Datron World Communications, Inc.

ANTENNA SYSTEMS
For HF Transceivers

- **Fixed Station, Mobile, Tactical**
- **Broadband or Narrowband**
- **Power Handling to 5kW**
- **MIL Construction**
- **NVIS Applications**
- **Rapid Deployment in the Field**
- **Applicable to any HF Transceiver**

One of the most critical aspects of good HF communications is the choice and deployment of the antenna system. Care taken in the selection of the antenna, its location, and matching to the associated transmitter are the most important factors in ensuring strong, reliable communications. Datron transceivers and amplifiers (and most other suppliers') are designed to operate into any antenna with a feed-line impedance of 50 ohms. The antenna system should be carefully matched and the VSWR should not exceed 1.5:1 for best results. Datron realizes the importance of using the proper antenna, and has a wide range of experience in determining the correct antenna for the specific user application. To help the customer design the correct system, Datron offers a wide range of HF antennas for fixed station, mobile, tactical, and marine usage.

Fixed-station Antenna Systems

A variety of antenna choices are available for fixed-station HF systems. High-end HF antenna systems for fixed stations starts with the broadband log-periodic. The best overall antenna for long-range HF fixed station operation. is a log-periodic or other type of directional array. Two other types of high-end HF antennas are omni-directional antennas like conical monopole arrays or SPIRA-CONEs, both of which provide excellent coverage for short and medium-to-long range applications. Datron can source these antennas for user applications, however, the prospective user should be aware that they are large, extremely expensive and require considerable real estate to install.

For semi-permanent and less expensive installations, the ½-wavelength dipole antenna is easy to erect and provides superior performance to all but complex directional arrays. The downside is that the ½-wave dipole operates on one frequency, generally with a narrow bandwidth of about 2% on either side of center frequency. An alternative to the dipole is a long-wire antenna using an antenna tuner. While this will operate on all channels and allow ALE scanning, the efficiency is considerably lower than the dipole antenna (and an antenna tuner is required). However, when space is a factor, and multiple frequency operation is necessary, it is best to use a narrowband antenna like a whip or long-wire with an antenna tuner. Table 1 shows Datron's fixed-station dipoles and wires.

Another option to consider, when space is available, is the use of a loaded, broadband antenna. While these generally have lower efficiency, they do not require an antenna tuner and do allow operation on all channels in the transceiver. Datron's ABB-series is a line of both 125W and 1 kW broadband antennas, which have proven medium-range performance up to 2000 miles. These are shown in Table 2. Mast kits containing mast sections, guying equipment, and the necessary tools for installation are also available from Datron to facilitate the erection of these antennas.

Another form of narrowband antenna that can be used in a fixed-station is the vertical whip. This antenna requires an antenna tuner and is especially useful when space is at a premium and long-range communications is desired. Note that the ground system is an essential part of the whip installation as the vertical whip, and unlike the broadband antenna, is a ground-dependent antenna, so proper grounding techniques must always be used. In general, the longer the antenna, the more efficient it is. Datron's RA-PAS is a whip with a standard length of 32 feet made up of rugged eight 4 foot sections. Antennas of shorter or longer length can conveniently be constructed by adding or removing 4 foot sections that easily screw together. If the user must use a whip for his base station installation, Datron also offers a complete line of automatic antenna tuners to complement this selection and match the antenna.

Part No.	Description	Application	Input
AD1	Single-frequency dipole	Fixed Station, fixed-frequency, long-range	50 ft. RG213 feedline
AD2	Two-frequency dipole	Fixed Station, fixed-frequency, long-range	50 ft. RG213 feedline
AD3	Three-frequency dipole	Fixed Station, fixed-frequency, long-range	50 ft. RG213 feedline
AD4	Four-frequency dipole	Fixed Station, fixed-frequency, long-range	50 ft. RG213 feedline
ALW	Long-wire antenna kit	Fixed station; requires antenna tuner	75 ft, with hang-up rope and insulators

Table 1. Datron fixed-station Dipole and Long-wire Antennas

Part No.	Length	Rated RF Power	Application	Input/Load
ABB100A	142 ft.	125 W	Fixed station, low power, better low-frequency efficiency than the ABB100B	100 ft. RG-213 with PL-259 (UHF) connector
ABB100B	112 ft.	125 W	Fixed station, low power	100 ft. RG-213 with PL-259 (UHF) connector
ABB1000A	142 ft.	1000 W	Fixed station, high power, better low-frequency efficiency than the ABB1000B	100 ft. RG-213 with PL-259 (UHF) connector
ABB1000B	112 ft.	1000 W	Fixed station, high power	100 ft. RG-213 with PL-259 (UHF) connector

Table 2. Datron Broadband HF Antennas (note: Add "N" to the P/N to obtain an antenna with an type N connector on the coaxial feed-line (e.g., "ABB100AN" is the "ABB100A" with an N connector instead of a PL239).

Mobile Antenna Systems

The antenna used in conjunction with mobile HF systems is generally a whip with a maximum length of 16 ft mounted on the appropriate vehicle. Over much of the HF range, this length represents only a small fraction of a wavelength. Therefore, the whip must be electrically lengthened by using an antenna tuner. This results in lower efficiency and requires a good tuner and a careful installation. The lead-in wire from the tuner to the antenna becomes part of the radiator, so it must be kept as short as possible to maximize radiation from the actual antenna.

Datron's selection of whips is detailed in Table 3. It includes a variety of mounting arrangements, from a very rigid vertical base, to flexible spring bases, to a special tilt-adapter base that allows the antenna to be rigidly mounted in any attitude from horizontal to vertical. NVIS operation (omni-directional, close-in coverage) can be obtained by tying down any whip into a horizontal attitude, and either the flexible spring base or the tilt-adapter systems work well in this application.

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Automatic Antenna Tuners

An efficient, rapid tuning, automatic antenna tuner is a necessity for use with narrow-band HF antenna systems like whips and long wires. Datron offers three tuners to satisfy user requirements in this area. The AT7000B and the RAT7000B are 125W, completely automatic tuners designed to match whips and wires to 50 ohms over the 1.6 – 30 MHZ frequency band. They both have 100 programmable memory channels for ALE scanning or silent tuning. The AT7000B is packaged in an immersible fiberglass case, while the RAT7000B is in a rugged metal case. Both tuners can be mounted in any attitude, but the RF output connector should always be as close to the antenna input as possible.

For higher power applications, the RAT1000D is a completely automatic, waterproof tuner, which will also tune whips and wires over the HF band and has a full 1kW RF power handling capability. The RAT1000D is a compact 1kW tuner that is ideal for either a high-power mobile or high-power fixed-station installation where a narrow-band antenna is needed. It too has 100 programmable memory channels, and can be mounted in any attitude.

All three antenna tuners have a control interface specially designed for seamless operation with any of Datron's HF transceivers. They can, however, be used with other radios if the appropriate interface is provided.

Part No.	Length	Rated RF Power	Mounting	Application
MAR-12	12 ft.	1000W	Flexible Spring Base with side-mount bracket, feed-thru design	Vehicular; medium-range in vertical attitude or NVIS when tied down in semi-horizontal plane.
MAR-16	16 ft.	1000W	Flexible Spring Base with side-mount bracket, feed-thru design	Vehicular; long-range in vertical attitude or NVIS when tied down in semi-horizontal plane.
RA-MAS	16 ft.	400 W	Rigid Base with flange bracket, feed-thru design	Vehicular; long-range; minimal NVIS component
RA-PAS	32 ft.	1000 W	Rigid Base meant for horizontal surface mounting in fixed-station installations; side-fed	Transportable Fixed Station; long-range
MAR-16T	16 ft.	1000 W	Flexible spring base and tilt whip adapter with side-mount bracket, feed-thru design	Vehicular; long-range or NVIS. Antenna can be locked in one of four separate positions from vertical to horizontal
AW7	23 ft.	500 W	Anodized aluminum mounting flange, side-fed	Fixed station or marine; long-range
AW10	36 ft.	5000 W	Galvanized ductile iron mounting flange, side-fed	Fixed station or marine; long-range applications
AWM	9 ft.	150 W	Mounting base with spring and insulator	Vehicular; medium-range; for low-power systems

Table 3. Datron Mobile, Marine and Fixed-station Whip Antennas

Tactical antenna systems

Table 4 illustrates a group of antennas that can be used in a tactical mode with Datron's PRC1099A manpack radio. The standard antenna for tactical HF use is the AT-271A/U 1- foot whip. The internal matching network in the radio is designed to tune this over the 1.6 to 30 MHz range. A variety of dipole, long-wire and NVIS antennas are available to satisfy other tactical communication requirements.

Part No.	Description	Application	Input
AT-271A/U	10 ft. collapsible, sectional, Whip	Tactical, PRC1099A standard antenna; used with internal 1099A radio tuner	Direct connection to radio whip antenna connector
ALW-R	100 ft. Rugged long-wire antenna kit	Tactical, used with 1099A internal antenna tuner	Comes with hang-up rope, counterpoise, and long-wire adapter
ALD-REM	Lightweight dipole kit with long-wire adapter and counterpoise	Tactical, used with 1099A internal antenna tuner; provides NVIS operation	25 ft. of 300 ohm transmission line, with counterpoise and long-wire adapter
ALW	Long-wire Adapter	For use with long-wire antennas and PRC1099A internal tuner	Connects to PRC1099A antenna port
AGK	50 ft braided 2-wire set	Tactical antenna grounding kit	Connect to ground connector on 1099A radio
NVISKIT	Transportable, deployable Near Vertical Incidence Skywave (NVIS) antenna (AS-2259) with mounting base	Tactical NVIS usage; deployable by 2 people in 20 minutes	Connects to PRC1099A antenna port connector or output of external antenna tuner (when external amplifier is used)
ALD	Lightweight Dipole Kit	Tactical, fixed-frequency, long range	33 ft. RG-58 feedline; connects to 50 ohm port on PRC1099A

Table 4. Datron Tactical Antennas

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