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User Manual | TDR-Series Repeater

maxon

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TDR-Series Repeater User Manual

Thank you for purchasing the Maxon TDR Series of Digital/Analog Repeaters. As a product built to the DMR standard, the TDR Series provides ergonomic design, reliable performance and comprehensive digital functions to deliver an advanced communication solution. To obtain the maximum benefits, please read this manual carefully before use.

100% Continuous Duty Cycle at High Power
Integrated Power Supply
Multiple Installation Methods
IP Multi-Site Connect (Optional)
TDMA Technology
Secure Communication

Maxon endeavors to achieve the accuracy and completeness of this manual. However, with the possibility of improvements and enhancements to the product,any Items and features listed in this manual are subject to change without notice.

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Safety Matters

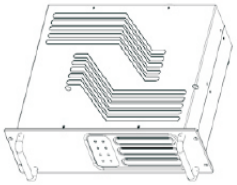
Please read the rules below. Nonobservance of these rules may cause danger or violation of law.

- The use of this radio must comply with regulations of Federal, State and Local government guidelines.
- Only qualified technicians are allowed to maintain this radio. Do not disassemble the radio.
- Do not expose the radio to direct sunlight or near heating devices for a long time.

Product Inspection

Unpack the product carefully and check for any damage to the repeater and that all peripheral items are included. Contact Maxon America direct or your Authorized Maxon Dealer if anything is damaged or missing.

①Repeater



②Power Cable

③User Manual

General Installation

Proper installation can ensure optimum performance and reliability of the repeater, therefore, pre-installation planning is required. This includes considering the mounting location of the equipment in relation to input power and antenna. Also to be considered are site environment conditions, the particular mounting method (several available), and the required tools and equipment.
If this is the first time installing this type of equipment, it is highly recommended to read the following installation requirements and instructions carefully before beginning the actual installation.

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Pre-Installation Overview

The information below is an overview for installing the repeater and auxiliary equipment.

- Pay particular attention to environment conditions at the site, ventilation requirements, and grounding and lightning protection in pre-installation.
- Unpack and inspect the equipment.
- Mechanically install the equipment at the site.
- Make necessary electrical and cabling connections, including the following:
  - AC input power cable.
  - Connect coaxial cables to TX and RX antenna.
- Perform a post-installation function check test of the equipment, to verify proper installation.
- Configure parameters (e.g. Working Frequency, PL, Code, Color Code etc.) of the repeater based on user's requirements.

Environmental Conditions at Intended Installation Site

The repeater may be installed in any location suitable for electronic communications equipment, provided that the environmental conditions do not exceed the equipment specifications for temperature, humidity and air quality.

Operating Temperature Range

-30°C (-22°F) to +60°C (+140°F) – maximum operating temperatures surrounding the repeater (Refers to the temperature if the repeater is mounted in a cabinet).

Humidity

Levels at or below RH of 95%, non-condensing at 50°C (122°F).

Air Quality

Air quality (rack mount): It is recommended that airborne particulates level to not exceed 90μg/m³ in either a controlled or uncontrolled environment.

Proper filtrating equipment must be in use if the intended installation environment is dirty, dusty or does not accord with the requirements of air quality. As the dirt or dust in the internal PCB and module is difficult to clean, and may cause problems such as overheating, improper electrical connections, etc.

Ventilation Requirements

The repeater is equipped with a cooling fan to provide forced convection cooling. So please comply with the ventilation requirements below in pre-installation.

- Cabinets must be equipped with ventilation slots or openings in the front (for air entry) and back or side panels (for air to exit). If several repeaters are installed in a single cabinet, ensure ventilation openings surround each repeater to allow for adequate cooling.
- All cabinets must have at least 15cm (6 inch) of open space between the air vents and any wall or other cabinets to allow for adequate air flow.
- When several cabinets (several repeaters in each cabinet) are installed in a closed area, adequate ventilation must be ensured; also consider any air conditioning or other environmental control devices, to meet the operating temperature requirements of the equipment.

AC Input Power Requirements

The repeater is equipped with a switching-mode power supply of which the working range is 100-240VAC (47-63Hz AC input power). A standard power cable is provided to connect the power supply to AC power supply.
A grounded socket-outlet is recommended to connect the AC power supply.
The plug must be connected to the AC power supply which can provide a maximum power of 280W. For nominal 110/120 VAC input, the AC power supply must be with 5A current supply and protected by a circuit breaker with 15A rated current. For nominal 220/240 VAC input, the AC power supply must be with 3A current supply and protected by a circuit breaker with 10A rated current.

Mounting Methods

The repeater can be mounted in a rack, bracket or cabinet.

Device Grounding and Lightning Protection

One of the most important issues to be considered is the grounding and lightning protection system in designing and designation of the communication site. The repeater is equipped with a ground screw which is on the rear of the power supply module and used for connecting the repeater to the site ground. Correct grounding and lightning protection should be made for antenna cable, AC and DC power cables, in accordance with electrical codes, rules and requirements. If not, permanent damages to the radio equipment may occur.
Correct grounding technology is closely related to lightning protection, and the common types of site grounding are listed below:

Electrical Grounding

The use of a ground cable is used for transferring the current from the site's circuits or devices. This includes the AC or DC power supply used for site power device, and lines or cables for connecting site alarm or sensor.

RF Grounding

This type involves the grounding of useless RF energy. One example of RF Grounding is to use a shielding object to avoid or minimize the harmful RF energy from communication devices and cables. The device must be installed in places which are easily accessible.

Lightning Protection Grounding

Providing adequate lightning protection is vital for ensuring a safe and reliable communication site. RF cables and AC or DC power cables must be protected in case of a lightning strike that enters the site.

Note: The information supplied in this manual under the Grounding Technology and Lightning Protection section are not of a explicit manner, therefore, it is recommended that a licensed electrical contractor provide the requirements for proper grounding and lightning protection required at the communication site.

Mechanical Installation

This section introduces mechanical installation steps of the repeater. Mounting methods vary depending on different types of rack or cabinet selected for the repeater.

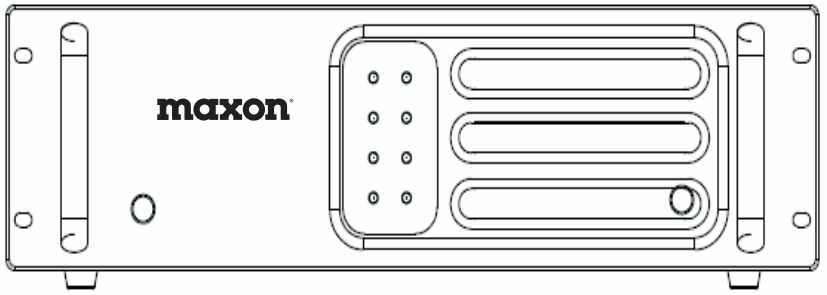
Mounting the Repeater in a Rack or Cabinet

Rack or cabinet mounting must have guide rails and hole spacing, with EIA 48.3 cm (19 inch) configuration.
The cabinet must have adequate ventilation and comply with the minimum standards listed below:

- Depth: 41.3 cm (16.25 inches)
- Width: 48.3 cm (19 inches)
- Height: 13.4 cm (5.25 inches)
- The two installation rails are 5 cm (2 inches) away from the front of the cabinet, and front installation hole spacing is 2.25 inch (from center to center).

Repeater Overview

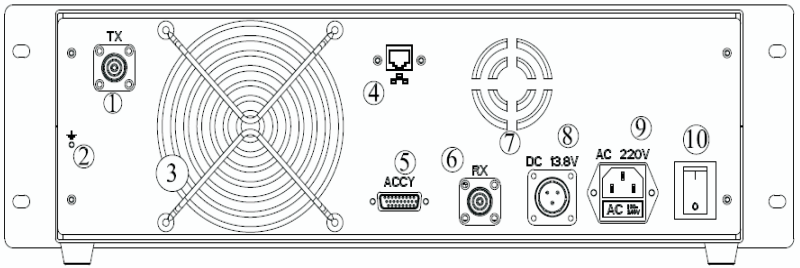
Front Panel



LED Indicators

LED	Status	Description
Power	Red LED glows	AC power supply on
	LED off	Power off
Disable	Red LED glows	Repeater Disabled
	Red LED flashes	Self-checking mode
	LED off	Normal working mode
Digital	Green LED glows	Digital mode
Analog	Green LED glows	Analog mode
Tx A	Red LED glows	Transmitting (analog)
	Red LED glows	The repeater in slot A is transmitting (digital).
Rx A	Green LED glows	Receiving (analog)
	Green LED glows	The repeater in slot A is receiving (digital).
Tx B	Red LED glows	The repeater in slot B is transmitting (digital).
Rx B	Green LED glows	The repeater in slot B is receiving (digital).

Rear Panel



NO.	Item	Description
1	Tx Connector	N Type (Roll Pass)
2	Ground Screw	Must be connected to system grounding.
3	Main Fan	Variable speed fan to assist in air flow and temperature control of repeater.
4	Ethernet Connector	100Base-TX (RJ45)
5	Accessory Connector	26 pin for programming cable and external accessories.
6	Rx Connector	BNC (Roll Pass)
7	Power Fan	Fan for air flow and temperature control.
8	Backup Battery Connector (DC Input)	Backup battery is an optional accessory and provides backup power for the repeater. It can be charged slowly by the repeater, but it is recommended to be charged with an external charger after it is in use for a long period of time. Standard repeater power supply can automatically toggle from AC power to battery power when AC power supply is cut off, and automatically switch to AC power when the AC power supply recovers. The front panel power LED turns red from green when battery power supply is connected.
9	Main Power Supply Connector (AC Input)	100 – 240V
10	Power On/Off Switch	Switch on or off the AC power supply to the repeater.

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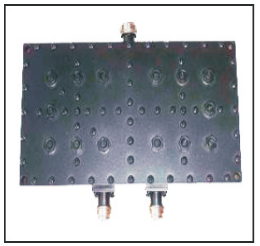
Rear Accessory Connector Pinout

Pin No.	Pin Name	Pin Function
1	USB_VBUS	USB External Power Supply
2	GND	
3	MAP_GPIO_3	External Programmable Input Trigger Control Connector
4	EXT_SWB+	13.8V External Power Supply Switch
5	ALARM	Alarm Power Output (13.8V)
6	GND	
7	EXT_MIC+	External MIC/Audio Input Connector
8	RX_AUDIO	RX Audio External Output Connector
9	EXT_SPK-	External Speaker Voice Output-
10	USB_DM	USB
11	GND	
12	MAP_GPIO_2	External Programmable Input Trigger Control Connector
13	ACC_ID2	External ID Recognition Matrix 2
14	EMERGENCY_IN	External Emergency On/Off Switch
15	ACC_ID3	External ID Recognition Matrix 3
16	EXT_PTT	External PTT
17	GND	
18	EXT_SPK+	External Speaker Voice Output+
19	USB_DP	USB
20	MAP_GPIO_8	External Programmable Input Trigger Control Connector
21	GND	
22	MAP_GPIO_7/MDIO_CLOCK	External Programmable Input Trigger Control Connector
23	MAP_GPIO_6	External Programmable Input Trigger Control Connector
24	PUB_ADDRESS1	Signal Public Output Address 1
25	PUB_ADDRESS2	Signal Public Output Address 2
26	IGN_SENSE_IN	External Sense On Switch

Optional Accessories

Two main accessories of the repeater are antennas and duplexers. For more information, please contact your Authorized Maxon Dealer.

Antennas



Duplexers

Troubleshooting

Phenomena	Analysis	Solution
The repeater can not be powered on.	a. Power cord is not connected or is not securely connected to the outlet. b. Power cord fuse is damaged.	a. Properly connect the power cord and ensure secure connection. b. Check if the DC fuse has blown; if yes, replace it with a new one.
Group members cannot talk to each other, or the repeater cannot communicate with a subscriber radio.	a. TX/RX frequency of the repeater is inconsistent with that of portable /mobile terminals. b. Failed to repeat useful signal due to strong interference signal. c. The group member is out of the coverage of the repeater.	a. Re-set frequencies. b. If you cannot remove or bypass the interference source, change channels to operate on other frequencies. c. Go within the coverage of the repeater.
Group members cannot talk to each other, even though RX indication is given.	a. Your ID is inconsistent with that of other group members. b. Inconsistent CTCSS/DCS.	a. Set your ID to the same as that of other members. b. Re-set CTCSS/DCS.
Short communication range or poor audio	a. Leakage of signal energy due to damaged connection cable. b. Loose connection between antenna connector and the cable, or loss of connection. c. Invisible damage of cable. d. Duplexer is not properly set (if duplexer is mounted).	a. Replace the cable with a new one if necessary. b. Secure the connection or replace cable plug with a new one if necessary. c. Replace the cable with a new one. d. Contact the manufacturer or your dealer to re-set the duplexer.

If you experience other problems, contact your Authorized Maxon Dealer for additional technical information and support.

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Care and Cleaning

To help with the optimal performance and longevity of your repeater, please follow the tips below.

Repeater Care

Keep the repeater at a place of good ventilation and heat dissipation to promote normal operation.
Do not place articles on top of the repeater.
Do not allow the repeater to come in contact with corrosive agents, solutions, or water.

Repeater Cleaning

Clean up the dust and fine particles on the repeater parts with a clean and dry lint-free cloth or a brush regularly.
Use a non-woven cloth with neutral cleanser to clean routinely.
Do not use chemical preparations such as stain removers, alcohol, sprays or oil preparations.
Make sure the repeater is completely dry before use.

Caution: Power off the repeater before cleaning.

Service and Support

Contact Maxon America, Inc. or your Authorized Maxon Dealer if you are in need of any service or support.

Maxon America, Inc.
11535 W. 83rd Terrace
Lenexa, KS 66214
Phone: 913-859-9515
Fax: 913-859-9550
Email: maxon@maxonamerica.com

Warranty Statement

Maxon America, Inc. offers to the original end user:

Three (3) Year Limited Warranty on Maxon/TecNet LMR, Repeater, and Maxon Data Radios (separate warranty period on accessories) with exception to the model and series listed below.

Two (2) Year Limited Warranty on Maxon/TecNet TJ-3000 Series Radios (separate warranty period on accessories).

One (1) Year Limited Warranty on Maxon/TecNet Spartan Series Radios (separate warranty period on accessories).

One (1) Year Limited Warranty on Accessories (includes, but not limited to, batteries, antennas, belt clips, chargers, audio accessories, nylon cases, leather cases, etc.) and UDM Series .

Maxon warrants each new radio product manufactured or supplied by it to be free from defects in material and workmanship under normal use and service for the time period stated, provided that the user has complied with the requirements stated herein. The warranty period begins on the date of purchase from an Authorized Maxon Dealer. This warranty is not assignable or transferable. This warranty is void if the product serial number is altered, defaced or removed. Maxon is not responsible for any equipment that is attached to or used in conjunction with our products.

During the warranty period, if the product fails to function under normal use, because of manufacturing defects or workmanship, it should be returned to the Authorized Maxon Dealer from which it was purchased. The Authorized Maxon Dealer will repair the product or return the product for repair to Maxon or its Authorized Repair Depot. The user is responsible for the removal of the product from a vehicle or any equipment attached to it, or other site of its use; transportation of the product to the Authorized Maxon Dealer; for the return of the repaired or replacement product to the site of its use and for the reinstallation of the product.

Maxon shall have no obligation to make repairs or replacement of product which results from normal wear and tear, or is necessitated by catastrophe, fault, or negligence of the user, improper or unauthorized alterations or repairs to the product, incorrect wiring, use for which it was not designed or by causes external to the product. Maxon's sole obligation shall be to replace or repair the product covered by the warranty. Replacement is done at Maxon's discretion and may consist of a similar or higher featured product. Repair may include the replacement of parts with functionally equivalent new or reconditioned parts. All replaced parts and accessories are warranted for the balance of the original time period. All parts and accessories that are replaced become the property of Maxon America, Inc.

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FOR ANY PRODUCT THAT DOES NOT COMPLY WITH THE WARRANTY SPECIFIED, THE SOLE REMEDY WILL BE REPAIR OR REPLACEMENT. IN NO EVENT WILL TECNET BE LIABLE FOR ANY DAMAGES, INCLUDING ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES, OR THE LOSS OF PROFIT, REVENUE OR DATA ARISING OUT OF THE USE OF OR THE INABILITY TO USE THE PRODUCT.

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Specifications-General	
Frequency Range	UHF: 400-470MHz VHF: 136-174MHz
Channel Capacity	16
Operating Voltage	AC 110~240V 50/60Hz
Channel Spacing	25kHz/20kHz/12.5kHz
Antenna Impedance	50Ω
Dimensions (H×W×L)	132.5×482.5×296.5mm
Current Drain (Standby)	<0.9A
Current Drain (Transmit)	<12A
Receiver	
Analog Sensitivity	0.22μV (12dB SINAD) 0.25μV (Typical) (12dB SINAD) 0.3μV (20dB SINAD)
Digital Sensitivity	0.25μV/BER 5%
Adjacent Channel Selectivity	65dB
Intermodulation	70dB
Spurious Response Rejection	80dB
Blocking	90dB
Conducted Spurious Emission	⩽-57dBm
Audio Distortion	⩽3%
Audio Response	+1~-3dB
Transmitter	
TX Power Output	UHF High Power:45W / VHF High Power:50W Low: 25W
Modulation Limiting	⩽2.5kHz @ 12.5kHz ⩽4.0kHz @ 20kHz ⩽5.0kHz @ 25kHz
Conducted/Radiated Emission	<-36dBm (<1GHz) / < -30dBm (>1GHz)
Adjacent Channel Power	60dB @ 12.5kHz 70dB @ 20/25kHz
Audio Response	+1~-3dB

Audio Distortion	⩽3%
Frequency Stability	±1.0ppm
FM Modulation	11KΦF3E @ 12.5kHz 14KΦF3E @ 20kHz 16KΦF3E @ 25kHz
4FSK Digital Modulation	12.5kHz Data Only: 7K60FXD 12.5kHz Data & Voice: 7K60FXW
Digital Vocoder Type	AMBE3000
Digital Protocol	ETSI-TS 102 361-1

Environmental Specifications

Operating Temperature	-30℃~ +60℃
Storage Temperature	-40℃~ +85℃
ESD	IEC 61000-4-2 (Level 4) ±8kV (Contact) ±15kV(Air)

All specifications are tested according to applicable standards and subject to changes without notice due to continuous development.