#### 6.1. LOCATION

The RF Unit has been designed in the standard format of 19" / 3 units high and it must be installed in cabinets with this format.

The RF Unit 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:  $26.4V_{DC}$  (range: from 21.12 to 31.68  $V_{DC}$ ).
- ❑ Minimum source current: 20 A.
- ❑ There is a power control circuit in the RPS P25 module in order to avoid an over-current condition.
- ❑ If lead batteries are used, they are to be placed as far from the RF Unit 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 RF Unit to the power supply source. Use a cable with 2.5 mm<sup>2</sup> 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.



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### **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 coaxial cable, 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, a combiner or a band pass filter is required, adjust them to the working frequency before starting up.

### **6.4. SWITCHING ON THE RF Unit**

- ❑ 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 P25 modules.
- ❑ Check the 50Ω load is connected to the rear TNC connector in the RPA P25.
- ❑ Check that the RPS P25 module LED SUPPLY is on.
- ❑ Activate the power on switch on the RPS P25 module.
- ❑ Check that the 26.4V LED and 13.2V LED on the RPS P25 module are on and check that the LEDs "ON" are switched on in the other modules.
- ❑ Wait for the RF Unit to start up.

Note: See subclause 5.3 for more information on references for the different modules and LEDs.



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### 7. CONFIGURATION

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

### 8. INCIDENTS



***The repeater must be repaired by authorized technical personnel only. If a RF Unit failure occurs, the entire RF Unit must be replaced. If transmitter module is damaged and there is not an entire RF Unit 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 RF Unit, 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

	<b>Led indication</b>	<b>Status</b>	<b>Failure / Solution</b>
<b>RPS</b>	SUPPLY	OFF	POWER SUPPLY FAILURE. CHECK THAT THE SOURCE AND THE POWER SUPPLY CABLE ARE CORRECTLY CONNECTED. CHECK THE INTERNAL FUSE OF THE RPS. CONTACT TECHNICAL SERVICES IF UNSOLVED.
	26.4V	OFF	Power supply failure. Contact Technical services.
	13.2V	OFF	Power supply failure. Contact Technical services.
<b>RPA P25</b>	ON	OFF	POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	TX POWER	OFF	No power transmission in the antenna. Wait for RF Unit to be started up. Check other LED indications. Contact Technical Services if unsolved.



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<b>RTX P25</b>	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.
	BUS 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 PROPERLY CONNECTED. CONTACT TECHNICAL SERVICES IF STILL UNSOLVED.
	RPW ERROR	ON	Reflected power alarm. Check that the antenna is properly installed. Contact Technical services.

<b>RRX P25</b>	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.
	BUS ERROR	ON	Communication failure with the RCPU P25 module. Check that all the modules are correctly installed. Contact Technical Services if still unsolved.

<b>BSYNC</b>	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF. ERROR	ON	Failure in the 10MHz reference. Contact Technical services.
	TIME GPS	ON	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: <ul style="list-style-type: none"> <li>- check that the starting up period has been exceeded (about 10 minutes after switching on)</li> <li>- check the GPS antenna connection.</li> <li>- check the correct positioning of the GPS antenna, in accordance with the manufacturer's instructions.</li> </ul> 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.



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<b>RCPU</b>	ON	OFF	INTERNAL POWER SUPPLY FAILURE. CONTACT TECHNICAL SERVICES.
	REF ERROR	ON	Failure in the 10MHz reference. Check that the BSYNC 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.
	BUS ERROR	ON	Communication failure by the RF Unit 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 MSC. Check that the reception antennas are correctly installed. Contact Technical services if still unsolved.
	LSC ERROR	ON	Communication failure with the LSC. Check the Ethernet connections. Check that the LSC is working correctly. Contact Technical Services if still unsolved.
	RF 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.