DPT Series
Digital Paging Transmitter
User Manual

SONIK

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DPT Version 2D

DPT-Series User Manual

This manual covers the following products:

Models: DPT-136   136-150MHz, 5W
           DPT-150   146-174MHz, 5W
           DPT-218   218-230MHz, 2W
           DPT-260   260-280MHz, 2W
           DPT-450   450-470MHz, 2W

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WARNING

Changes or modifications to this device that are not expressly approved by Sonik are prohibited and could void the user's warranty and possibly his authority to operate this product. This device is designed for one-way paging operations and is not type approved for any other purpose.

**DO NOT allow the antenna to come close to or touch the eyes, face, or any exposed body parts while the radio is transmitting.
DO NOT operate the radio near electrical blasting caps, explosives or near explosive gasses.
DO NOT operate the radio unless it has been installed and inspected by a qualified radio technician.**

The information in this document is subject to change without notice.

1. Specifications

Physical and Environmental Specifications

Dimensions:	5.0" x 9.0" x 1.5"
Operating Temperature:	-30 to +60°C
Humidity:	95 % non-condensing
Vibration:	0.27 G (5 to 500 Hz)
Shock:	3G or 2 ft. drop
RF I/O:	BNC female

General Electrical Specifications

Power Supply:	+12.5VDC ± 10%
PLL step size:	10/12.5KHz
Frequency Stability:	2.5ppm. 1.5ppm optional. (The temperature of operation for the 1.5ppm options is restricted to -20C to +50C)
Power Consumption:	<1.5W standby Mode <16W transmit Mode
Frequency range:	150-174MHz 218-230MHz* 260-280MHz* 450-470MHz*
Modulation:	GFSK type: 16K0F2D
RF circuits no-tune bandwidth:	10MHz (modulation may require some adjustment)
Analog frequency response:	0-2400Hz, ±1.5dB
Digital input:	0-2400bps

* (export only)

## *Specifications of Transmitter section*

Maximum Transmitter Power:	5W nominal, (2W nominal above 218MHz)
Transmitter Spurious:	<60dBc
Duty Cycle:	Up to 100% -30 to +45°C, derated to 50% at 60°C.
Transmit attack time:	10mS
Deviation:	Adjustable, 1-6kHz.
Modulation rise time:	145uS nominal

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2.   Introduction

This Digital Paging Transmitter is a high performance transmitter capable of transmitting both digital and analog signals. It features:

- *Both analog and digital inputs*
- *Data rates up to 4800bps*
- *Continuous duty operation at full power output*
- *High stability reference oscillator*
- *Synthesized frequency generation*
- *Easy configuration via a built-in RS-232 port*
- *Compact size and an easy to use interface.*
- *Front panel status LEDs*
- *Built-in test signal generator.*
- *Fast transmit attack time.*

The Digital Paging Transmitter is intended to be used in conjunction with a paging encoder and terminal. In some configurations the terminal and encoder are located at the same site as the transmitter. In others, it may be remotely connected using commercially available transmitter controllers and modems. Wider area coverage can be obtained by using this Digital Paging Transmitter as an exciter for a high-power amplifier. This product is *not* intended for use in simulcast systems, where more than one transmitter is on the air at the same time.
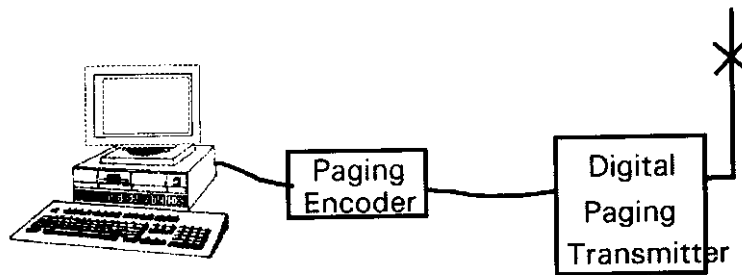

Typical Paging System

In a typical configuration, a computer terminal is connected to a paging encoder. The encoder is connected to the Digital Paging Transmitter. An operator enters the pager ID code of the pager to be signaled into the terminal. The terminal communicates this to the encoder, which formats the page into a standard format such as

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POCSAG. The formatted paging message is sent to the Digital Paging Transmitter for transmission over the air.

Other manufacturers have paging encoders available with built in keypads, facilitating the entry of pages without requiring a dedicated computer.

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3.   Operation
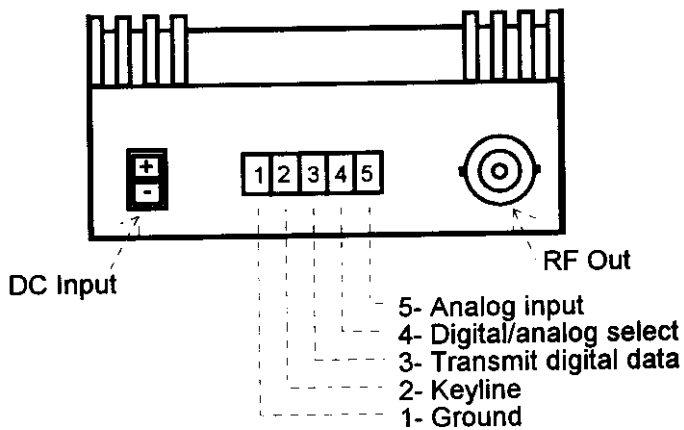
Rear Panel Connections

3.1.   DC Input

The Digital Paging Transmitter is designed to operate off of 12.5V DC. It may be used with any regulated DC power supply. A DC input jack is provided on the rear of the unit. The power cord for the unit is Sonik part number 5C201-6.

3.2.   Terminal Block

A 5 pin terminal block located on the rear of the unit is used for connecting signals to. The Digital signals (Keyline, Transmit Data, Mode select) are CMOS type inputs . Of these three the the KeyLine and the Transmit Data have protection circuits increasing their input range to ±20 volts maximum thus allowing direct connection to RS-232 sources on these two pins.

Connect the appropriate signals on the Terminal Block to your paging encoder or transmitter controller. Generally you will only need to connect three wires. The Ground, the Keyline, and the Transmit data. Refer to the technical manual of your terminal or transmitter controller for information on where these signals are to be connected.

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The 5 pins are defined as follows:

Pin	Function	Level
1	Ground/signal common	Connect this to the signal ground of the paging encoder.
2	Keyline. Activate this input to turn the RF on.	This signal may be programmed to be either active low or active high. The default from the factory is active low. Open circuiting this will not cause the transmitter to key. It is a CMOS type level. A low must be <.8V and a high must be greater than 3.5V. This pin may be driven by an RS-232 type signal.
3	Transmit data.	This is a TTL/CMOS type input. Data to be sent over the air is applied to this pin. Internal limiters and filters condition this signal, ensuring emissions compliance and spectral purity. The factory default configuration is: 0 = negative deviation, 1 = positive deviation. This pin may be driven by an RS-232 type signal.
4	Analog/digital mode select	A CMOS low or open circuit on this line puts the transmitter in the digital mode (pin 3 active). A high on this pin puts the unit in the analog mode (carrier is centered, and analog modulation may be applied to pin 5) This signal should NOT be connected to an RS-232 type signal.
5	Analog input	Any signal on this pin will modulate the RF carrier, even in the digital mode. Do not apply any signal to this pin when the transmitter is in the digital mode of operation. When in the analog mode, the signal should be centered with a 2.5V bias for true DC modulation. An internal jumper may be removed, thus AC coupling this signal to the modulator. The analog signal applied to this pin must be hard limited.

3.3. Serial Interface Connections

An RS-232 type connector is located on the front of the unit. It is used for configuring the transmitter and programming the frequency of operation. The serial data rate is set at 9600 baud, 1 stop bit, no parity. The following table and diagram show the connector configurations for the 9-pin connector.

Name	Function	DB-9 Pin #
TXD	Transmit Serial Data from I/O module to modem	3
RXD	Receive Serial Data from modem to I/O module	2
GND	System Ground	5

Serial Interface Pin Assignments

```
   5   4   3   2   1
  ( O   O   O   O   O )
    O   O   O   O
   9   8   7   6

9 Pin Female Connector
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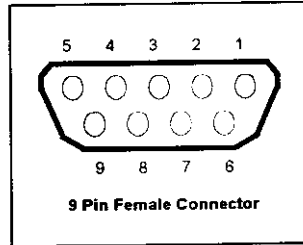
Most any terminal emulation program may be used to communicate with the Digital Paging Transmitter. Suitable programs for the IBM PC are Procomm, Wincomm, and Windows "Terminal" program. Be sure to disable hardware in the handshaking when connecting a computer terminal to the Digital Paging Transmitter.

When a terminal is connected to the programming serial port on the front of the unit, a copyright notice should appear on the terminal each time the power is cycled on and and OK> prompt should be displayed.

3.4. Programming

Programming and re-tuning of this product should only be performed by a qualified service technician.

The Digital Paging Transmitter will respond with an OK> prompt each time it is ready for a command or has successfully executed a command. An ER> prompt means a command was entered incorrectly, and an ??> prompt means the Digital Paging Transmitter did not understand the command. All commands must be entered exactly as specified below, in UPPERCASE letters. All commands must end in a carriage return (the Enter key on most keyboards).

Valid commands are:

FREQ=nnn.nnnn where nnn.nnnn is the frequency of operation in

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MHz.

KEY HIGH	Makes the keyline active high.
KEY LOW	Makes the keyline active low
DATA+	This sets the DATA input to positive polarity (1 = +deviation, 0 = -deviation)
DATA-	Sets the DATA input to negative polarity (1 = -deviation, 0 = +deviation)
TXDATA	This command is for testing purposes only. It causes the transmitter to key. The modulation will be an internally generated 244Hz square wave. Do not apply external modulation when using this function. The unit will unkey when any character is received via the RS232 port.

3.5. Continuous Duty Cycle operation

If the unit is to operated in a system that will leave it transmitting 100% of the time, it should be physically located in an area that allows air to circulate around the case. To ensure long equipment life, the transmitter should be keyed 100% of the time only if the ambient temperature is less than 45 degrees Celsius.

4. Alignment

4.1. Equipment required:

- Service monitor capable of measuring power, frequency, and modulation of an FM signal.
- 2 amp DC power supply, adjustable 10-12.5V DC.
- Volt meter
- A spectrum analyzer may be handy for tuning and ensuring stability or the carrier.

4.2. Procedure

1. Connect the power supply to the unit.

2. Connect the service monitor to the unit.

3. Remove the bottom cover of the unit. There are two screws on each side, two in the front, and two in the rear that must be removed.

4. Turn the power on to the unit, but do not assert the keyline.

5. Program the unit using the FREQ= command, to the proper operating frequency.

6. The unit is factory set for positive deviation with a digital 1 input, and an active low keyline. Reprogram the unit per section 3.4 of this manual if these polarity of the hardware interface needs changing.

7. Remove the internal shield cover from over the VCO.

8. Connect a voltmeter to TP5. Adjust L3 for a reading of 5.0V

9. Key the transmitter on using the keyline (pin 2 of the terminal block on the rear of the unit.) Normally, this signal must be grounded to key the transmitter.

10. Turn the DC power supply down to 10.0V.

11. Adjust the RF power output adjust pot, R84 for maximum power out (fully counter clockwise).

12. Adjust C75, C73, C70, and C65 for maximum power output. C70 and C65 may have to be balanced, as they interact. Go back and

forth between adjusting them to achieve best results. The RF output power should be 5 watts or greater.

13. Turn the DC power supply up to 12.5V

14. Adjust the RF output using R84, to 5.0 watts or less (2 watts on units above 200MHz). **DO NOT LEAVE THE POWER CONTROL SET AT MAXIMUM**! It must always be turned down some from its maximum power setting. Slightly re-adjust C70 and C65 for best efficiency and lowest harmonic output. A current draw of 1.25 amps at 5 watts RF output is normal. 1.5 amps at 5W is less than optimal efficiency. To reduce harmonic output, adjust C65 and C70 for minimal harmonic output, while monitoring the power output and harmonic level.

15. Apply a 300Hz square wave to the digital input. Alternately, you may use the TXDATA command via the RS232 port to key the transmitter and send the internally generated 244Hz test square wave.

16. While monitoring the FM deviation with an oscilloscope, adjust the modulation DEVIATION level (R70) and the modulation BALANCE (R77) for the proper deviation and a square modulated wave as viewed on the service monitor's oscilloscope. The DEVIATION adjustment sets the FM deviation, and the BALANCE adjustment sets of "squareness" of the wave shape. Both of these adjustments are accessible via the front panel. Normal deviation for POCSAG paging is ±4.5kHz deviation.

17. The frequency of the unit should not need adjustment. If it is desired to adjust the frequency, C37 may be used to slightly adjust the center frequency of operation.

18. Unkey the transmitter, disconnect the computer terminal, and re-assemble the unit. It is ready for service.

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Balance (R77)

L3

DC In

Deviation (R70)

C75

C73

1
2
3
4
5

⊙ TP5

C70

C37

Power Adj.
R84

C66

RF
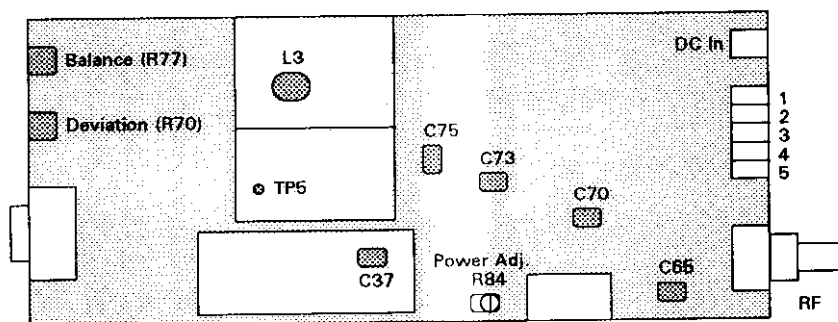
Digital Paging Transmitter Test and Alignment Points

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Sonik Technologies Corporation Limited Warranty

Subject to the Limitations of Warranty and the Warranty Procedures, hereinafter set forth, Sonik Technologies Corporation (Sonik) hereby warrants this product to perform substantially in accordance with its specifications for a period of one year from the date of original purchase from Sonik. Sonik's sole obligation under this warranty and the purchaser's exclusive remedy under this or any other warranty expressed or implied, is the adjustment, repair, or replacement, at Sonik's discretion, of the defective Sonik product.

Some states and jurisdictions do not allow limitations of an implied warranty, so the above limitation may not apply to you.

This warranty gives you specific legal rights, and you may have others, which vary from state/jurisdiction to state/jurisdiction.

Sonik assumes no liability for consequential damages whatsoever.

Limitations of Warranty:

a. This warranty is extended only to the original purchaser of the product and shall not be valid or enforceable unless such original purchaser shall have proof of purchase. This warrant does not apply to products sold under OEM agreements, and/or private label arrangements.

b. This warranty is limited to repair or replacement of any materials found to be defective, any required servicing or adjustment of the product, or replacement of any materials found to be defective, or replacement of the product if Sonik deems the repair of the product as ineffective or uneconomical.

c. Tampering, misuse, attempted repair, or damage to this product shall invalidate this warranty.

d. This warranty only applies to this product as it existed at the time of original purchase by the original purchaser from Sonik. Sonik may make design modifications and improvements to this product and shall be under no obligation to modify or alter this product to conform to such changes, additions, software bug fixes, or improvements.

e. Sonik assumes no responsibility for any consequential damages caused by or arising out of any such defect

in materials or workmanship, or with respect to any breach of any implied warranty applicable to this product.

f.   **Sonik assumes no liability for consequential damages whatsoever.** To the maximum extent permitted by law, in no event shall Sonik or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use, or inability to use, the product, even if Sonik has been advised of the possibility of such damages. Sonik and its suppliers disclaim all other warranties, either expressed or implied, including but not limited to, implied warranties of merchantability or fitness for a particular purpose with regard to this product, its hardware, its software, or its firmware. Because some states do not allow exclusion of limitation of liability for consequential or incidental damages, the above limitations may not apply to you.

Warranty Procedure

To obtain warranty benefits provided by this warranty, it is the responsibility of the original purchaser to conform to the following procedures:

a.   Call Sonik Customer Service Department and receive a Return Authorization Number (RAN).

b.   Without expense to Sonik, return this product to Sonik, attention of the Customer Service Department.   Sonik recommends that you insure the shipment for full value as Sonik is not responsible for lost shipments.   Mark the outside of the shipping carton with the RAN number. Inside the shipping carton include the following items:

- The product, properly packaged.
- A full description of the defect for which warranty remedy is sought.
- Return address.
- Contact name and telephone number of person familiar with the problem/defect.

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