Paragon-III
(Narrow Band)
Data Base Station
Technical Manual
Version 0.01

Preliminary

July 2004

Part no.: 120 20190-001

History

Version 0.01: Preliminary version (April 2004)

Definitions

The following terms are used throughout this document.

Asynchronous	Information that can be sent at random times, and not synchronized to a clock. Transmission characters begin with a “start” bit and end with a “stop” bit.
AVL	Automatic Vehicle Location. Optional feature that involves using GPS (Global Positioning System) signals from the mobile unit by the Host PC.
BDLC-III	Base Station Data Link Controller (PD = Parallel decode). An async controller-modem designed for the radio base station in mobile systems. A component of Paragon-III.
E-DBA	Dataradio’s Enhanced Dynamic Bandwidth Allocation.
CDip	Windows based "Commands & Data over IP" radio-modem Software. This software allows basic tests, unit configuration, and troubleshooting.
DCE	Data Communications Equipment. This designation defines the direction (input or output) of the various RS-232 interface signals. Modems are always wired as DCE.
DTE	Data Terminal Equipment. This designation defines the direction (input or output) of the various RS-232 interface signals. Most user equipment, as well as PCs, are wired as DTE.
Gemini-III	High specs dual DSP mobile radiomodem with Dataradio PD technology (Parallel Decode)
IP	
Network Speed	This is the *bit rate* on the RF link between units. Could be different from COM port *baud rate*.
Paragon-III	Next generation of Paragon/PD+. Runs up to 128 kb/s
Parallel Decode	Technology featuring dual receivers for added data decode sensitivity in multipath and fading environments.
Radio Assembly	Radio modules used in Paragon-III and available in two distinct series depending on radio’s frequency band.
RS-232	Industry–standard interface for serial data transfer.
VIS	Vehicular Information Solutions. Dataradio’s name for a series of products specially designed for mobile data.

1. PRODUCT OVERVIEW

This document provides information required for the setting up, operation, testing and trouble-shooting of the DATARADIO Paragon-III radio-modem base station.

1.1 Intended Audience

This document is intended for engineering, installation, and maintenance personnel.

1.2 General Description

Paragon-III product is a factory-integrated industrial-grade Dataradio base station used in mobile networks and is designed specifically to fit the needs of vehicular applications. It features dual receivers for added data decode sensitivity in multi-path and fading environments.

When used with Dataradio's state-of-the-art Gemini-III (G3) mobile IP data solution, the system delivers unequaled high-speed data performance and unmatched effective throughput.

All Paragon-III models are supplied in a rack-mount configuration that includes:

- A Paragon-III full-duplex Radio-modem assembly that includes a Next generation high-speed Dataradio "Base Station Data Link Controller" module (BDLC-III) fitted in the radio chassis assembly.
- Duplexer and backup power units are custom furnished items.
- Wire line modem(s) are optional items.
- Laptop PC and its application software are user-supplied items.

1.2.1 Features:

- Parallel Decode (PD) technology featuring dual receivers for added decode sensitivity in multi-path and fading environments.
- Fully IP based product line, using an optimized IP layer that reduces IP overhead for the RF link
- Sophisticated dual DSP-based modem design provides added system performance, fewer retries and more effective throughput.
- Full duplex operation in the frequency bands of 800 MHz and UHF
- Power output:
    - 800 MHz model: 20W to 70W,
    - UHF model: 20W to 100W
- Models with on-air data speeds and modulation types as follows:

Table 1 - On-air data speeds and modulation types

Modulation type	Channel spacing	
	<25kHz (12.5 kHz, NPSPAC)	**25 kHz**
SRRC4FSK	14.4 kb/s	28.8 kb/s
	16 kb/s	32 kb/s
SRRC8FSK	21.6 kb/s	43.2 kb/s
	24.0 kb/s	48kb/s
SRRC16FSK	28.8 kb/s	57.6 kb/s
	32.0kb/s	64.0 kb/s

- Uses the Next generation high-efficiency Dataradio Enhanced DBA over-the-air protocol
- Over-the-air compatible with Gemini-III mobile products (factory settable)
- Out-of-band signaling enables transmission of GPS reports with no effect on system performance.
- Flash programmable firmware
- Modular design in a rugged die-cast aluminum chassis
- Paragon-III units are factory-configured based on each customer's network system requirements

1.3 Factory Technical Support

The Technical Support departments of DATARADIO provide customer assistance on technical problems and serve as an interface with factory repair facilities. They can be reached in the following ways:

For Canada and International customers:

DATARADIO Inc.

5500 Royalmount Ave, suite 200
Town of Mount Royal
Quebec, Canada H4P 1H7

Technical support hours: Monday to Friday 9:00 AM to 5:00 PM, Eastern Time

phone: +1 514 737-0020
fax: +1 514 737-7883

Email address: support@dataradio.com

or

For U.S. customers:

DATARADIO Corp.

6160 Peachtree Dunwoody RD., suite C-200
Atlanta, Georgia 30328

Technical support hours: Monday to Friday 8:30 AM to 5:30 PM, Eastern Time

phone: 1 770 392-0002
fax: 1 770 392-9199

Email address: drctech@dataradio.com

1.4 Product Warranty

Warranty information may be obtained by contacting your sales representative.

1.5 Replacement Parts

This product is usually not field-serviceable, except by the replacement of individual radio modules. Specialized equipment and training is required to repair logic, modem boards, and radio modules.

Contact Technical Support for service information before returning equipment. A Technical Support representative may suggest a solution eliminating the need to return equipment.

1.5.1 Factory Repair

When returning equipment for repair, you must request an RMA (Returned Material Authorization) number. The Tech Support representative will ask you several questions to clearly identify the problem. Please give the representative the name of a contact person, who is familiar with the problem, should a question arise during servicing of the unit.

Customers are responsible for shipping charges for returned units. Units in warranty will be repaired free of charge unless there is evidence of abuse or damage beyond the terms of the warranty. Units out of warranty will be subject to service charges. Information about these charges is available from Technical Support.

1.6 Packaging

Each Paragon-III product normally leaves the factory packaged as follows:

- A Series II Dataradio base station “Radio-modem assembly”
- A dual power supply assembly
- Standard seven-foot 120VAC power cords
- Two DC power cables to connect the radio assembly to the dual power supply assembly.

Frequently, Paragon-III product components are field-assembled prior to customer delivery.
The cabinetry may then be supplied in one of several custom rack-mount configurations that may also include fan, backhaul modems, duplexer/filters/combiners, and ancillary equipment.
If damage has occurred to the equipment during shipment, file a claim with the carrier immediately.

2. Installation

2.1 Overview

The cabinet and rack-mount housing the Paragon-III's radio assembly and the BDLC-III is generally installed in a sheltered facility. Occasionally located adjacent to the nerve center of the user's network, it is often located near tower sites or at remote locations where it operates unattended.

Furnishings needed include power, cabling, and installation of antenna, landline or microwave modem, and host PC or portable computer. Details of these are outside the scope of this manual. This manual covers the radio assembly and the BDLC-III that includes the modem.

2.2 Location

Be sure to place the Paragon-III in such a way that:

- The LEDs can be seen (as an aid in troubleshooting)
- Access to the antenna connector and to the back connectors is possible without removing the unit
- Sufficient air may flow around the unit to provide adequate cooling.

2.3 Front View:

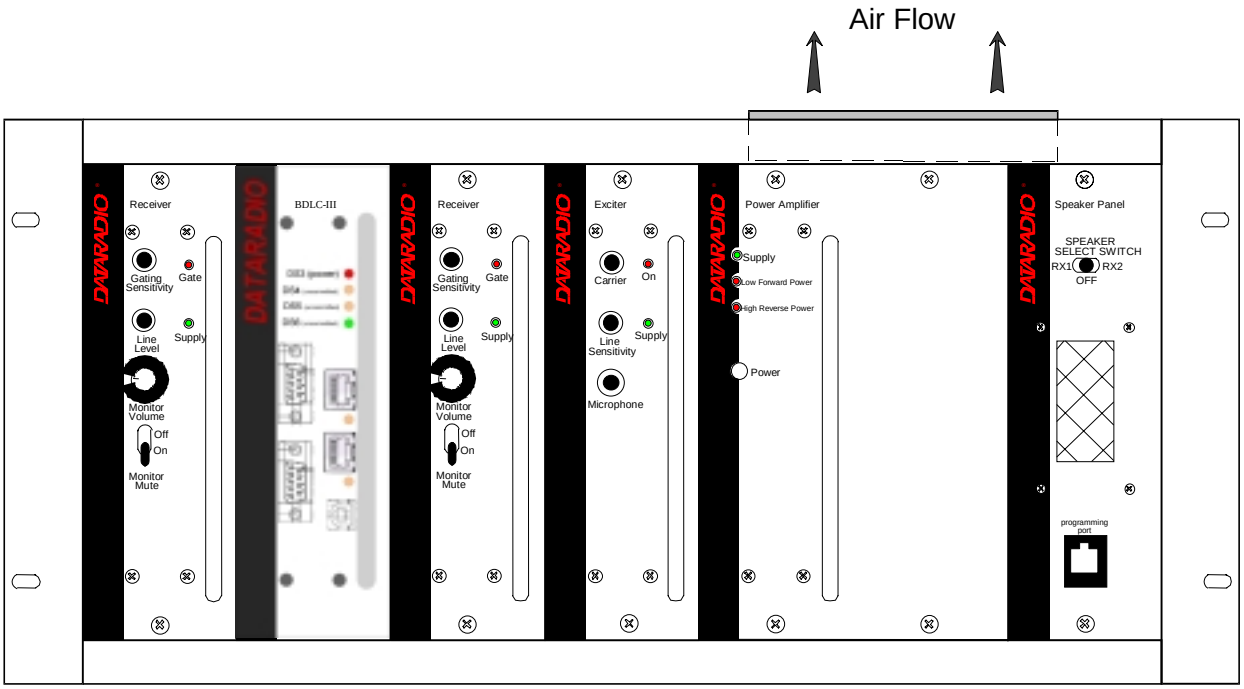


Figure 1 - Typical rack-mount multi-modules "Radio Assembly"

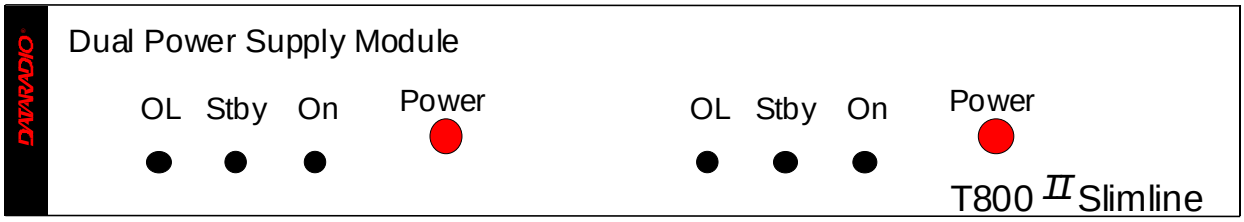


Figure 2 - Typical rack-mount dual "Power Supply"

2.4 Rear Views:

Figure 3- Base Station standard assembly

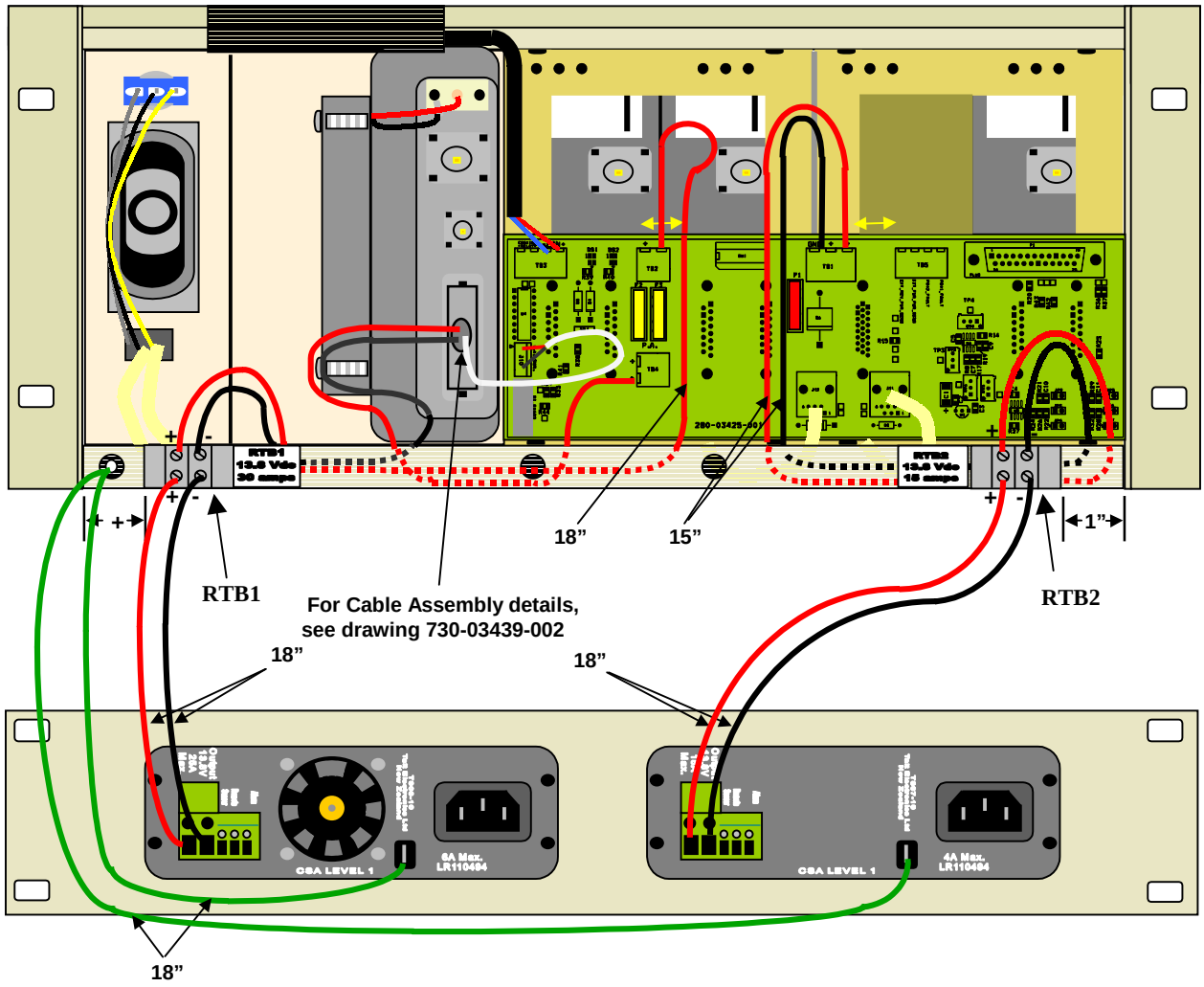
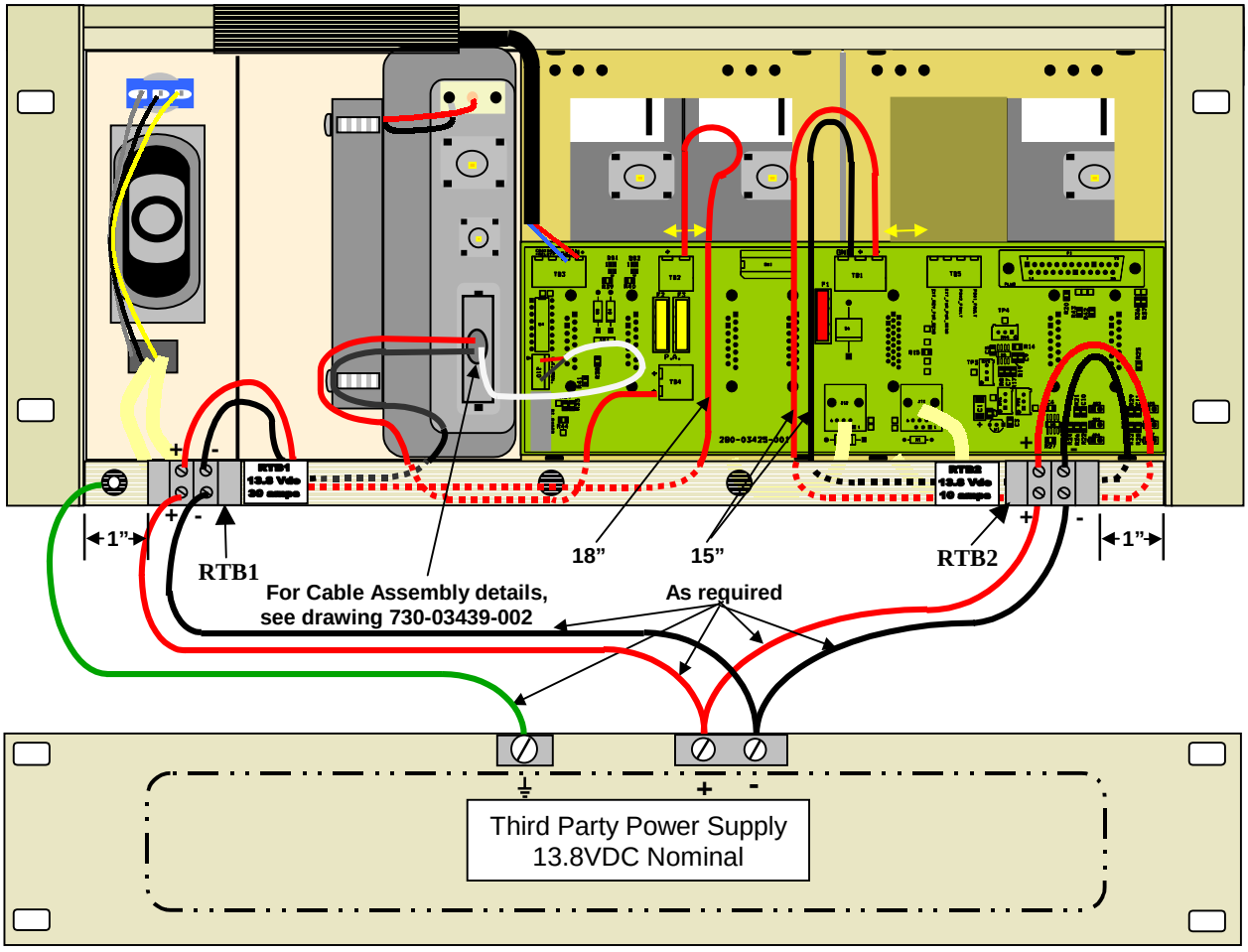


Figure 4 - Base Station standard assembly, with 3rd party DC supply module



2.5 Electrical

Standard 120 VAC electrical power is required. It should be capable of providing at least 10A to power Paragon-III (<6A) and ancillary equipment.

2.5.1 Paragon-III Assembly Power

Two distinct power configurations (rear views) are shown in the preceding pages. They are:

- Paragon-III Base Station Standard Assy.
  This configuration is described in paragraph 2.5.1.1 below.
- Paragon-III Base Station Assy. with 3rd party DC supply (Figure 4).
  Refer to Dataradio System Engineering for further details.

2.5.1.1 Standard Power Supply Configuration

The Radio assembly unit receives two separate 13.8 VDC power inputs from a "T800 Slimline" dual power supply typically rack-mounted right below the main assembly radio chassis.
The T800 is made up of two separate power supply units joined in a single chassis:

- A T807 using convection cooling is rated to 15A nominal at 13.8VDC. It supplies all the radio modules other than the Power Amplifier.
- A T808 using convection and fan cooling is rated to 25A nominal at 13.8VDC. It supplies only the Power Amplifier module (T859, or T889).

Normally used at room ambient temperatures, they can operate within their specifications over a range of –10 to +60 °C.

Note: Internal over-temperature protection shuts down the main transformer above 105 degrees Celsius.

Both power supply modules are internally connected to ground via their individual, rear-connected, seven-foot standard 120 VAC power cords. Nevertheless, each requires a separate secure electrical ground connection. Individual grounding tabs are provided next to the power connectors.
Similarly, the Radio Assembly chassis requires a secure ground connection. A threaded grounding binding post fitted with a knurled binding-nut is provided on the chassis next to DC input 2. Separate grounding leads with appropriate connectors are supplied (either in the courtesy small-parts kit or with one end fastened to the equipment.

- For each of the power supply modules, fit one end of the grounding lead's push-on connector onto the grounding tab.
- For the Radio Assembly chassis, install the grounding lead's lug over the binding post and firmly hand-tighten the binding-nut.
- For both T807 and T808 power supply modules
  1. Fit the slotted connector (on the other end of each of the grounding connector) under a conveniently located screw on the rack frame or other support surface. Scrape away paint if needed to ensure clean contact.
  2. Apply anti-corrosion compound where paint scraping was done.
  3. Ensure by testing continuity that a secure electrical and mechanical connection is achieved.

  If a –DC rail (0V) is installed as part of the system, the grounding leads may alternatively be fitted to the rail terminal.

Caution:

Improper grounding between power supply case and rack frame may result in harmful voltage potentials and/or miscellaneous power supply switching noise problems in both receivers and transmitter.

2.5.1.1.1 T808/807 DC Power Supply Connection & Torque Settings

Warning:

Securing the DC Power Supply cable into the DC connector to provide a good electrical connection is essential. Over time, the wires tend to compress in the DC connector resulting in an increasingly poorer connection. Consequently, as high current is drawn, the connector heats up increasing the resistance thereby causing still more heat until the connector eventually burns up.

Although screws securing DC cables to the Power Supply terminals are tightened to the torque settings given below prior to new system delivery, they must be re-tightened as part of the commissioning process and re-tightening is also part of the regular maintenance schedule.

Prior to replacing a Power Supply module into an existing system, inspect the cable and re-terminate the DC wires if the strands have previously been twisted together or show any sign of damage.

Cut the wire at the end of the insulation and then strip approximately .4 inch (10mm) of insulation off the cable. DO NOT TWIST THE WIRE STRANDS. Insert the DC cable into the screw terminal and tighten the screw to secure the cable as per the torque settings given below.

Torque Settings:

The manufacturer recommends torque setting all power supply terminal screws to:

- 0.5 to 0.6 Nm (or 4.5 to 5.3 In/lb or to .37 to .44 ft/lb)

  Note: Dataradio uses a Sturtuvan Richmond 29-pieces adjustable torque screwdriver model CAL36/4K.

  After tightening, pull on the cable to check the cable is secured tightly into the screw terminal.

2.5.1.1.2 Power Indications

- Press both red power buttons located on the front of the module to have complete power distribution to the Radio assembly. The power supply front panel LEDs indications are:

Table 2 - Power Supply, LEDs indications

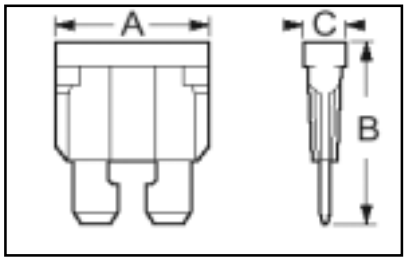
LED	Color	Indication
On	Green	Power enabled *
Stby	Red	Power disabled *
OL	Steady Red	Current Overload
On & OL	Flashing green and red respectively	Over voltage

* To remove voltage from the power supply PCB, disconnect the main power cords.

- For other Paragon-III LEDs descriptions, see section **Error! Reference source not found.**

2.5.1.2 Backplane Fuses

Blade fuses (Maxi-Fuse) are used on the Radio assembly backplane (see Figure 5):



Fuse Type	Dimensions – Inch (mm)		
	A	B	C
Maxi-Fuse	1.15 (29.21)	1.35 (34.29)	.35 (8.89)

Figure 5 - Maxi-Fuse

2.6 Antenna

2.6.1 Overview

Paragon-III commonly uses three antennas (one transmit and two receive) unless a duplexer is used with one of the receive antennas; then only two antennas would be needed. They should be mounted according to any guidelines supplied with the antennas. For antennas placement and spacing, consult System Engineering.

2.6.2 Cabling and Connection

1- Route good quality 50-ohm double-shielded coaxial cable(s) (e.g. RG-214 or Heliax) from the selected antenna position(s) to the Paragon-III Radio assembly.

2- Terminate the RX-1 and RX-2 cable-ends at the Receiver modules rear position with an N-type connector.

3- Similarly, terminate the TX cable-end at the Power Amp's module rear position with an N-type connector.

Caution:

When terminating RF cables use brand-name crimping tools (such as AMP, Jensen, Crimp-Master, etc…) of the correct size for the cable and type of connector used.

Common pliers are NOT acceptable.

2.7 Completing the physical Installation.

Paragon-III products are factory-configured to user's requirements and are shipped ready to run.

After new installations:

- Re-check that all connections are secure on the radio-BDLC assemblies (antennas, PC, power cords etc.)
- Check that fuses are inserted.
- Turn both BDLC-III and radio power ON.

You are now ready to check for normal operation (as per paragraph 2.8) and to run the Dataradio CDip program for testing or trouble-shooting.

Any change(s) to the settings must be done via files saved on diskette and loaded into the unit using the CDip program.

2.8 Checking out Normal Operation

1- Check that power is applied.

2- Check Radio assembly lights for proper operation as per section 3.1.1

3- Check for proper operation of the BDLC-III's LEDs.

4- Using the CDip program and an in-line wattmeter, check forward & reverse power to confirm main antenna installation

5- Using CDip, check the RF Data Link with a mobile that can be heard (as per section 4.3.1)

If user application and mobiles are available, test the installation by going through a normal sequence of transmitting and receiving messages.

3. Operating Description

3.1 Radio Assembly

The Radio assembly component of each Paragon product is made up of high performance synthesized radio base station designed for single operation. The Radio Assembly's modules are commonly installed in a standard, 19-inch wide rack frame.

The complement of modules is identical for Series II *UHF, and 800 MHz models*:

- 2 x Receivers
- 1 x Exciter
- 1 x BDLC-III (controller-modem)
- 1 x Power Amplifier
- 1 x Speaker panel
- 1 x Dual Power Supply

3.1.1 Receiver module

The RX1 and RX2 receivers' use identical front panel controls and indicators. These are:

- Gating Sensitivity - sets the RF signal level required to open the mute gate and allow audio to pass to the speaker[1].
- Gate LED - indicates the status of the mute circuit. It is lit when a signal above the mute threshold is received1.
- Supply LED - is lit when DC power is applied. Fast Flashes when linked with PGM800Win. Slow Flashes indicates VCO (synthesizer) out of lock. Unequal Flashes indicates internal communication error.
- Line Level - Not used
- Monitor Volume - The audio output delivers up to 1 watt to the speaker. Always set volume knob to minimum when not in use to reduce current consumption.
- Monitor Mute Switch - opens the mute, allowing continuous monitoring of the audio signal. On = audio muted

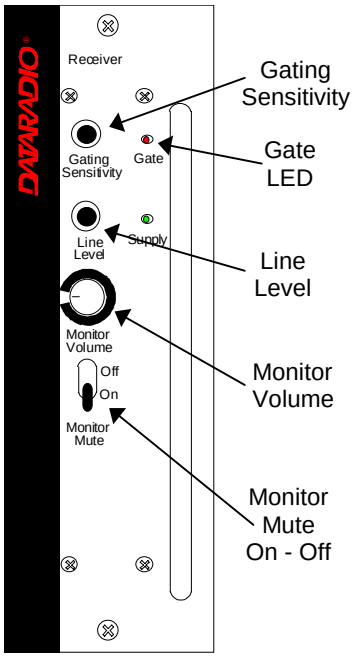


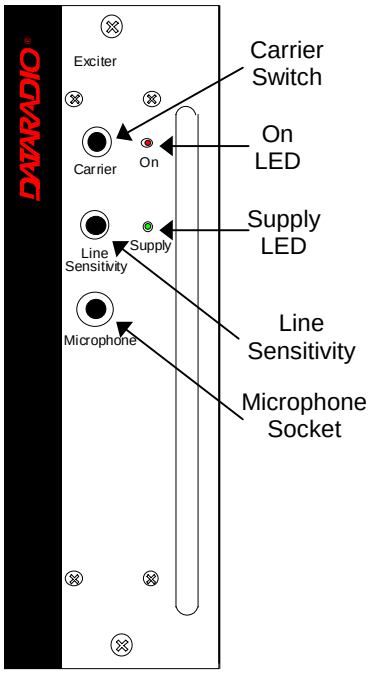
Figure 6 - Receiver module

[1] "Gating Sensitivity" and "Gate LED" are not functionally used except to allow listening to incoming receptions as a trouble-shooting aid.
Depending on the sensitivity adjustment, the Gate LED lights and a relay can be heard on incoming RF signals.

3.1.2 Exciter module

The Exciter's front panel controls and indicators are:

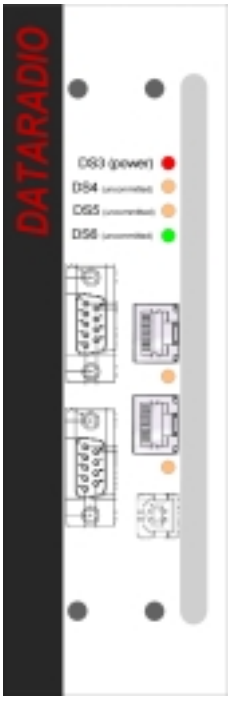
- Carrier Switch - momentarily keys the transmitter ON while pressed (used for test purposes only).
- On LED - is lit when transmitting
- Line Sensitivity – not used.
- Supply LED - is lit when DC power is applied. Fast Flashes when linked with PGM800Win. Slow Flashes indicates VCO (synthesizer) out of lock. Unequal Flashes indicates internal communication error.
- Microphone Socket – not used.



3.1.3 BDLC-III module

The BDLC-III's front panel connectors and indicators are:

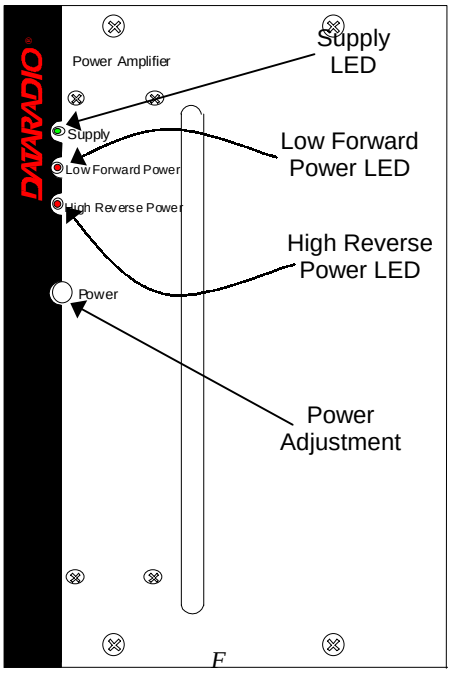
- 2x DE-9 RS-232 ports for setup and user data
- 4x main unit status LED
- 2x Ethernet ports – for setup and user data
- 2x Ethernet LEDs (status & activity)
- USB port – reserved.



3.1.4 Power Amp module

The Power Amp front panel and indicators are:

- Supply LED - is lit when DC power is applied.
- Low Forward Power LED - is lit when forward power is below the level set, normally 80% of nominal forward power.
- High Reverse Power LED - is lit when high reverse power is detected (e.g. VSWR= 3:1).
- Power - sets the PA output power:
  - UHF models: 20 - 100 Watts
  - 800 model: 20-70 Watts



igure 7 - Power Amp module

3.1.5 Speaker panel

The speaker panel is fitted with a four-Ω speaker.
Both series of radio assemblies share the same front panel fitted with an RJ11 connector. This connector is used to allow programming the radio from the front of the unit via a programming lead. This feature is exclusive to the Series II modules.
If the speaker panel needs to be removed, a mirror programming port connector is provided on the backplane.

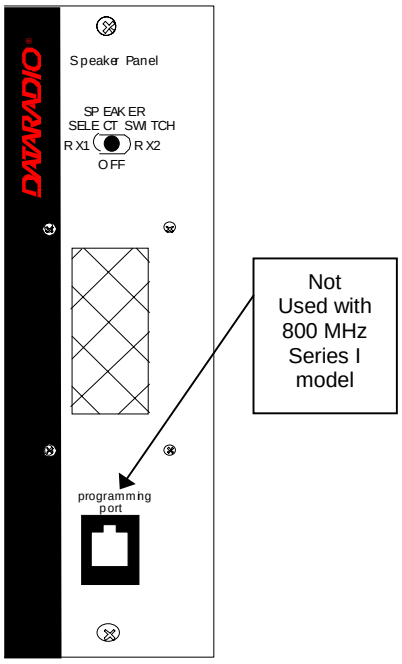


Figure 8 - Speaker module

3.1.6 Dual Power Supply module

The Dual Power Supply module is made up of two separate power supply units coupled in a single chassis.
Refer to:
Table 2 on page 9 for tabular listing of power supply LEDs indicators and Figure 9 below.

This module has:

- Two “Power” red-colored pushbutton switches - Push in for ON and release out for OFF. Control complete power distribution to the Radio assembly
- Two “ON” LEDs - light green when push button(s) is (are) ON; DC power is distributed to radio modules. Flash green in conjunction with the “OL” LED (flashing red) when an over voltage condition is present.
- Two “Stby”- Standby voltage LED, lights red when push button is off; AC power is applied but DC is not distributed to radio modules. To remove presence of voltage, disconnect both power cords.
- Two “OL” LEDs - Monitor current overload, light steady red when supply exceeds current limit set; nominally 25Amps (T808 model). Flashes red in conjunction with the ON LED (flashing green) when an over voltage condition is present.

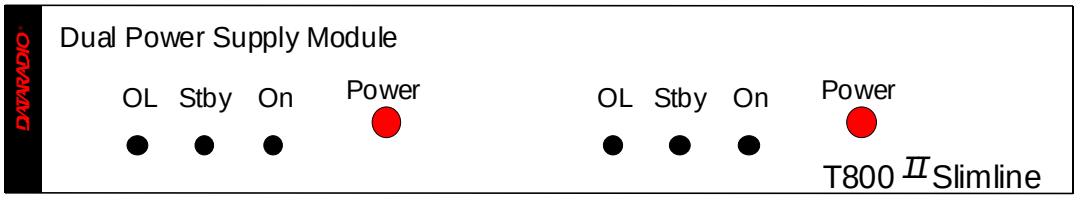


Figure 9 - Dual Power Supply Module front panel

3.1.6.1 Power Supply Rear Connections

The rear connections (convection-cooled model shown; fan-cooled model not illustrated) for each of the power supply are:

Fail Alarm –
Off: Power supply OK; approx. +Vout (via 1k resistor - typ. 13.8V).

ON: Power supply failure; approx. -Vout (via 11k resistors - typ. 0V)

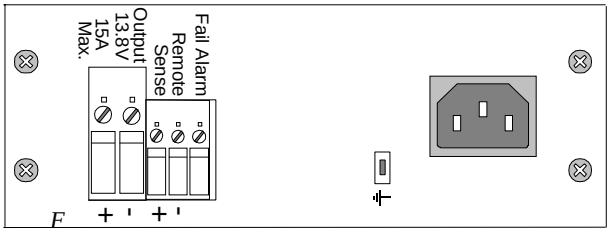
+ Remote – Not used for Paragon

- Sense – Not used for Paragon

-VE – main ground (0V)

+13.8V – Mains DC output supply

Note: more power supply installation details are covered in section 2.5.1



igure 10 - Dual power supply, rear connections

3.1.7 Radio Backplane Assembly

A single PCB backplane is used. The main components are:

- RJ11 connectors (J11, J12) – connects to the Speaker panel front RJ11. Used for programming the Radio modules.
- DB-25F port to ancillary equipement
- One channel-select DIP switch (SW1)
- Cooling fan driver – TB 3 located on backplane connects to the horizontally-mounted fan on top of the Radio assembly and activated by BDLC's PTT signal (setting JP1 2-3 will power the fan continuously).
- 30 A Fuse (F2 & F3) – two blade fuses (15ADC) in parallel are used for future Power amplifier
- 10 A Fuse (F1) – one blade fuse to power the other base station components (receivers, exciter and optionally the BDLC).

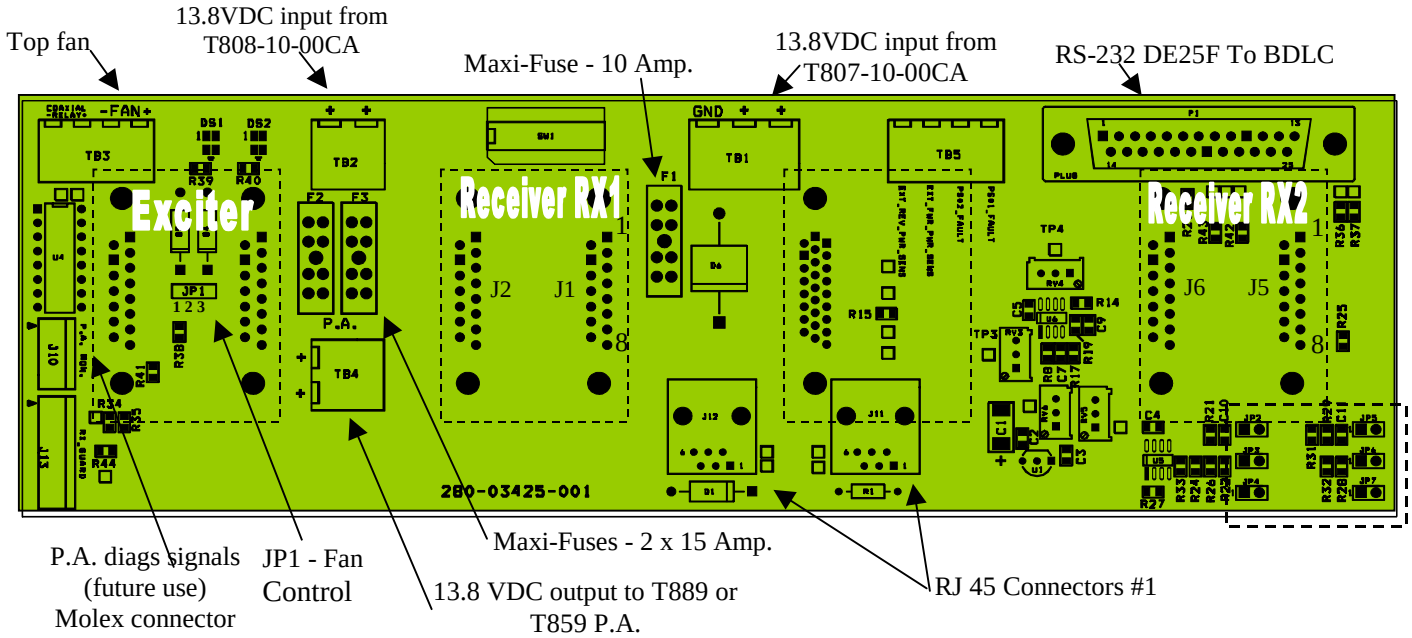


Figure 11 - 280 03425-001 Radio backplane

4. Trouble-Shooting and Testing

The checks described below should be done at time of installation, annual intervals, or whenever deterioration in performance is noted.

4.1 Equipment Required

- In-line watt meter (150W & 10 W ranges)
- Radio service monitor (IFR-120B with option 03: 30KHz IF filter or equivalent).
- RG-214 or RG-223 cable with N-Type male connector to connect Paragon-III to the service monitor.
- CDip 1.0 or later[1]

Important note: Before proceeding make sure that the service monitor has been calibrated recently and has warmed up for at least the time specified by its manufacturer.

*Some reported frequency and deviation problems have actually been erroneous indications from service monitors that have not adequately warmed up. This is particularly likely when field service is done during winter months***.**

4.2 Recommended Checks

A) After an installation

1. LED Indications
2. Using CDip, Save "unit config" to a file
3. Transmitter Output Power
4. Transmitter Reflected Power
5. RF Link test between Paragon-III and mobile unit(s)

B) For annual maintenance & trouble-shooting

Same checks as A) plus:

6. Carrier Frequency Error
7. TX Deviation
8. Low Frequency Balance
9. 12 dB SINAD
10. Receiver distortion
11. RSSI check
12. Verify power supply connections & terminals torque settings (see paragraph 2.5.1.1.1)

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1 To learn how to launch the Windows-based software alignment and system-testing tool CDip, please refer to the readme.txt file on the application's installation diskette.

For functional details of the numerous buttons and menu-selectable items available, please refer to the program's context sensitive help. It is also possible to access the help information via the F1 key.

Table 3 - Checklist A (After installation)

CHECKLIST A (Paragon-III) Recommended Check out after Installation				
Step	**ACTION**	**EXPECTED RESULTS at 25°C**	**MEASURE WITH**	**IF NOT?**
1	**Normal Power-up Sequence**	BDLC-III beeps once, all LEDs come ON for about four seconds, the green LEDs then flash in a "ripple" pattern for close to two seconds. All LEDs go OFF except the CK that should flash 6 to 8 times per second.		
2	**Connect and save unit config** Press CDip ***Get*** button	as per CDip Help content		
3	**Transmitter Output Power** Press ***TXON (Unmod)***	**UHF**: 20 - 100 watts **800 MHz**: 20 - 70 watts +10%, -10%	Service monitor set to read power or 150W in-line watt-meter installed as close as possible to the unit antenna connector.	[1]Check for bad connec-tions, damaged coax cable, etc.
4	**Transmitter Reflected Power** Press ***TXON (Unmod)***	< 5% of forward power or as specified by System Engineering.	10W in-line watt-meter	Check for bad connections, damaged coax cable, etc.
5	**RF Link test** Use the mobile address function and "Send" but-ton to dynamically test the link	Look for "Delivery confirmed" on the Status bar	Refer to 4.3.2 and to WinRIS Help content.	Mobile is out of range Refer to factory technical support.

[1] (unless unit has been set a lower value). Note that readings less than 100 watts for UHF or 70 watts for 800 MHz models, may be due to losses in cables used for testing. Check also your wattmeter frequency calibration curve. Do not be too ready to condemn the transmitter or the RF feedline & antenna installation.

Table 4 - Checklist B (General)

CHECKLIST B (Paragon-III) General Check out (part1 of 2)				
Paragon-III units are set and characterized at the factory to optimize performances. It is **not recommended** to try readjusting units unless it is really required. Misadjusting a unit may result in significant performance losses. **The proposed adjustments in the "IF NOT?" column below, should be tried ONLY if system data performance degradation is noticed combined with out-of-tolerance items.**				
Step	**ACTION**	**Expected Results at 25ºC**	**MEASURE WITH**	**IF NOT?**
1	**Normal Power-up Sequence**	BDLC-III beeps once, all LEDs come ON for about four seconds, the green LEDs then flash in a "ripple" pattern for close to two seconds. All LEDs go OFF except the CK that should flash 6 to 8 times per second.		
2	**Connect and save unit config** Press CDip ***Get*** button	as per CDip Help content		
3	**Transmitter Output Power** Press ***TX ON (Unmod)***	**UHF**: 20 - 100 watts **800 MHz**: 20 - 70 watts +10%, -10%	Service monitor set to read power or 150W in-line watt-meter installed as close as possible to the unit antenna connector.	Adjust "Power" on the front panel of the "Power Amp"
4	**Transmitter Reflected Power** Press ***TXON (Unmod)***	< 5% of forward power or as specified by System Engi-neering.	10 W in-line wattmeter	Check for bad connections, damaged coax cable, etc.
5	**Carrier Frequency Error** Press ***TX (Unmod)***	< ±300 Hz	Service monitor set to read frequency error	Adjust TCXO (IC700) (see inside Exciter module at, Figure 21(800), Figure 23(UHF))
6	**TX Deviation (KHz)** Press ***TX (modulated)*** Carrier will be modulated with a 1 kHz tone.	Refer to "Figure 12 - Carrier Deviations for Tone or Data modulation" per bit rates **Tolerance is +5%, -10% for all bit rates.**	Service monitor set to read deviation. (IF filter set to Mid or 30 kHz position)	Refer to technical support
7	**Low Frequency Balance** Initiate a *TX Random data test* via CDip	a) Record deviation level read from step 6 b) Record deviation read from *TX Random test* c) Difference between a) and b) should be: < 1.5 kHz (HC & NPSPAC) < 2.0 kHz (FC)	Service monitor set to read deviation (IF filter set to Mid or 30 kHz position, all audio filtering disabled)	Refer to Section 5.2.3.4

CHECKLIST B (Paragon-III) General Check out (part2 of 2)				
Paragon-III units are set and characterized at the factory to optimize performances. It is **not recommended** to try readjusting units unless it is really required. Misadjusting unit may result in significant performance losses. **The proposed adjustments in the "IF NOT?" column below, should be tried ONLY if system data performance degradation is noticed combined with out of tolerance items.**				
Step	**ACTION**	**EXPECTED RESULTS at 25°C**	**MEASURE WITH**	**IF NOT?**
Set the service monitor to generate on the selected receive frequency. Verify alternately for both receivers. The carrier should be modulated with a 1.0 kHz tone at deviation level specified below:				
8	**12 dB SINAD** (Dataradio wide band measurement method: no audio filtering) - For Full channel unit, set deviation to ±3 kHz. - For Half & NPSPAC channel unit, set deviation to ±1.5 kHz	Better than -108 dBm including cable loss (Typically -109 to -110 dBm)	- Backplane corresponding to the receiver being verified: J1 (RX1) or J5 (RX2), Pin 6 (see Figure 11, page 15) - Service monitor (IFR) set to SINAD - IFR IF filter set to MID position or 30 kHz wide filter.	Refer to section 5.2.2
9	**Receiver distortion** (Dataradio wide band measurement method: no audio filtering) - Set service monitor RF Gen output to –70 dBm - *Deviation level as per SINAD above.*	≤ 5.5 % (Typically < 3.5 %)	- Backplane corresponding to the receiver being verified: J1 (RX1) or J5 (RX2), Pin 6 (see Figure 11) - Service monitor (IFR) set to DISTORTION. - IFR IF filter set to MID position or 30 kHz wide filter.	Refer to section 5.2.2
10	**RSSI** Apply to each receiver input the following RF level UHF & 800 Mhz: -110dBm	**UHF & 800 MHz**: 2.0 VDC (+/- 0.3VDC) Note: BDLC must be connected to the radio during the measurements	- Backplane corresponding to the receiver being verified: J1 (RX1) or J5 (RX2), Pin 5 (see Figure 11) - DC Voltmeter measurement	Refer to section 5.2.2.5 for all models. Refer to factory technical support only if RX data performance degradation is noticed combined with out of tolerance RSSI readings.

4.3 Additional test details

4.3.1 Carrier deviations

Carrier Modulation								
SRRC16FSK			**SRRC8FSK**			**SRRC4FSK**		
	Tone	**Data**		**Tone**	**Data**		**Tone**	**Data**
Network Speed (b/s)	**Typical deviation in kHz** (1000Hz test tone)	**Maximum deviation in kHz**	**Network Speed** (b/s)	**Typical deviation in kHz** (1000Hz test tone)	**Maximum* deviation in kHz**	**Network Speed** (b/s)	**Typical deviation in kHz** (1000Hz test tone)	**Maximum* deviation in kHz**
Full Channel (800MHz)								
64000	± 2.8	±3.7	**48000**	± 2.8	± 3.7	**32000**	± 2.8	± 3.8
57600	± 3.5	± 5.0	**43200**	± 3.5	± 5.0	**28800**	± 3.5	± 4.8
Full Channel (UHF)								
64000	± 4.0	± 5.9	**48000**	± 4.0	± 5.8	**32000**	± 4.0	± 6.0
57600	± 4.2	± 6.2	**43200**	± 4.2	± 6.2	**28.800**	± 4.2	± 6.2
NPSPAC Channel (800MHz - U.S. only)								
32000	± 3.0	± 3.9	**24000**	± 3.0	± 3.9	**16000**	± 3.0	± 3.9
28800	± 2.7	± 4.2	**21600**	±2.7	± 4.2	**14400**	±2.7	±3.7
Half-Channel (UHF & 800MHz)								
32000	± 2.0	± 2.6	**24000**	± 2.0	± 2.6	**16000**	± 2.0	± 2.7
28800	± 2.2	± 3.2	**21600**	± 2.2	± 3.3	**14400**	± 2.2	± 3.2
***Data deviation shown may seem higher than tone deviation, however they fall within the appropriate FCC / IC's masks limits**								

Figure 12 - Carrier Deviations for Tone or Data modulation

4.3.2 RF Data Link Test

A link test between a mobile and a known base station can be done using the CDip "Address" and "Send" functions. The “Address” and “Device” fields, the “Send” button and the “Chat” message screen are used to send messages to specific mobile or base or to carry out RF test. Start by entering the address of the mobile (or base station) you wish to send a test message to or test:

1- Specify the address:

Addresses may be entered by typing directly in the “Address” field in two ways:

- Numerically, the valid address range is 1-126.
- As an “Alpha-Mapped-Nibble” (AMN) address, consisting of upper case letters in the range A-P.

The valid address range is A to GN.

- The base address is usually: 1.
- The program may display one of the following messages on the status bar:
- **For Paragon-III products:**

  “address is not in AMN or number format”

- **For mobile products:**

  “address is not in the range A – GN”

In either case, check that the address entered is within the acceptable range, is of a valid format and correctly typed.

2- Enter the Device number for mobile (or base station).

3- Press the Send button.

The Chat window reports “Sent to xx mobile” *(where xx is mobile name).*
If test is successful:
Status line reports “Delivery confirmed.
If test unsuccessful:
Chat window reports “Waiting”,
Then the Status line reports “Delivery Failed”.

5. Radio Programming and Adjustments

All receiver procedures detailed in this section should be done twice: once for the “Main” (or RX1) receiver module and a second time for the “Auxiliary” (or RX2) receiver module. Connect to the relevant module and its corresponding backplane PCB as required.

5.1 Series II Radio Programming

This procedure describes the steps needed to program the Paragon-III radio base station UHF, and 800 MHz (half & full channels).

5.1.1 Recommended Items

- 486 PC or better, MS-Windows 98 © or later
- T800win programming kit for Series II:
- PGM800Win programming software user's manual
- PGM800Win Windows based programming software version 3.0 or later
- T800-01-0002 programming cable (DB-25 to RJ-45 cable)
- Standard 25-pin parallel cable (terminated Male/Female)

5.1.2 Module Programming

Before starting programming, have a PC running MS-Windows © and the Tait PGM800Win software for Series II Base station.

This program supports the use of a mouse but may be used without one if required. Keyboard access follows the conventional MS-Windows © method as briefly described below:

- Press and hold the “Alt” key while pressing at the same time the relevant hotkey as indicated by an underlined letter on the menu command.
- On a drop-down menu, press only the hotkey without pressing the “Alt” key.
- Use the “Tab” key to cycle available fields and the “Enter” key to validate entries. *E.g. Pressing “Alt”+F opens the File drop-down menu and pressing “A” opens the Save As directory service box.*

- ***Receiver VCO and front-end alignment*** will be required when new receiver frequency is programmed outside the radio tuning range:

  800 = ± 3.0 MHz from previous center frequency
  UHF = ± 2.5 MHz from previous center frequency.

- ***Exciter and PA alignment*** will be required when new transmitter frequency is programmed outside the radio tuning range: ± 4 MHz from previous center frequency.

  1. Connect the PC, via the supplied programming lead, to the speaker panel’s front-mounted RJ11 connector.
  2. Run Tait PGM800Win program and follow instructions found in the T800 Programming Software User’s Manual to select the proper module to be programmed.
  3. Program required channel's frequencies.
     – Do not program any CTCSS tones on channels.
     – Do not change any other parameters.
     – Refer to Figure 13, Figure 14, Figure for screen program examples.
  4. Save the base station programming info to a file for further reference.

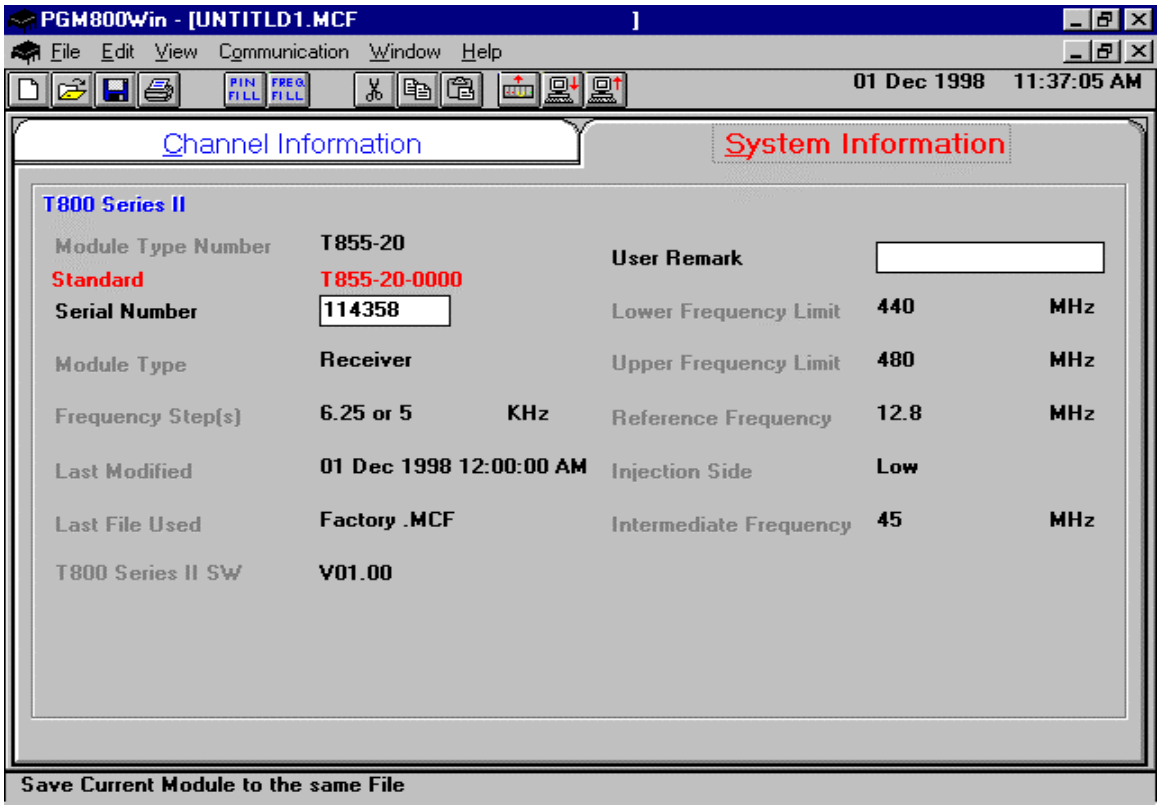

Figure 13 - Receiver System Information Sample

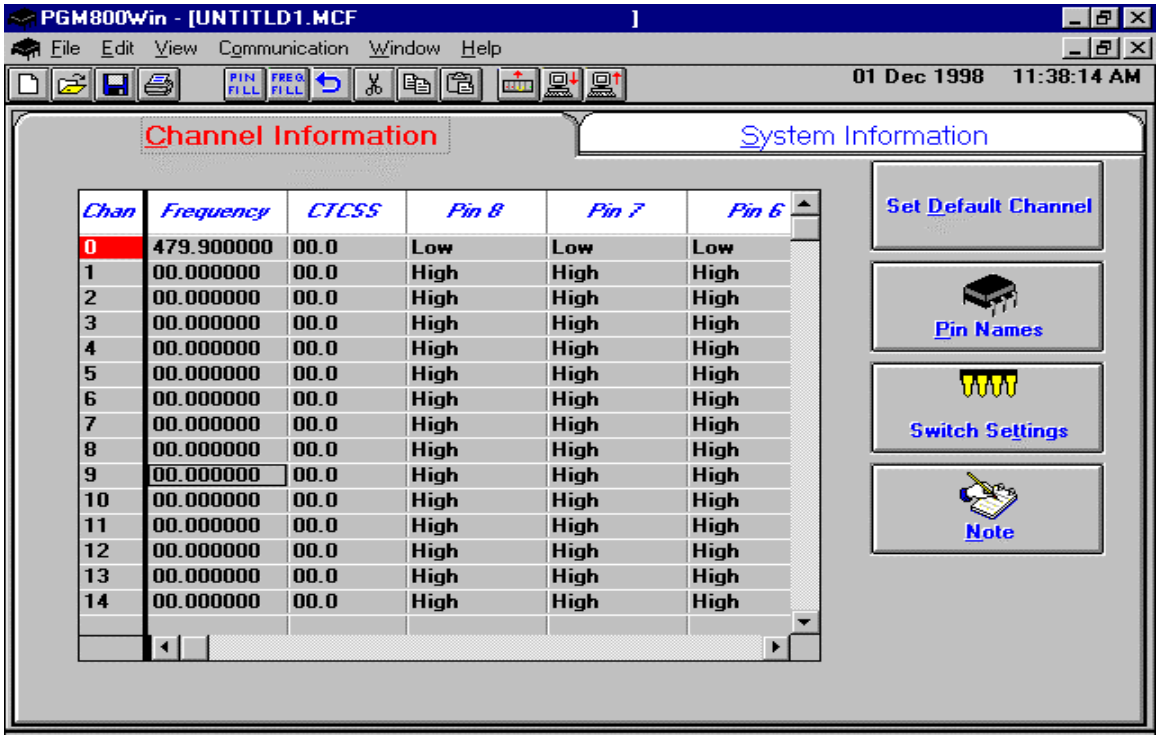

Figure 14 - Receiver Channel Information Sample

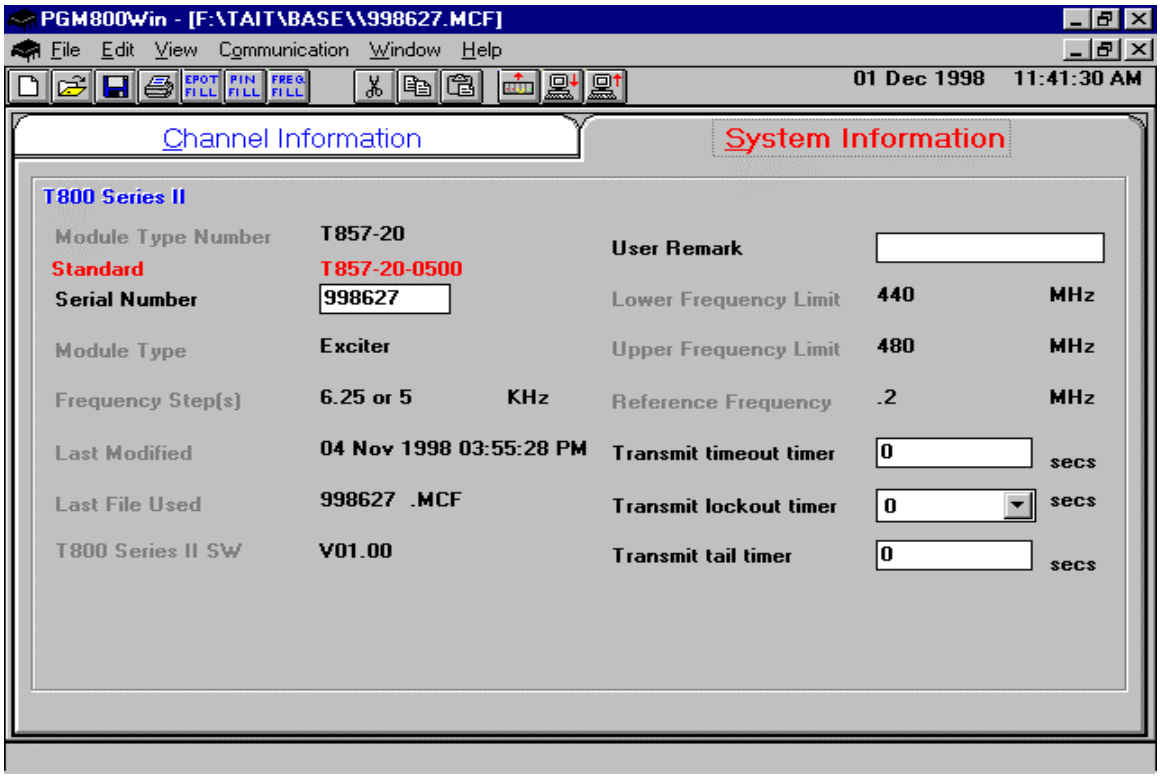

Figure 15 - Exciter System Infomation Sample

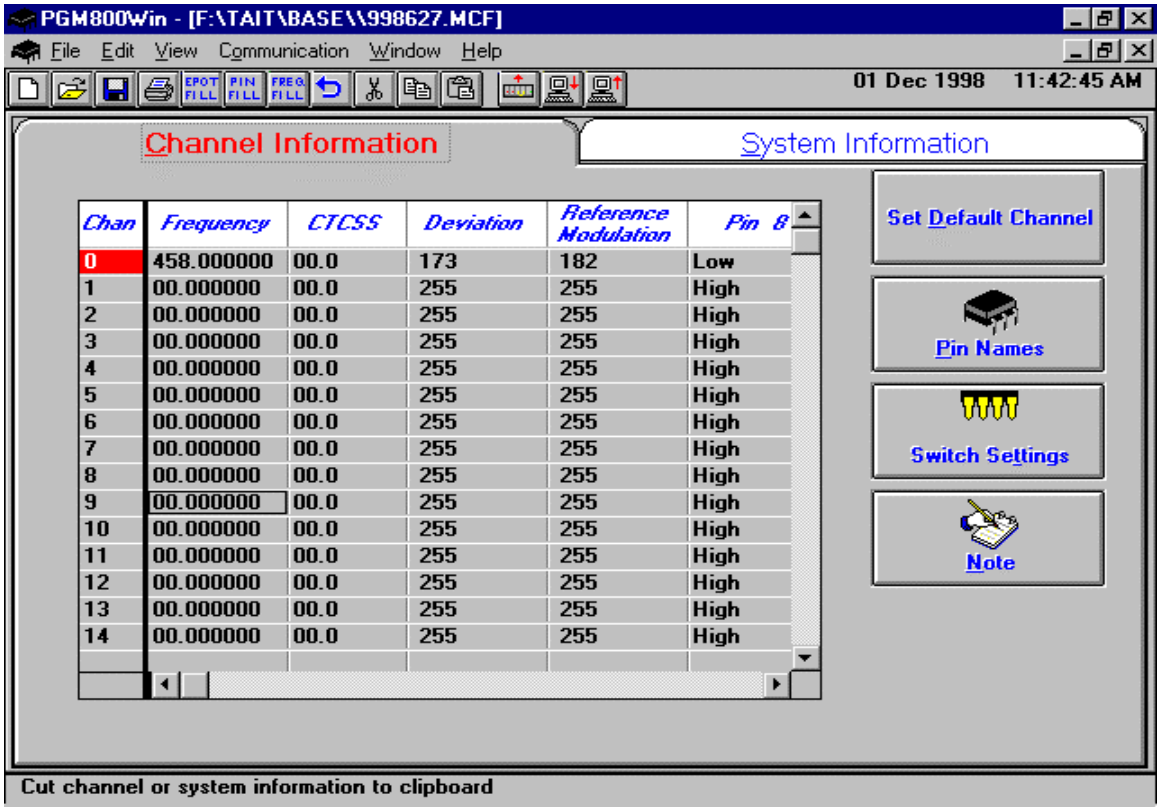

Figure 16 - Exciter Channel Information Sample

5.1.3 Channel Selection via DIP Switches

The backplane-mounted DIP switch settings override the default channel programmed by PGM800Win.

To set a default channel via the software, all DIP switches must be set to "OFF" (i.e. 00000000).

When a switch is "Off", its binary count is active; when a switch is "ON" its binary count is inactive. The various DIP switch combinations of ON or OFF make up a binary total, which identifies the channel number.

To select a channel, set the appropriate DIP switch or switches to "OFF" to make the binary count total the channel number you want. Set all other switches to "ON".

Example: To select channel 1, set the DIP switches as shown below:

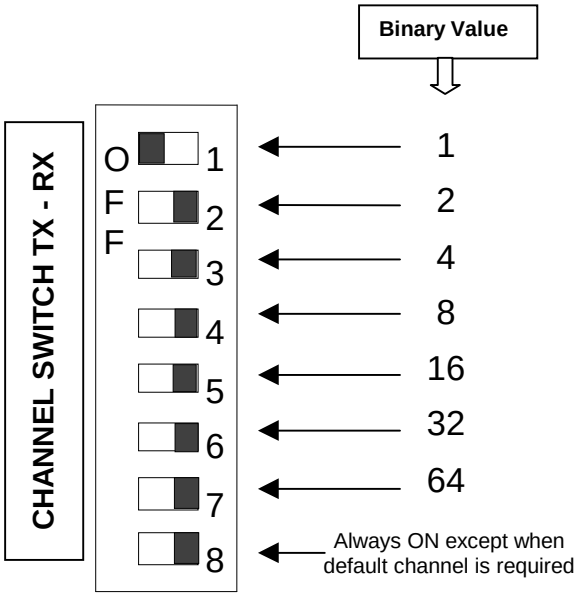

Figure 17 - Backplane DIP switches example - Channel 1 selected

5.2 Series II Radio Tuning

This section covers some basic Series II base station modules radio tuning and verification for:

- UHF (T85x-xx-0250) and
- 800 MHz MHz (T88x-xx-0200).

Note: Usually, this section is never done unless called for in section 5.1 "Series II - Radio Programming" or in Table 4 - Checklist B (General)**"Checklist B" (General).**

To identify the radio modules, check the part number on the manufacturer's label at the back of the Receiver, Exciter, and Power Amplifier modules:

RX	TX	PA
T885-10-0200 (800-870 MHz, 25kHz) T885-15-0200 (800-870 MHz, 12.5kHz & NPSPAC) T885-30-0200 (890-960 MHz, 25kHz) T885-35-0200 (890-960 MHz, 12.5kHz)	T881-1x-0200 (800-870 MHz) T881-1x-0200 (800-870 MHz) T881-3x-0200 (890-960 MHz) T881-3x-0200 (890-960 MHz)	T889-10 (850-870 MHz) TPL- PA8-2BF-LMS (890-960)
T855-10-0250 (400 - 440 MHz, 25kHz) T855-15-0250 (400 - 440 MHz, 12.5kHz) T855-20-0250 (440 - 480 MHz, 25kHz) T855-25-0250 (440 - 480 MHz, 12.5kHz) T855-30-0250 (480 - 530 MHz, 25kHz) T855-35-0250 (480 - 530 MHz, 12.5kHz)	T857-1x-0250 (400 - 440 MHz) T857-2x-0250 (440 - 480 MHz) T857-3x-0250 (480 - 520 MHz)	T859-10-0000 (400 - 440 MHz) T859-20-0000 (440 - 480 MHz) T859-30-0000 (480 -520 MHz)

5.2.1 Test Equipment

- Digital Multimeter & probes (e.g. Fluke 77)
- 1 HP 34330A Shunt 30A (UHF only, used for transmitter current measurement)
- Digital or Analog calibrated Oscilloscope & scope probes (X1, X10 selectable)
- Calibrated COM-120B (.001ppm OCXO and 30kHz IF options)
- 3-foot length of double-shielded N-M to BNC-M cable (RG-214 or RG-223)
- 2x 'BNC' to 'N' type adapters (e.g. Amphenol, Greenpar).
- Bird RF power meter with 150W / 50 ohm dummy load (optional)
- 3dB 150–watt attenuator
- 1x Torx screwdriver #T-10 and #T-20
- Pozidriv screwdriver #1 & #2
- 1x Six-inch adjustable wrench
- RF tuning/trimming tools.
- Extender Rail Kit for Series II chassis (T800-13-0000)
- 1x 6" coax cable N-M to BNC-M (comes with the radio to connect the exciter to the PA)

5.2.2 Receiver module (T885-xx-0200, T855-xx-0250)

Note 1: Refer to Figure 20 (T885), Figure 22 (T855)

Note 2: When the synthesizer is unlocked, the front panel green LED called "Supply" will flash indicating that it needs re-tuning.

Warning,

The LED will also flash when the unit is in setup mode while connected to the PGM800win program.

5.2.2.1 Initial Setup

This initial setup will be used during all receiver alignment procedures described below:

1. Remove the receiver (T885, T855) module from the Paragon-III rack frame
2. Remove the receiver top cover (nearest the handle).
3. Connect the Paragon-III Extender Rail Kit for Series II to the empty chassis receiver slot.
4. Prepare the Multimeter to DC Volts.
5. Apply power to the Paragon-III.

5.2.2.2 Synthesizer Alignment

Single channel: Connect the Multimeter to either side of L504 (T885) or the long lead of L1 (T855) in the VCO (this measures the synthesizer loop voltage).

1. T885 (800 MHz) Tune VCO trimmer CV500 for a synthesizer loop voltage of 10VDC.
2. T855 (UHF) Tune VCO trimmer C6 for a synthesizer loop voltage of 10V DC.

Multiple channels (adjusting as shown for single channel above):

1. T885 (800 MHz) Adjust the VCO loop to 10V using the middle frequency channel.
2. T855 (UHF) Adjust the VCO loop to 10V using the middle frequency channel.
3. All channels should lie within the upper and lower limits of respectively
   All channels should lie within the upper and lower limits of 16V and 3V respectively for the T885 and T855 or within 13V.

5.2.2.3 Front-End Alignment

1. IFR COM120B settings:
   a) Connect a 3 feet long double shielded cable (N-M to BNC-M) between the IFR T/R output and the receiver antenna connector.
   b) Select the generator mode (GEN button) and set to the main receiver channel frequency
   c) Select and turn-on GEN2
   d) Set the FM Deviation to ±3kHz (full channel) or ±1.5kHz (half channel) using 1KHz sine
   e) Select SINAD meter
   f) Use a X1 scope probe connected to SINAD input and monitor the Discriminator O/P on the back-plane at SK1 pin 6 (RX-audio1). Alternately, it is also possible to monitor at the receiver I/O Pad P207 (T885), the receiver TP314 (T855).
2. Adjust the helical resonators for best SINAD: #H400, #H401 and #H900 (T885); #FL410 and #FL420 (T855).
3. Continually decrease the RF level to reach 12dB SINAD, then re-do step 2) & 3) again. The absolute minimum requirement level to reach is -108dBm (typical level is -109 to -110 dBm)
4. Perform the SINAD linearity tests described in paragraph 5.2.2.4. If it fails to pass the requirement, contact your Dataradio technical support.

WARNING: Do NOT attempt to re-tune the IF stages

(I.e. L300 and L301 for T885, L310 to L390 for T855 or L330 to L360).

These adjustments do not need to be re-adjusted after frequency re-programming. Touching these coils will have a direct impact on the modem DSP ISI coefficient settings and may reduce significantly the radio performances over data.

5.2.2.4 SINAD and Linearity Check

1. Apply the following settings to the IFR COM-120:
   a) Generator mode, Output T/R, TX frequency to match the main radio RX frequency
   b) Filter set to wide band (no audio filter)
   c) Select Gen2 (Modulating tone fixed to 1KHz). All other Gen must be off.
   d) Set deviation to ±3.0KHz for full channel or ±1.5KHz for half channel radios.
   e) Use a X1 scope probe connected to the IFR SINAD input and monitor the Discriminator O/P on the radio backplane at SK1 pin 6 (RX-audio1). Alternately, it is also possible to monitor at the receiver I/O Pad P207 (T885), the receiver TP314 (T855).
2. Lower the RF level to get a 12dB SINAD reading. Level should be better than -108dBm (including cable loss).
3. Offset the IFR TX frequency 2kHz (full channel) or 1kHz (half / NPSPAC channel) ***above*** the main radio RX frequency, record the SINAD reading. It should remain within 1.5 dB from the on frequency SINAD reading. For T885 and T855, use above values.
4. Offset the IFR TX frequency 2KHz (full channel) or 1kHz (half / NPSPAC channel) ***below*** the main radio RX frequency, record the SINAD reading. It should remain within 1.5 dB from the on-frequency SINAD reading. For T885 and T855, use above values.

Note: If one of the above requirements is not met, try to re-tune the front-end. If still failed, contact your Dataradio technical support.

5.2.2.5 RSSI Adjustment

- Caution: mis-adjusting RSSI may reduce the Paragon-III's Parallel Decode (PD) performance.
- BDLC-III must be connected to the radio chassis assembly during this process.

1. T885-xx-0200 (800 MHz) and T855-xx-0250 (UHF) receivers:
Refer to Figure 20 - T885-0200 Receiver Tuning Controls location or

- Figure 22 - T855 Receiver Tuning Controls location
- Apply an on-channel signal from the RF generator at a level of -110 dBm modulated by a 1 kHz tone at a deviation of ±3kHz (full channel) or ±1.5kHz (half / NPSPAC channel).
- Adjust RV 345 (RSSI level) for T885, RV320 (RSSI level) for T855 to give 2.0V RSSI output at SK330 pin 2 (T855) or on backplane J1 (RX1) or J5 (RX2) pin 5 when measured with a voltmeter (See Figure 11 - 280 03425-001 Radio backplane for test point location).

The following RSSI graphics are given as general information only.
Refer to factory technical support ***only*** if RX data performance degradation is noticed combined with something that does not look like those RSSI curves.

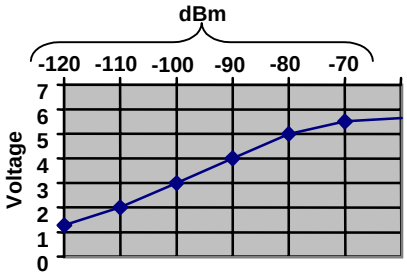

Figure 18 - T855 and T885, Typical RSSI Curve: volt to dBm

5.2.3 Exciter Module (T881-xx-0200,T857-xx-0250)

Note 1: Refer to Figure 21 (T881), Figure 23 (T857) for locating tuning controls and components.

Note 2: When the synthesizer is unlocked, the front panel green LED called "Supply" will flash indicating that it needs re-tuning.

Warning:

The LED will also flash when the unit is in setup mode while connected to the PGM800win program.

5.2.3.1 Initial Setup

1. Shut down power to the base station.
2. Prepare the Multimeter to DC Volts.
3. Remove the exciter (T881, T857) module from the base station rack frame.
4. Remove the exciter top cover (nearest the handle).
5. Connect a 3 feet long double shielded cable (N-M to BNC-M) between the IFR T/R output and the exciter antenna connector.
6. Connect the Paragon-III Extender Rail Kit to the empty chassis exciter slot.
7. Apply power to the base station.

5.2.3.2 Synthesizer Alignment

Single channel: Connect the Multimeter to either side of L309 (T881) or the long lead of L1 in the VCO (T857) (this measures the synthesizer loop voltage).

1. T881 (800 MHz) Tune VCO trimmer CV300 for a synthesizer loop voltage of 10V DC.
2. T857 (UHF) Tune VCO trimmer C6 for a synthesizer loop voltage of 10V DC.

Multiple channels (adjusting as shown for single channel above):

1. T881 (800 MHz) Adjust the VCO loop to 10V using the middle frequency channel.
2. T857 (UHF) Adjust the VCO loop to 10V using the middle frequency channel.

All channels should lie within the upper and lower limits of 16V and 3V respectively for the T881 and T857 or within 13V.

Note:

Normally, the fast TX key option is installed and the synthesizer is always energized. In the case where that option was not fitted, key the transmitter by pressing the front panel Carrier button to make the above adjustment possible.

5.2.3.3 TX Frequency Error Adjustment

1. Apply the following settings to the IFR:
   - Receiver mode
   - IFR RX frequency to match the main radio TX frequency
   - IF Filter set to 30KHz
   - Zoom the RF Error window: select 10Khz range
2. Key the transmitter by pressing the front panel TX-Key button and measure the carrier output frequency. It should be within ±300 Hz. If it is not, adjust the TCXO (IC700) to trim to meet the requirement, preferably within 100Hz.

5.2.3.4 Low-Frequency Balance Adjustment

Note:

- *PGM800Win version 3.00 or later must be used. Electronic potentiometer (256 step) is used to allow channel adjustment of two-point modulation (Low freq. balance).*

1. Apply the following settings to the IFR:
   – Receiver mode and Oscilloscope display (Source Demod out connector, DC coupled).
   – IFR RX frequency to match the radio transmit frequency
   – IF Filter set to 30KHz
   – Zoom the Deviation window: select 10kHz Range and DC coupling.
2. Select the active or, the lowest (in the case of multi-channel base) frequency channel (via dip switch, refer to Figure)
3. Transmit a square wave by using CDip (using a second serial port).
4. Press EPOTs button. Adjust IC220 via PGM800Win “reference modulation” to obtain the best square wave, no damping, no overshoot. (You can use either the mouse or up and down arrow keys). Record the deviation read.
5. For single-channel unit, proceed to step 8.
6. For multi-channel unit, select the highest frequency channel. Transmit a square wave via CDip and record deviation again.
7. The difference in deviation between the two channels should be less than ±300Hz. If not, re-adjust IC220 to "average" the square wave shape on both channels until the spec is met.
8. To confirm the adjustment, select the active, or the lowest frequency channel. Compare the deviation produced between 1000 Hz sine wave test tone and Random data test pattern

   The difference between the test tone and the test pattern should be:

   - < 1.6 kHz (SRC4FSK, SRC8FSK: HC & NPSPAC)
   - < 2.1 kHz (SRC4FSK, SRC8FSK, SRC16FSK: FC)

   For multi-channel unit, repeat this step on the highest frequency channel.
9. Select the active channel. Transmit a TX ON (Modulated) adjustment tone via CDip. Make sure that deviation level read on the IFR correspond to model and bit rate in use. Re-adjust deviation as necessary referring to Checklist B at step 6, page .

5.2.3.5 Exciter Power Output

1. Apply the following settings to the IFR:
   - Receiver mode, Output T/R
   - IFR RX frequency to match the main radio TX frequency
   - IF Filter set to 30KHz
   - Select auto range in the *Power reading* window
   - Connect the coaxial cable from the IFR T/R to the Exciter output connector
2. Key the Exciter by pressing the module PTT button. The output power at the coaxial cable end connecting to the power amplifier should be:
   - UHF (T857) = 1W ±300mW (no adjustment provided)
   - 800 MHz (T881) = 4W ±300mW (RV502, Figure 21)

5.2.4 Power Amplifier Module (T889 (*800-870 MHz only*), T859)

- Re-install the exciter module into the Paragon-III rack frame.
- Connect the Exciter module to the Power Amplifier.
- Connect the Power Amplifier output to the IFR T/R connector or to a stand-alone BIRD style power meter, terminated with a 150W dummy load.
- Forward and reverse power alarm set (control) are identified on the PA cover.

5.2.4.1 Power Amplifier Power Output

- Key the transmitter on the exciter and adjust the PA output for required output (max 100W for UHF and max 70W for 800) using the front panel power control

  If power cannot be reached, refer to section 5.2.4.4 for T859 UHF model, or factory technical support for T889 models. Cable loss should be included in the reading.

5.2.4.2 Forward Power Alarm Level (Optional setting)

1. Power up the PA and adjust front panel power control so that the output power is at the alarm level required, usually 20% lower than nominal value (e.g. 40W if the PA normally operates at 50W).
2. Adjust the forward power alarm set (T889: RV101and T859: RV48) so that the forward power alarm LED lights.
3. Adjust front panel power control for the normal operating power level

5.2.4.3 Reverse Power Alarm Level (Optional setting)

1. Power up the PA and adjust the front panel power control for the normal operating power level.
2. Connect an unterminated 3dB 150 W pad to the PA output (e.g. 3:1 VSWR) and adjust the reverse power alarm set (T889: RV105 and T859: RV52) so that the reverse power alarm LED lights.

5.2.4.4 Tait T859 (UHF) Standard Tuning Procedure

1. For sets with serial numbers following 217262, set RV69 (driver power level) fully clockwise.
2. For all units, preset the tuning controls as shown in Figure 19

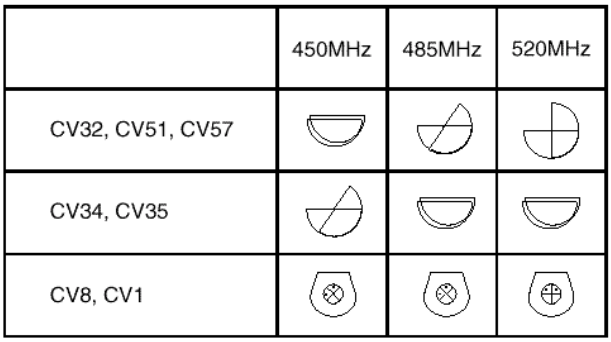

Figure 19 - T859 Tuning settings

3. Set RV63 (front panel power control) fully clockwise.
4. Key on the exciter (press PTT button).
5. Adjust CV1 for maximum output.
6. Adjust CV8 for maximum output.
7. Adjust CV32 for maximum output.
8. Adjust CV51 and CV57 for maximum output.
9. Adjust CV34 and CV35 for maximum output.
10. Recheck all settings. The power output should exceed 110W.
11. For sets with serial numbers following 217262, adjust RV69 (driver power level) until the output power drops to 110W.
12. For all units, adjust RV63 (front panel power control) to reduce the power output to the required level (normally 100W).

5.2.4.5 Tait T859 Tuning for Best Efficiency

1. Insert a Shunt current device (HP 34330A Shunt 30A) between the power supply red wire and its 13.8Vdc output, then connect the shunt to the multimeter (VDC scale)
2. While transmitting, monitor the current. It should remain under 22A.
3. Retune CV32, CV51 and CV57 towards maximum capacitance to obtain minimum supply current, but do not exceed a maximum drop of 0.5A per control.
4. Check that the supply current is <22A for 100W output power.

Note: These control settings are normally very close to minimum supply current. If the current is reduced too far, maximum power output will drop and 2f rejection may degrade.

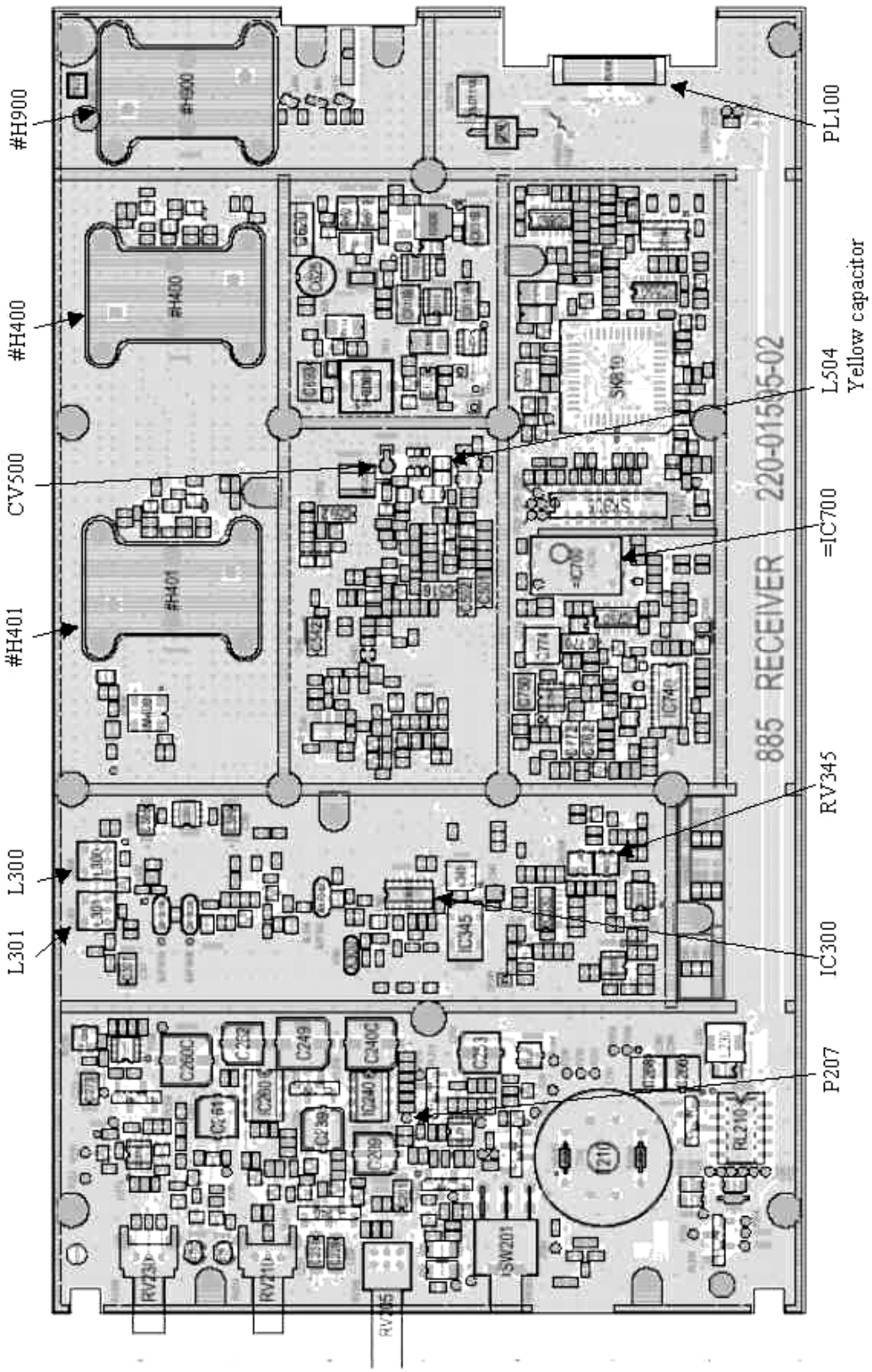

Figure 20 - T885-0200 Receiver Tuning Controls location

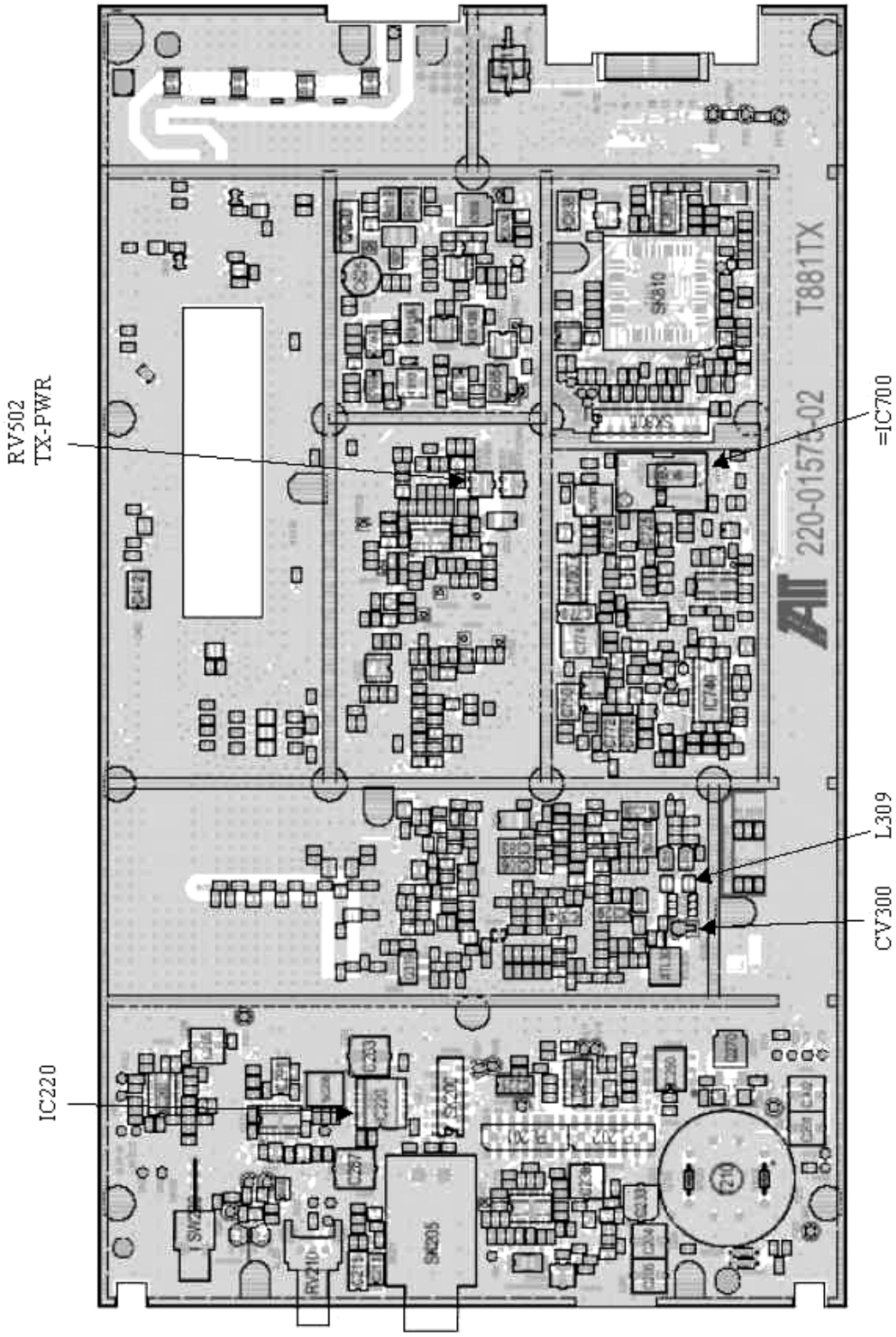

Figure 21 - T881-0200 Exciter Tuning Controls location

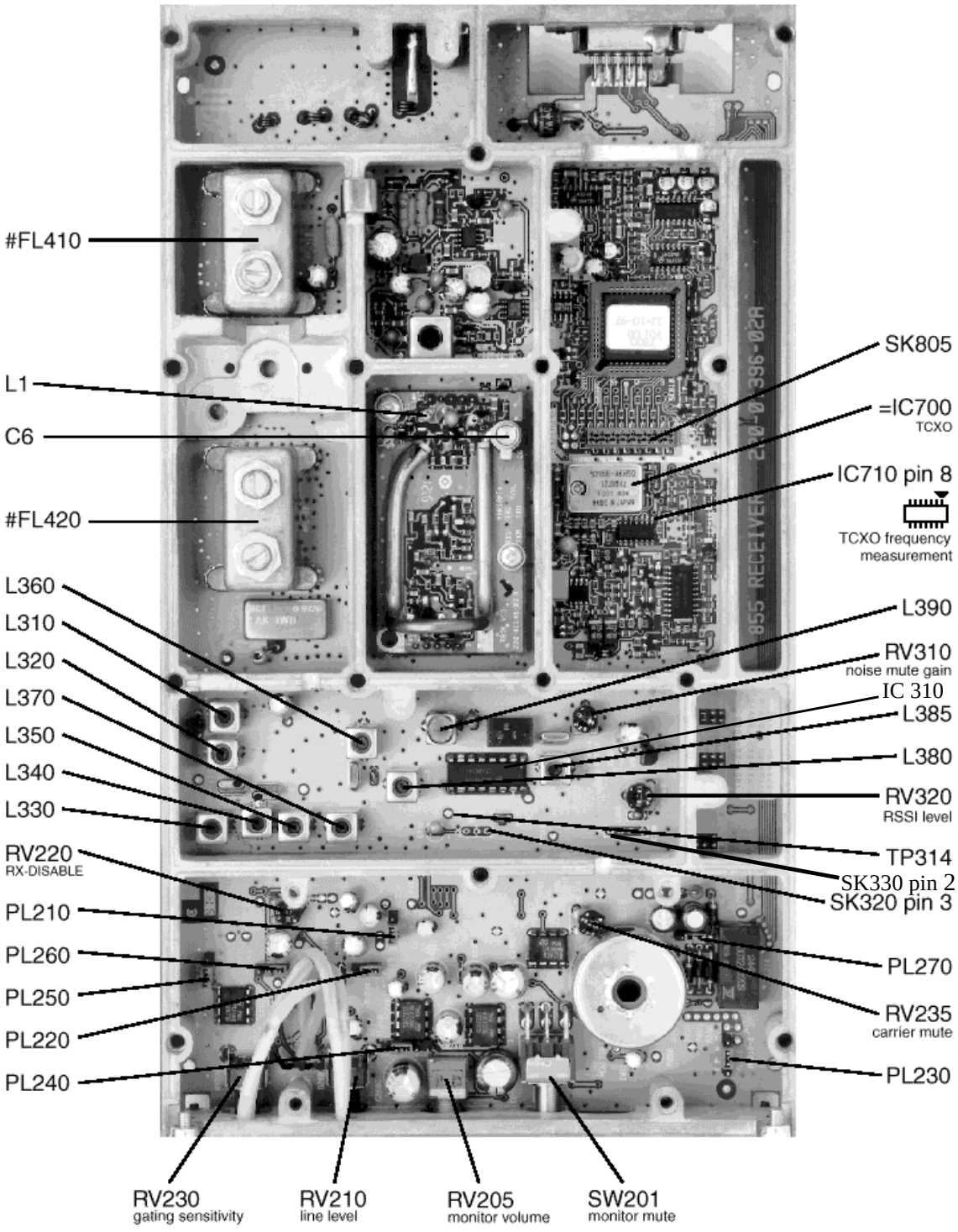

Figure 22 - T855 Receiver Tuning Controls location

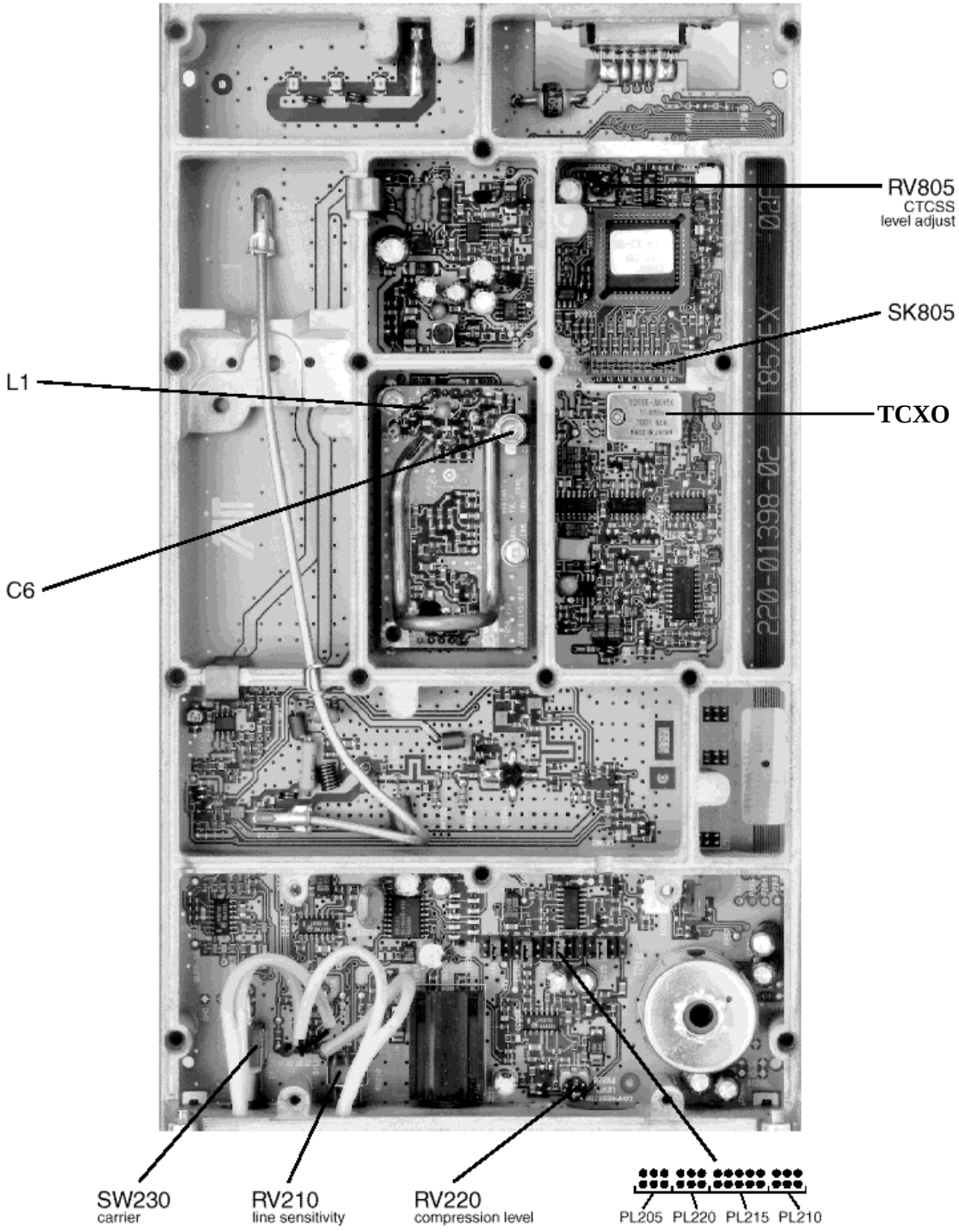

Figure 23 - T857 Exciter Tuning Controls location

6. Specifications

GENERAL

		UHF	800	
Frequency		400 - 440 MHz[1] 440 - 480 MHz 480 - 520 MHz	800 - 870 MHz	
RF/Modem Assembly Size	19.0" W x 17.5.0" H x 12.5" D + 2.0" connector allowance			
Frequency Stability		1.0 ppm (-20 to +60°C)		
Supply Voltage	13.8 VDC nominal (negative ground), 10.8 - 16 VDC or 120 VAC			
Circuit protection (radio backplane)	Main fuse (F1): Blade fuse (Maxi-Fuse) 10A : Power amp. fuse (F2 & F3): Blade fuses (Maxi-Fuse) 2 x 15A (30A total) Crowbar diodes for reverse polarity protection			
RX Current Consumption @ 13.8 VDC	1.5A max. (Two receivers with speaker monitoring)			
TX Current Consumption @ 13.8 VDC		24A (22A DC typical @ 450MHz for 100W)	28A (23A DC typical @ 850MHz for 70W)	
Base Station Power Consumption @ 120 VAC	6A max.			
Channel spacing	25 kHz and 12.5 kHz			
Operating Temperature Range	-30°C to +60°C (deleted power supply, catalog number with 0 in second to last digit) -10°C to +60°C (with standard Dual Power Supply assy., catalog number with 2 in second to last digit)			

RECEIVER

Selectivity @ 25 kHz @ 12.5 kHz		87 dB min, 90 dB (Typical) 83 dB min, 85 dB (Typical)	85 dB min, 88 dB (Typical) 79 dB min, 80 dB (Typical)
Sensitivity @ 12 dB SINAD	-116 dBm*		
Spurious Response Rejection	100 dB (Typical)		
Intermodulation Rejection - EIA (25 kHz) - EIA 300-096 (12.5 kHz)		85 dB (Typical) 80 dB (Typical)	80 dB (Typical) 75 dB (Typical)
Hum and Noise - EIA (25 kHz) - ETS 300-096 (12.5 kHz)	55 dB* 50 dB*		47 dB* 45 dB*

***** Psophometrically weighted (De-emphasis response)

TRANSMITTER

Rated Continuous RF Power		100W	70W	
Range of Adjustment		20 – 100 W	20 – 70 W	
Spurious Emissions: - transmit - standby	-36 dBm to 1GHz, -30 dBm to 4 GHz (to 3.2GHz for 800 model) -57 dBm to 1GHz, -47 dBm to 4 GHz ((to 3.2GHz for 800 model))			
VSWR Stability	5:1 mismatch			
Transmitter Sideband Noise @ +/-25 kHz @ +/- 1 MHz		-95 dBc -105 dBc	-88 dBc -100 dBc	

[1] **WARNING**: The frequency band 406 to 406.1 MHz is reserved for use by distress beacons and should not be programmed into the unit.

Operation	Full duplex
Protocol	Dataradio Proprietary NextGen with OOB AAVL support

Data rates and Modulation type	SRRC4FSK (14400 b/s, 16000 b/s, 28800 b/s, 32000 b/s) SRRC8FSK (21600 b/s, 24000 b/s, 43200 b/s, 48000 b/s) SRRC16FSK (28800 b/s, 32000b/s, 57600 b/s 64000b/s)			
Rx Sensitivity for 1% Packet Error Rate with Parallel Decode, at carrier frequency	UHF (Full channel)	UHF (Half channel)	800 MHz (full channel)	800 MHz (NPSPAC)
	TBD	TBD	TBD	TBD
	TBD	TBD	TBD	TBD
	TBD	TBD	TBD	TBD
	TBD	TBD	TBD	TBD

FCC / IC CERTIFICATIONS		FCC	IC (DOC) *
UHF	400 - 440 MHz	EOTBDD4T85-1	773A-BDD4T85
	440 - 480 MHz	EOTBDD4T85-2	
	480 - 520 MHz	EOTBDD4T85-3	N/A
800 MHz Series II	800 - 870 MHz	EOTBDD4T881S2 (4Watts) EOTBDD4T889 (70 Watts)	773A-BDD4T88

* Operating under Class II permissive change, approval pending for technical reassessment

EMISSION DESIGNATORS

Bit rate 4FSK 8FSK 16FSK	Baud rate	Pulse shaping	UHF	800MHz	
32000 48000 64000	16000	SRRC	16K5F1D (C)	13K6F1D (G)	
28800 43200 57600	14400	SRRC	16K2F1D (C)	13K4F1D (G)	
16000 24000 32000	8000	SRRC	8K50F1D (D)	10K0F1D (H) TBD (D)	
14400 21600 28800	7200	SRRC	8K67F1D (D)	10K7F1D (H) TBD (D)	