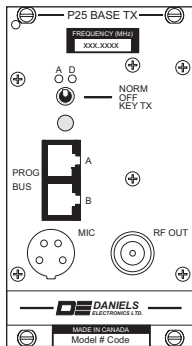# TN366 UT-4D400 UHF P25 Digital Base Transmitter

The UT-4D400 P25 digital base transmitter is a high performance, low power FM transmitter capable of P25 digital or analog operation in 12.5 KHz (narrowband) or 25 KHz (wideband) channels. The UT-4D400 base transmitter operates in one of two frequency bands: 406 to 430 MHz or 450 to 470 MHz. A modular design allows each of the transmitter's internal modules to be individually assembled and tested. This facilitates construction, tuning and maintenance as well as troubleshooting procedures. The transmitter can be programmed with up to 2 banks of 16 channels each.

Daniels P25 digital base transmitters are primarily used in base station applications and will transmit clear or secure (encrypted) P25 and analog voice radio communications (secure mode operation is optional). P25 transmitter options such as Frequency, CTCSS, NAC and analog / digital operation are software programmed with Daniels Radio Service Software package.

Specifications

Frequency Bands	406 - 430 MHz / 450 - 470 MHz
Channel Spacing	12.5 KHz and 25 KHz
Transmitter Switching Range	Unlimited
RF Output Power	0.5 to 2.0 or 2.0 to 8.0 Watts adjustable
Duty Cycle	100% Continuous Duty
Undesired Emissions (Conducted Spurious)	< -70 dBc
FM Hum & Noise Ratio (300 Hz - 3.4 KHz)	> 40 dB
Carrier Frequency Stability	± 1.0 ppm (-30 °C to +60 °C)
Modulation Type (Analog)	11K0F3E (FM) or 16K0F3E (FM)
Modulation Type (Digital)	8K10F1E (FM)
Audio Distortion (Analog)	< 3.0 %
Audio Frequency Response (Pre-Emphasis)	+1.0, -3.0 dB (300 Hz to 3.0 KHz)
VSWR Protection	< 20:1 (All Phase Angles)
Output Impedance	50 Ω (Type N Connector)
Operating Temperature	-30 °C to +60 °C
Standby Current	< 75 mA (no encryption) / < 105 mA (encryption)
Transmit Current (2.0 W)	< 1.70 A
Transmit Current (8.0 W)	< 2.80 A

Models Available

UT-4D420-B0-x00	12.5 / 25 KHz Bandwidth, 2.0 or 8.0 W, 406 - 430 MHz, no encryption capability
UT-4D460-B0-x00	12.5 / 25 KHz Bandwidth, 2.0 or 8.0 W, 450 - 470 MHz, no encryption capability
UT-4D420-B1-x00	12.5 / 25 KHz Bandwidth, 2.0 or 8.0 W, 406 - 430 MHz, DES-OFB encryption capable
UT-4D460-B1-x00	12.5 / 25 KHz Bandwidth, 2.0 or 8.0 W, 450 - 470 MHz, DES-OFB encryption capable

## Transmitter Operating Frequency

The transmitter is initially aligned at the factory for the frequency stamped on the 'Factory Set Operating Frequency' label on the front panel. For any frequency change, no re-alignment of the transmitter may be required. To align and / or adjust the transmitter the outer cover needs to be removed, the transmitter needs to be plugged into the subrack via a cable and / or extender card and power must be applied to the system. A 50 Ω dummy load should be connected to the RF output when transmitting.

Transmitter Alignment Procedures

RF BOARD SHIELD

FRONT PANEL

TO TX AMP RF IN

TRANSMITTER 14 HP CASE

TX POWER AMPLIFIER
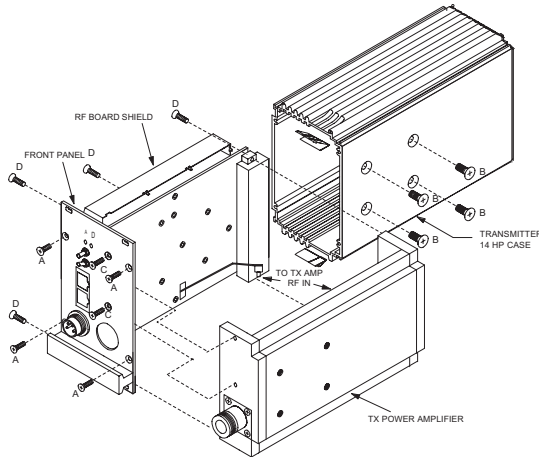
Remove the four front panel screws (A) and four side panel screws (B) to slide the transmitter outer cover off and expose the Main Board, Controller and DSP Boards, RF Board and Amplifier. Remove the two front panel screws (C) and the four internal screws (D) to remove the Amplifier Assembly.

RSS Service Mode:

The RSS has the ability to put a transmitter into Service Mode, where the Reference Oscillator may be aligned and a Transmitter Test Pattern can be generated. To put the transmitter into Service Mode, it must be connected to a PC running the Radio Service Software (RSS) through the Radio Programming Interface Module (RPIM). Connect the RPIM to the transmitter and apply power. From the RSS Transmitter Configuration window, click on the Service button. Note that you must not remove power to the radio or swap radios during servicing. When any required Service functions have been completed, the radio can be taken out of Service Mode by clicking on the Exit button in the Service window.

Test Pattern Generation**:**

After the Transmitter has been adjusted, its performance may be monitored by causing it to generate a Test Pattern. Connect the Transmitter output to a communications test set adjusted to monitor the desired frequency. Select the desired Frequency and Test Pattern, and click on the Key Tx button. Check that the correct output is generated (see TIA/EIA 102.CAAA, "Digital C4FM/CQPSK Transmitter Measurement Methods").

Reference Oscillator Alignment**:**

To adjust the Reference Oscillator frequency connect the RF output of the transmitter to a frequency counter or communications test set. Note the frequency stated in the Reference Frequency text box, and adjust the communications test set to monitor this frequency. For this test, the RF board will GENERATE a 0 dBm RF signal from its RF OUTPUT. Click on the Enable button in the RSS, and the communications test set should show the presence of a carrier near the nominal frequency. Note the frequency error and click on the Softpot Value spinbutton until the measured frequency is as close as possible to the nominal frequency. Click on the Program button to save the new Reference Oscillator Softpot value to the radio, or on the Cancel button to return to the original setting.

Amplifier Output Power Adjustment:

No adjustment is necessary for the output power level when a change in frequency is made. To change the power output level, adjust RV1, the output power adjustment, until the desired output power is measured.

* Older amplifier modules may require R7, the output power adjustment, to be set back to the desired transmitter ouptut power when a change in frequency is made, however the newer models will remain with a constant output power level.

Note: For complete alignment procedures, refer to the instruction manual. These notes are for reference only.

© Copyright 2006 Daniels Electronics Ltd. All rights reserved.
TN366 Rev 4-0-0 Nov 06