DIGITAL WIRELESS CORPORATION

DB-1000
Digital Station
216-222 MHz 25 watts

User Manual

09-05-0001-00

FCC Interference Warning

The FCC requires that manuals pertaining to Class A and Class B computing devices must contain warnings about possible interference with local residential radio and TV reception. This warning reads as follows:

NOTE: This equipment has been tested and found to comply with the limited for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial or residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Computer Software Copyrights

Modifications

Any modifications or changes to the circuitry or settings not approved by Digital Wireless Corporation could void the user's authority to operate this product.

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1 General Overview

The DM-1000-2 Digital Station is a narrowband repeater specifically designed for DV/IP format digital transmissions used on the i2way Network. The station receives i2way Network signals on one frequency, decodes, processes, reformats the data, and rebroadcasts it on another frequency. i2way Network signals contain call control information, streaming digital voice and customer payload data. i2way format stations do not respond to or repeat analog transmissions, or any other form of digital transmission.

The DM-1000 Digital Station is available in various models that cover the 138-520 MHz bands. The station receives and transmits data at 10,000 bps using four level frequency shift keying ("4FSK") in 12.5 kHz channels.

The station's construction is modular, and may be field repaired by simply replacing plug-in modules. It may be configured in single channel "conventional" or multi-channel "trunked" modes. Multi-channel systems are typically trunked, with one channel operating as the "control channel" and the remaining channels as "transaction channels".

This manual details the version for 12.5 kHz spaced channels in the 216-222 MHz bands.

2 Installation

The DB-1000 station is designed to be installed indoors, typically in an electronic equipment rack. DWC manufactures equipment cabinets specifically for this purpose although a large number of commercially available "rack cabinets" are suitable. The station may also be installed in a specifically-designed "outdoor" cabinet intended for the housing of sensitive electronic equipment. A trained technician should perform the installation.

2.1 Unpacking after Shipment Receipt

The station is normally shipped in a cardboard carton protected by foam. The unit is ready-to-operate, and generally the only included accessories not attached are the power cord and rack-mounting brackets. If the rear panel power switch is protected by tape or other method, remove this before operating. *Do not apply power to the station unless a suitable antenna or load is connected to the transmitter output.*

2.2 Mounting

The station is intended to be installed in a standard EIA “19 inch” rack. The station is “one rack unit” high (or about 1.75 inches), and requires about 19 inches of depth to provide space for rear panel connectors. The station is designed to draw fresh air in from the front panel and left front side panel, and exhaust air from the rear and right rear side panels. So, the front and rear of the station should be unobstructed to allow air to freely flow.

The 19 inch rack mounting brackets may be installed in any one of several locations. 6-32 machine screws are provided to attach the brackets to the chassis, and the brackets may be installed using the appropriate tapped holes, six per bracket, located at the front, middle and rear of each side of the chassis. Consequently, the station may be installed in a standard EIA 19 inch rack frame, either from the front or the rear. The station may also be installed in an “open-frame” rack where equipment is generally center mounted. DWC base station cabinets further allow for simultaneous front and rear mounting to provide additional earthquake stability, and have additional air filtering and forced air cooling to allow for less than ideal air quality conditions.

It is highly recommended that the station be installed in one of the following (a) a clean environment in a suitable rack cabinet, (b) in a DWC base station cabinet (which itself has filtered air intakes and fans) or (c) other cabinetry with filtered air intakes to reduce airborne particles being drawn into the base station fans. Dirt and dust will not effect the operation of the base station other than reducing the life of the fan bearings. Serious buildups of dirt and dust may cause the transmitter or power supply to overheat.

2.3 Transceiver Real Panel Connectors

There are several connectors on the rear panel:

DIGITAL AUDIO I/O	RS-232 serial port carrying digital audio, payload data & control data
TEST PORT	RS-232 serial port for connection to a PC computer
MAINS POWER IN	85-264 V 47-63 Hz AC

DC POWER IN	13.8 VDC input
DC POWER OUT	13.6 VDC output 2 amp maximum
TX OUTPUT	Output to antenna or RF Power Amplifier
RX 1 Input	Receiver input 1 from antenna
RX 2A Input	Receiver input 2A from antenna
RX 2B Input	Receiver input 2B from antenna

2.4 Environmental Considerations

The station is normally intended to be operated in environments that are maintained between 0° C and +40° C (+32° F and +104° F). The nominal operating temperature is +25° C ±3° C (77° F ±5° F). Please consult the factory for installation assistance in environments that vary from these parameters.

The station electronics are designed and specified to operate between -30° C and +50° C (-22° F and +122° F), however the sealed lead acid batteries should not be operated at temperature of less that -20° C nor higher that +40° C (-4° F and +104° F).

The station can be operated with a relative humidity of less than 95% at altitudes below 10,000 feet above sea level. Storage temperature range (unpowered) is from -20° C and +50° C (-4° F and +122° F).

If the indoor environment is less than pristine, it is recommended that the station be installed in a cabinet supplied with clean, filtered forced air. Frequent maintenance should performed on the filters in order to keep them clear of dust and particles that may be injected into the base station (which has internal fans).

If the station is installed in an “outdoor” cabinet, a thermostatically controlled heater should be installed in the cabinet to prevent the inside air from falling below freezing (0° C or +32° F).

While the station is designed to handle “rugged” environments, an air conditioned location is preferred and desirable. Air conditioning prolongs component life and makes maintenance easier on technicians. If air conditioning is used, a closed system is preferred (with no intake of outdoor air).

2.5 Radiation Hazards

The DB-1000 Digital Station is a “base station repeater” and is intended to have its antenna installed on a radio tower or other antenna support such that the center of radiation (the antenna) is not near humans. During installation planning, care should be taken to research and understand relevant government radiation regulations and to ensure that the final installation will meet such regulations. Since every installation is unique, radiation safety is beyond the scope of this manual. You should consult an engineering professional during the installation of this station to ensure that your installation will not cause any rafdiation hazards.

2.6 Power Switch

Unless otherwise noted in the DWC shipping documents, the station is shipped with the internal batteries factory-connected. The rear panel power switch is set to the “OFF” (down) position. Prior to installing the unit the power switch may be set to the “ON” (up) position to verify that the unit is functional, however care must be taken to not depress the red transmit button on the front panel, or “key up” an i2way mobile or portable on the station’s operating frequency in the immediate vicinity of the unit unless a suitable 50 ohm antenna load is attached to the transmitter output “Type N” connector on the rear panel.

2.7 Antenna System

The station needs an antenna system, and the design of such system may greatly vary from installation to installation. If maximum coverage is desired, a high quality antenna system, consisting of two or more separate antennas for receive and transmit, along with high quality antenna filtering, is suggested. If the coverage requirements are modest, a lower quality antenna system is acceptable. Some “campus” systems may utilize “radiating” cable in order to provide service in difficult buildings. Since antenna systems vary imensely, you should consolt an engineering professional familiar with the design of mobile antenna systems prior to installing this station.

2.8 Grounding

Connection of the station to a good quality ground is necessary for safety and to protect the station from the environment. If you install more that one DB-1000 station, each station should be independently grounded. A 6-32 “grounding screw” is provided at the rear of each base station. It is painted green for identification. Lightning and surge protection should be installed on each antenna transmission line and grounded where the transmission line enters the building. Polyphaser devices are one suitable product. The transmission line should be grounded to the tower and at the building entrance pursuant to normal industry procedures.

3 Operation

Typically the DB-1000 Digital Station operates unattended, often at remote, inaccessible locations. There are minimal operating controls, and sophisticated test and diagnostic controls. No user intervention is needed for normal operation as the Base Station is fully automatic.

3.1 Transceiver Front Panel

The Base Station Transceiver Module has six pushbutton controls, 5 LED status indicators, and a LCD display.

3.1.1 The pushbuttons are:

MENU Selects the main operating menu

PTT Causes the base station to transmit

MON Allows monitoring of the radio channel in FM analog mode

ENTER Activates a selected menu item

UP Increments a selected menu item

DOWN Decrements a selected menu item

3.1.2 The LED status indicators are:

TX	Transmit light (paralleled with LED on PTT switch)
RX-1	Indicates a DV/IP radio signal is present on the RX-1 input
RX-2	Indicates a DV/IP radio signal is present on the RX-2 input
+12 VDC	Indicates +12 (+13.6 VDC) input voltage is present
AC	Indicates that AC power between 86 and 230 volts is present.

3.2 Adjustments

The Station's adjustments and programming are password protected, and is available only to the factory and factory-trained maintenance personnel. Authorized, factory-trained personnel should consult the maintenance manual for the Station for further information.

3.3 Normal Repeater Operation

When the unit is placed in normal service, no user intervention is required. The ID number of the incoming mobile/portable transmission is displayed on the front panel LCD display. The RX and TX LED indicators will light, indicating the unit is transmitting. The RF Power Amplifier cooling fan will turn on when the station transmits.

Caution:

The DB-1000 Station should never be operated without an antenna or 50 ohm test load attached.

3.4 Automatic Station ID

The DV/IP Base Station has a built-in automatic Morse Code generator that may be programmed to periodically transmit the assigned call sign of the base station with a frequency modulated carrier wave, if required or desired. The MCW audio frequency is 1,350 Hz. Consult the factory for programming information.

4 Maintenance and Repair

4.1 General

There are no user-servicable components in the station. There are no manual adjustments or alignment controls. The station has hazardous voltages present inside. Testing, installation and repair must be performed by qualified technicians trained in the handling of this equipment. Severe, potentially lethal electric shock can occur from contact with the AC input terminals, power supply connector or AC fuse, accessible when the top cover is removed. Therefore, the top cover should only be removed by experienced and qualified technicians trained in the handling of this equipment and only when the AC mains power cord is removed.

CONTACT THE FACTORY FOR MAINTENANCE, REPAIR AND WARRANTY INFORMATION.

4.2 User Routine Maintenance

4.2.1 Quarterly

- Dust should be removed from the air filters. This may be performed by removing the two left hand front panel fans, and the power supply mounting bracket, in order to remove and clean or replacing the fan filters. Alternatively, the air filters may be cleaned with a strong vacuum cleaner, by applying the vacuum cleaner's hose over the air intakes and removing built up dust and residue.

- The station should be "keyed" (placed into transmit mode) and all fans observed for normal operation. Replace any fans that may have failed.

- Using a DV/IP compatible mobile or portable radio ("the test radio"), place the test radio into "ECHO" mode and "TECHNICIAN" display mode, and make several ten second voice transmissions through the station from a location where normal or better coverage is routinely experienced. The test may be performed at the station's installation (tower) location. Observe the two frame error readings on the front panel of the test radio. Typically 1 or less frame errors should be observed. If an unusually high number of errors are observed, contact your factory authorized service person or the factory.

4.2.2 Annually

- The transmitter frequency and power output should be checked by a factory trained service technician using service procedures recommended by the factory.

- The receiver temperature controlled crystal oscillator should be checked by a factory trained service technician using service procedures recommended by the factory.

- Additional tests should be performed as recommended by the factory by a factory trained service technician using service procedures recommended by the factory.

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