

439 TTA System

For Passband 799MHz - 816MHz



DS040299-1
7/10/2025



Description

The 439 TTA system is designed to enhance the performance of base radios, thus ensuring reliable communications for critical Public Safety applications. This solution increases receiver sensitivity, which will improve wide-area coverage and marginal in-building penetration, as well as help correct the imbalance between mobile and hand-held radio users. This solution can be used in P25, high performance data, and standard land mobile systems.

Key Features

- The control unit housed in the equipment shelter is designed to interface receivers operating within the passband of the system (799-816 MHz).
- Includes an antenna feedline and a test port line between the control unit and the TTA.
- Redundant LNAs. Each of the two low noise amplifiers within the TTA use quadrature design, as well as separate bias circuits for maximum redundancy. In addition, if the preferred amplifier fails, the system will automatically switch to the backup amplifier, and a technician will be notified.

System Advantages:

1. **Powerful computing** provides a platform for the rich feature set available today, as well as future upgrades. The system has a central processor, and both the TTA and control unit have their own sub-processor.
2. **Enhanced coverage** due to **superior intermodulation performance** and **low noise figure**.
3. **Less points of failure** due to increased integration of cables, connectors and components.
4. **Compact and lighter** tower top amplifier **reduces tower loading**.
5. **Installation and optimization are simplified**.
 - a. Front panel touch display.
 - b. User-friendly software interfaces. These dramatically simplify the process of optimizing the TTA system. The user will know exactly where he or she stands during the optimization process due to a simple interface and acknowledgements/feedback from the system.
 - c. Auto-setup software. The system will automatically compute the proper attenuation based on factory and field measurements. The technician can accept that attenuation or override it.
 - d. Front panel RF test port and a test transmission line are used to collect gain (RSSI) and sensitivity measurements at ground level.
 - e. The RF test port also allows sweep measurements from the front panel.
 - f. Continuous feedline resistance monitoring indicates if there is something wrong with the integrity of the feedline cable or connectors.
 - g. Mounting hardware (brackets and two 2"-3" diameter hose clamps) is included.
6. **Maintenance is simplified through extensive logging, monitoring, alarming, and reporting**.
 - a. Technicians will be notified if the system drifts outside its normal operational parameters. The system features electrical current monitoring of each amplifier, temperature monitoring of the TTA and control unit, and antenna feedline resistance monitoring.
 - b. Alerts for alarms, warnings, or information updates, which are sent via SMTP (email) and SMS (text), can be user configured as enabled or disabled. This will help prevent information overload and simplify the site monitoring process.
 - c. The back of the control unit has five contact pairs used as auxiliary alarm inputs. Using customer-supplied sensors, the control unit can monitor functions like doors (open/closed), shelter temperature, and other equipment alarms and statuses. The control unit can monitor threshold changes only on the contact pairs.
7. The TTA and control unit contain **auxiliary serial ports for additional sensor connections**. TX RX is considering providing optional sensors, which will take several measurements: TX antenna forward and reflected power, VSWR, and power going through the TX feed line at the output of the combiner. All data collected through the auxiliary serial ports will be logged by the TTA system. In addition, the TTA system's extensive alarm notification capabilities will convey sensor alarms to the user.

8. **High-level carrier detection.** Today's system will **detect and send an alarm when in-band problematic RF signals interfere with the system.** TX RX may provide a spectrum display option, which would provide a means of identifying the specific, problematic RF signals.
9. **TTA autonomous operation.** If the control unit fails, the TTA will operate autonomously as long as 12 VDC operating voltage is applied to it.
10. **Power failure bypass mode.** If the TTA, control unit, or both devices lose power, and there is no way to get power to the control unit, the system will automatically default to operate in power failure bypass mode. This will allow RF signals to pass through the system but at lower signal levels. Coverage will decrease but will not be eliminated.
11. **Ethernet ports** for local and remote interface.
12. **Lightning protection.**
 - a. The antenna port is surge protected to meet the following specifications: IEC 61000-4-5, 8/20 μ s waveform at **40kA** single strike, and 10/350 μ s waveform at 3kA.
 - b. The main and test ports are surge protected to meet the following specifications: IEC 61000-4-5, 8/20 μ s waveform at **20kA** multiple strike, and 10/350 μ s waveform at 3kA.
13. **Several models are available**, such as 120 VAC or -48 VDC operation. In addition, models are available with or without factory-installed redundant power sources (power supplies or DC-DC converters).

Model Number	439-040292
Description	Single Branch Redundant Amp TTA

Tower Top Amplifier System Specifications	
System Gain	22 dB min, adjustable to 10 dB or less
System Noise Figure (Narrow Band)	2.5 dB max (+25 C) 2.7 dB max (-30 to +60 C)
User Type	Public Safety Critical Infrastructure
Frequency Band(s)	700/800 MHz
System Passband (Narrow Band)	799-816 MHz (17 MHz)
System Gain Flatness	\leq 1.20 dB
System Selectivity (Narrow Band)	BW 3 dB = 23.31 MHz, Q = 34.65 BW 6 dB = 24.70 MHz, Q = 32.69 BW 60 dB = 40.24 MHz, Q = 20.07 Shape Factor = 1.63 @ 60 dB / 6 dB
Adjustable Attenuation Range	15.0 dB to 0 dB
Adjustable Attenuation Step Size	0.5 dB
Optional Redundant Power Supply	Yes
Test Port	Yes
Preselector	Yes
System TX Band Rejection	\geq 110 dB
Internal Termination Test Mode	Yes
Antenna Test Mode	Yes
Bypass (Failure) Mode	Yes
Bypass Mode System Loss	< 20 dB

Internal Storage of Test Data	Yes
Receive Gain Adjustment	Yes (either touch display or web interface)
High Level Carrier Monitor	Yes (events are logged)
AC Current	~300 mA (@110 VAC)
DC Current	~1A (@ -48 VDC), ~2.6A (@ 12 VDC)

Tower Top Amplifier Specifications	
Gain	28.0 dB minimum
Noise Figure (Narrow Band)	2.2 dB max (+25 C) 2.4 dB max (-30 to +60 C)
Type of Amplifier	Quadrature Coupled
Amplifier Redundancy	2 Independent Quadrature Amplifiers
Amplifier Switching	Automatic upon failure detection
Type of Amplifier / Test Mode Switching	Hermetic Relays and Solid-State Switch
Amplifier Input 3rd order IP	> 14 dBm
Return Loss on all RF Ports	> 15 dB
Power Requirements	Power derived from RX cable
Operating Temp Range (full spec)	-30° C to +60° C
Operating Temp Range (degraded spec)	-40° C to +70° C
Lightning Protection Main Port and Test Port	20kA IEC61000-4-5 8/20µs multiple strike 3kA 10/350µs
Lighting Protection Antenna Port	40kA IEC61000-4-5 8/20µs single strike 3kA 10/350µs
Grounding Studs	M8 Stud
Test Port Coupling (Test In to Antenna In)	30 dB +/- 2 dB
Test Port Coupling Flatness	≤ 0.25 dB
Internal Termination Accuracy	< 0.1 dB difference int to ext termination
Connector type (all RF ports)	N-female
Connector Spacing (X and Y planes)	2.0" center to center
Enclosure	NEMA 4X Aluminum (epoxy painted)
Size Maximum (H x W x D)	Approximately 8.0" x 7.5" x 4.25"
Weight Maximum	11 lbs.
TTA Unit Factory Test Record	Electronically Stored
Preselector (Narrow Band)	<i>Frequency Range</i> 799 - 816 MHz <i>Stopband Rejection (low side)</i> > 60 dB @ 762 – 776 MHz <i>Stopband Rejection (high side)</i> > 60 dB @ 824 – 2500 MHz

Control Unit Specifications		Model #: 439-040293
Gain (with 0 dB of attenuation)	≤ -6.0	
Noise Figure	≤ 12.0 dB	
Type of Amplifier	Quadrature Coupled	
Amplifier Redundancy	None	
Amplifier Output 3rd order IP	> 45 dBm	
RF Port Return Loss	> 15 dB	
Adjustable Attenuator Type	Electronic	
TTA Connectors Type (rear facing)	N-female	
TTA Connector Spacing (X-Y planes)	1.25" center to center minimum	
Number of RX Output Ports	8 expandable to 16 or 32	
RX Out Connectors Type (rear facing)	BNC-Female	
RX Out Connector Spacing (X-Y planes)	0.850" center to center minimum	
RX to RX Port Isolation	> 20 dB	
External Filter Ports	Yes	
External Filter Port Connector Type	BNC-Female	
Test Port In Connector Type (front facing)	BNC-Female	
ESD Protection	IEC61000-4-2 level 3	
Grounding Studs	M8 Stud	
Status Indicator	Front Panel LCD and bi-color LED	
Alarm Contact	Form-C	
Ethernet Port	On rear panel (includes SNMP)	
Power Requirements	90 – 240 VAC 50/60 Hz (-48 VDC also available)	
Operating Temperature Range (full Specs)	0°C to +50°C (Non-Condensing Humidity)	
Enclosure	Standard EIA 19" Rack Mounting	
Size Maximum (H x W x D)	3.5" (2 RU) x 19.0" x 16.5" with filters	
Control Unit Factory Test Record	Electronically stored	
Weight	< 15 lbs.	