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AN/PRC-117F Application Note: Setting up the Radio for SATCOM HPW Messaging

General Description

High Performance Waveform (HPW) is a satellite waveform that can be used on both wideband and narrowband UHF satellites. HPW offers high speed, reliable, error free delivery of data. The data rate for transmission is adaptive to channel conditions, providing the highest possible throughput automatically. The interface for HPW Messaging is Harris' RF-6710 application, which is an extension to Microsoft Outlook. The user simply uses Microsoft Outlook to send messages and files to the desired end user who also has an AN/PRC-117F with HPW.

This application note will go over a summary of the steps that need to be completed to ensure a quick, simple and successful setup to get started using the AN/PRC-117F and HPW. The steps include installing WMT, loading the appropriate COMSEC for use with HPW, programming a net in the radio for HPW, entering the HPW Time-Of-Day, configuring the RF-6710 Wireless Messaging Terminal software, and connecting the PC to the radio.

Operational Checklist

Use this checklist if you have already read this entire application note. Otherwise, skip this checklist for now and read this entire application note to ensure a successful setup.

- Loaded KG-84 TEK (Traffic Encryption Key).
- Loaded SATELLITE TSK (Transmission Security Key).
- Programmed HPW preset into radio.
- Entered HPW TOD (Time of Day).
- Connected radio to PC using HPW Cable (Harris P/N 10513-0710-A006).
- Configured Network Database on the PC correctly, to include your Local Address.
- Started WMT (Wireless Messaging Terminal) on the PC.
- Verified HPW Protocol Status is 'IDLE'.
- You should be ready to send and receive HPW messages.

Installing Wireless Messaging Terminal

For a full description on the install and setup of the Wireless Messaging Terminal, WMT, or as it is also known, RF-6710W-HPW, please refer to the Software User's Guide that can be found on the installation CD.

NOTE: RF-6710W-HPW WMT Version 2.6 or any other versions of WMT products must be uninstalled prior to installing a newer version of the RF-6710W-HPW WMT software.

Software Compatibility:

WMT-HPW Version 2.6

- Operating Systems: Windows NT 4.0 and Service Pack 4 for NT, or Windows 95, or Windows 98
- Email Client: Microsoft Outlook 98

WMT-HPW Version 3.2

- Operating Systems: Windows 2000 (Professional or Server Edition), Windows NT 4.0 and Service Pack 4 for NT, or Windows 98 Second Edition (SE)
- Email Client: Microsoft Outlook 2000 or Microsoft Outlook 98

WMT-HPW Version 3.2.1

- Operating Systems: Windows XP, Windows 2000 (Professional or Server Edition), Windows NT 4.0 and Service Pack 4 for NT, or Windows 98 Second Edition (SE)
- Email Client: Microsoft Outlook 2002 (XP), Microsoft Outlook 2000, or Microsoft Outlook 98

Basic Installation Steps:

- Microsoft Outlook must first be installed. Check the software compatibility above for proper versions. Microsoft Outlook must be configured for **Corporate or Workgroup** (not *Internet Only*). This can be changed or verified by opening Microsoft Outlook and selecting the *Tools* menu, then *Option*, click on the *Mail Services* tab, click on the *Reconfigure Mail Support* button, and selecting *Corporate or Workgroup*.
- To install the WMT-HPW software, insert the CD into the CD-ROM drive and the WMT Installation Wizard screen will appear. Select *Yes* to accept the licensing terms and then click *Next*. Click *Next* again on the following screen. Click *Go* on the following screen to start the install.
- The next step in the installation is to install the modem driver needed for the PC to communicate with the radio. This is slightly different for the few versions of WMT-HPW:

WMT-HPW Version 3.2.1 (Windows 2000 or XP)

- This version automates the process from Windows 2000 and Windows XP using the Network Radio Driver Installer (NRDI), shown in Figure 1.
- Select the COM Port you intend to use for the connection to the radio. Leave the connection speed at **115200** bps. Leave the *Advanced* options as is and click the *Install Driver* button.

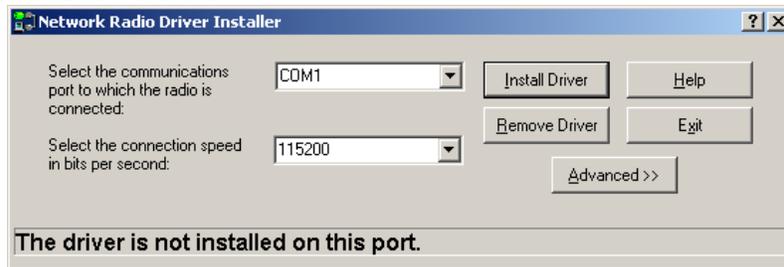


Figure 1. – NRD Application

- Once the Modem is installed, the installation is straightforward by following the directions on the screen.

WMT-HPW Version 3.2.1 (Windows 98SE) and WMT-HPW Version 3.2 (any Windows)

- The install is less automated with these combinations and will be outlined with on screen help windows. These can be confusing to use, so the steps are outlined here in Figures 2 - 10.
- The *Phone and Modems Options* window (which can also be found in the Control Panel) will appear. See Figure 2.

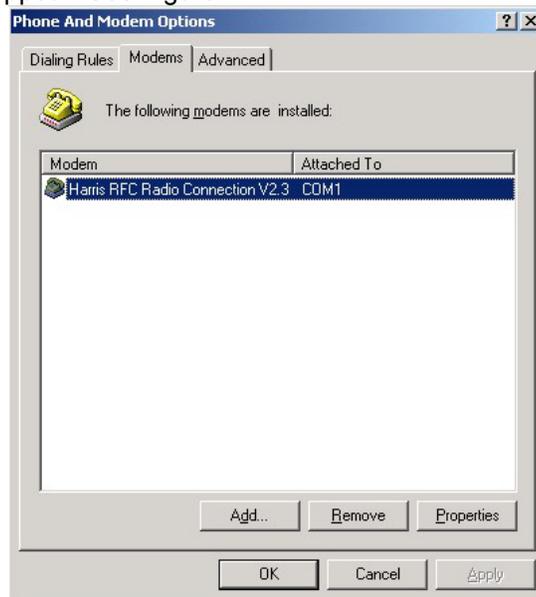


Figure 2. – Phone and Modem Options

- Click the *Add* button, which will start the *Add/Remove Hardware Wizard*. See Figure 3.

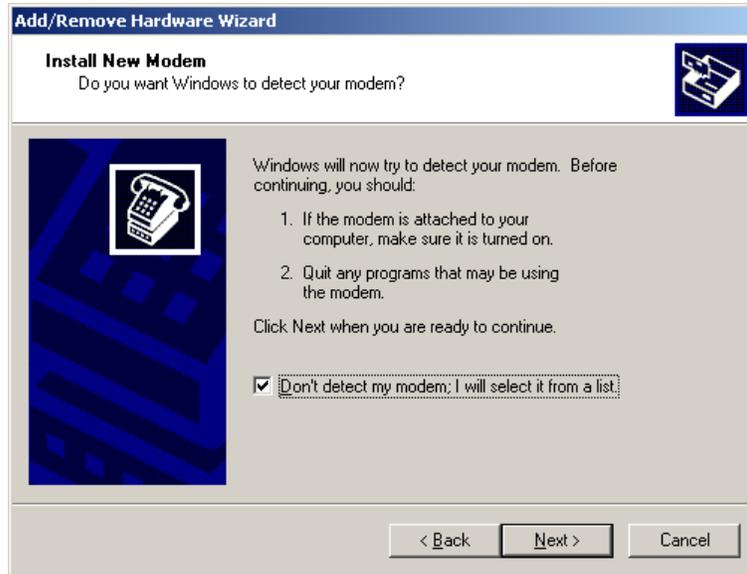


Figure 3. – Add/Remove Hardware Wizard

- Select *Don't detect my modem; I will select it from a list* and click *Next*. See Figure 4.

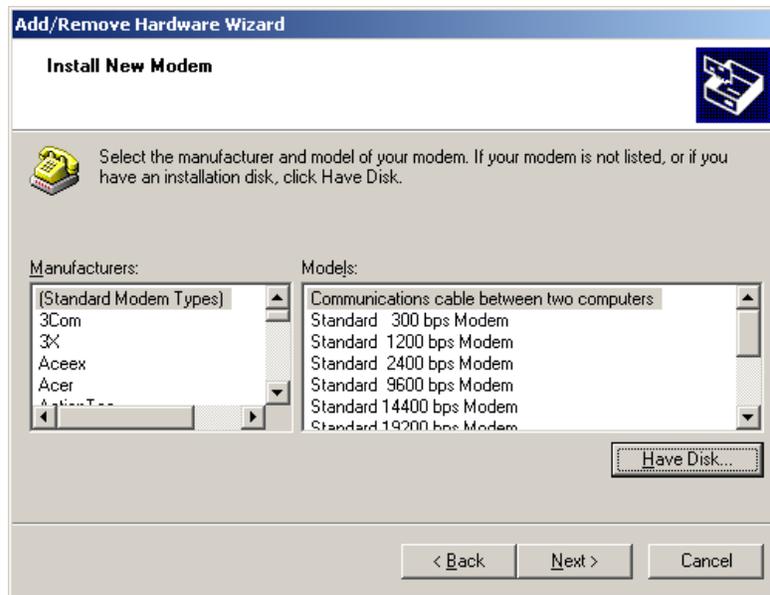


Figure 4. – Modem Selection

- Click the *Have Disk* button to select the driver from the install CD. See Figure 5.



Figure 5. – Install from Disk window

- Click the *Browse* button to select the Install CD and select the *mdmrfc.ini* file. See Figure 6.

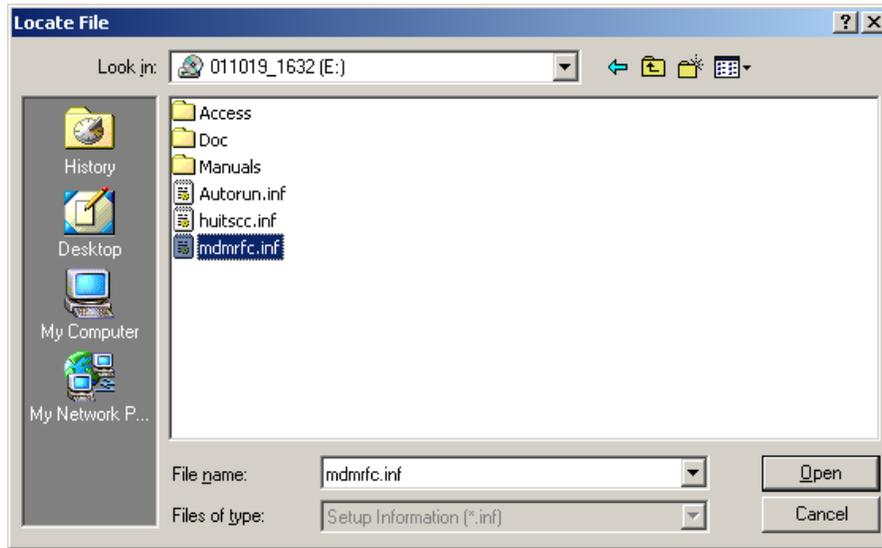


Figure 6. – Locate File window

- Select the *mdmrfc.ini* file and click the *Open* button. See Figure 7.



Figure 7. – Install from Disk window

- Click *OK* button to proceed. See Figure 8.

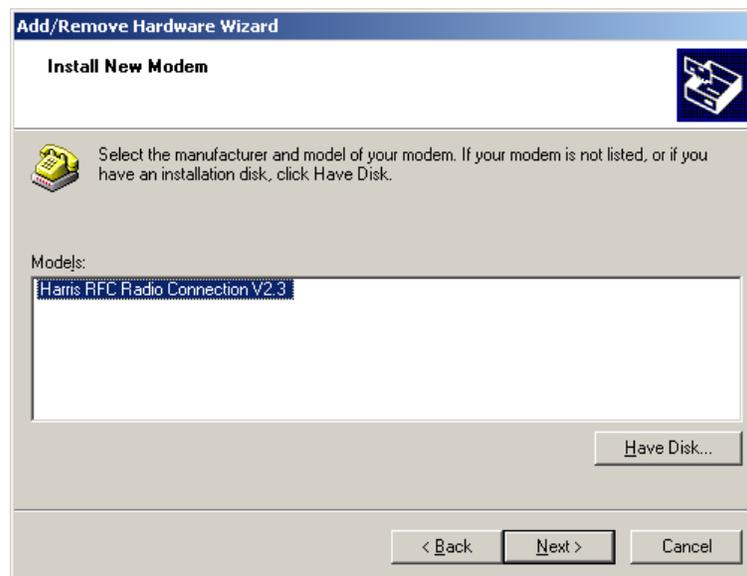


Figure 8. Radio Modem Selection

- Select the *Harris RFC Radio Connection* and click *Next*. See Figure 9.

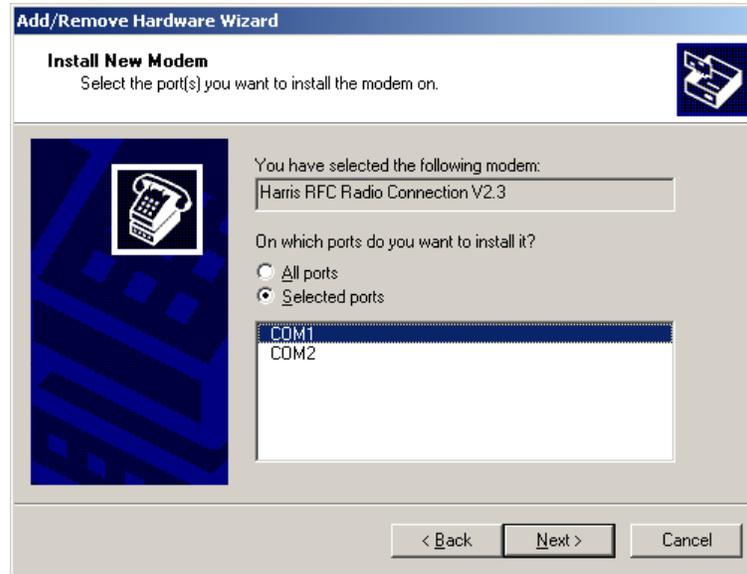


Figure 9. – COM Port Selection

- Select the COM Port that is intended to be used for the connection to the radio and click *Next*. Click *Finish* on the following window. See Figure 10.

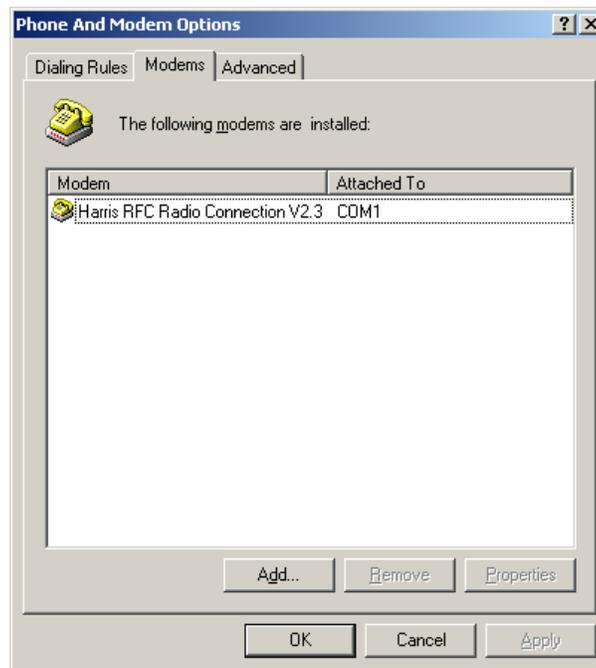


Figure 10. – Installed Modem

- Once the Modem is installed, the installation is straightforward by following the directions on the screen.

WMT-HPW Version 2.6 (any Windows)

- This application note will not go into detail with the installation of WMT-HPW Version 2.6 as it is becoming obsolete. Please refer to the Software User's Manual on the install CD for details on installation.

Operating WMT for the First Time:

Upon completion of the install, WMT will reboot your PC. Once the PC is rebooted, a few initialization type activities need to be completed.

- First, the Network Database must be configured. See Figure 11.

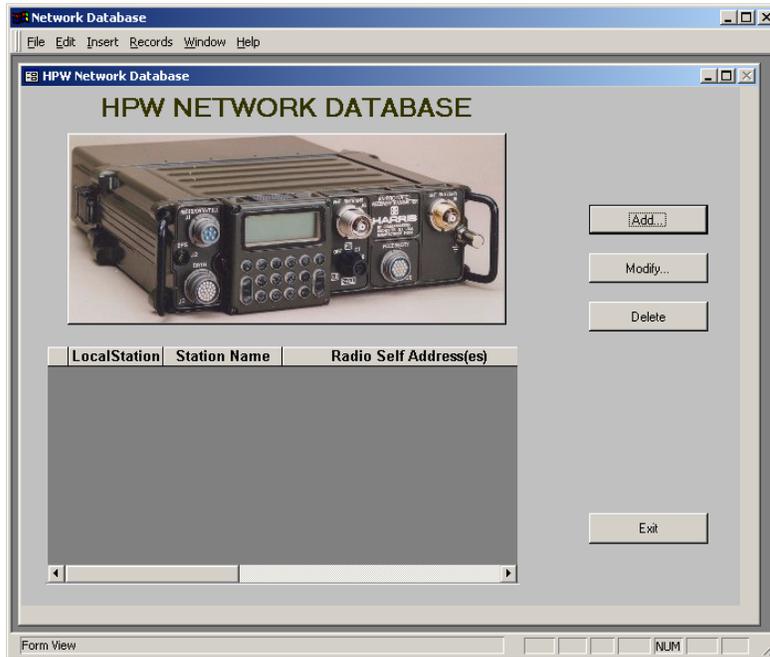


Figure 11. – Network Database

- Click the *Add* button to add Network Stations. See Figure 12.

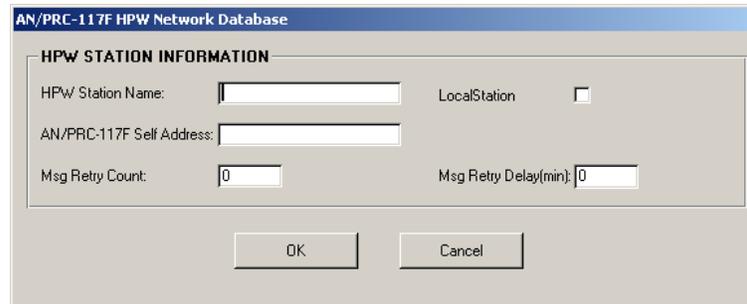


Figure 12. – Adding Stations

- Once all the stations have been added, click on the *Exit* button. The Wireless Messaging Settings will then need to be configured. Click OK on the Welcome screen. See Figure 13.

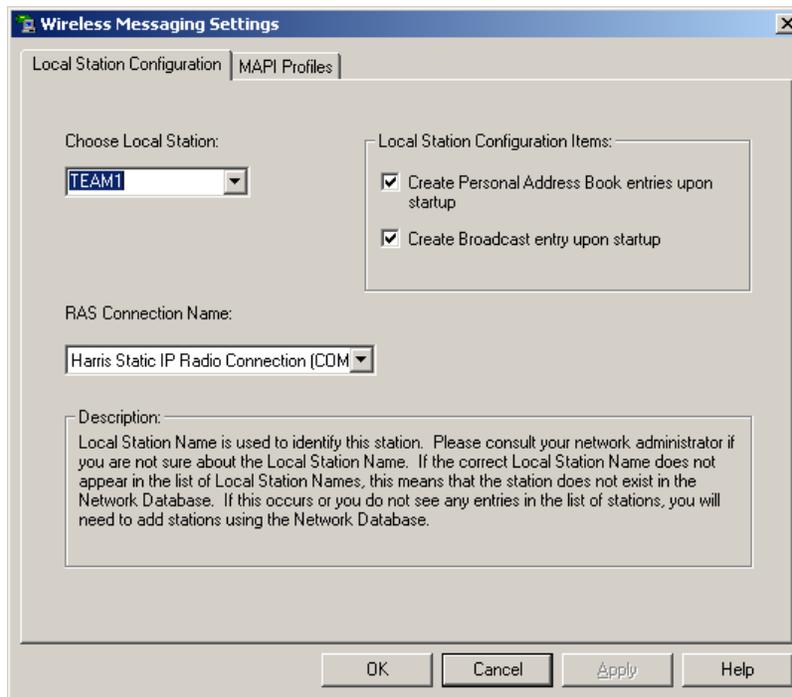


Figure 13. Wireless Messaging Settings

- Make sure your *Local Station* is selected properly. Verify that you want a *Broadcast* station created. Click *OK*.
- WMT-HPW is not completely configured for operation. Let's move onto the radio setup.

Loading the COMSEC

To load the radio with the appropriate COMSEC, follow the steps outlined below. The KG-84 TEK and the satellite orderwire TSK, which is used for timing purposes, will be loaded. The example shown here will be with a Common Fill Device (CFD), such as a KYK-13 or KYX-15. The procedure for loading with a Data Transfer Device (DTD), the AN/CYZ-10, or a KOI-18 CFD is very similar with the exception that the fill is initiated from the fill device rather than the radio.

NOTE: The fill device should be attached to the radio after the function switch has been put into the LD position and the radio displays the FILL MENU. The fill device should be removed from the radio before the function switch is taken out of the LD position as well.

NOTE: The SATELLITE TSK is required regardless of the radio mode, PT or CT.

1. Rotate the function switch to the **PT** or **CT** position.
2. Allow radio to complete initializing.
3. Rotate function switch to **LD** position.
4. Select **FILL DEVICE** as **KYK-13**. Press **ENT**.
5. Connect FILL Device to the ADF PORT (J1) of the radio.
6. Select **CRYPTO TYPE** as **KG-84**. Press **ENT**.
7. Select **KEY TYPE** as **TEK**. Press **ENT**.
8. Select desired **KEY NUM: 01** to **25**. Press **ENT**.

NOTE: This is the COMSEC key position that corresponds to the key position programmed during Net Programming.

9. Press **ENT** to initiate the fill.
10. Select **MORE FILL DATA?** as **YES** to load additional CRYPTO.
11. Press **CLR** to select a different CRYPTO TYPE.
12. Select **CRYPTO TYPE** as **SATELLITE**. Press **ENT**.
13. Select **KEY TYPE** as **TSK**. Press **ENT**.
14. Select desired **KEY NUM: 01** to **25**. Press **ENT**.

NOTE: This is the COMSEC key position that corresponds to the HPW TRANSEC KEY ID programmed during Net Programming.

15. Press **ENT** to initiate the fill.
16. Select **MORE FILL DATA? – NO**
17. Disconnect Fill Device from the radio.
18. Change the function switch back to the **PT** or **CT** position.

Programming a Net for HPW

This example describes how to program a SATCOM HPW data preset using KG-84 Mode 1 encryption. Alternative preset programming choices will be noted at each step in the sequence. HPW nets require a KG-84 TEK, a SATELLITE TSK, and the TOD to be loaded (must be +/- 30 seconds of other HPW stations).

1. Press **PGM**.
 - a. Select **NORM**. Press **ENT**.
 - b. Select **NET**. Press **ENT**.
 - c. Input desired Net number to modify. Press **ENT**.
 - d. Select **ACTIVATE IN LIST? - YES**. (If NO, Net not displayed with **PRE +/-**) Press **ENT**.
 - e. Select **NET TYPE** as **SATCOM** (Up/Down arrow buttons). Press **ENT**.

2. Select **FREQ**. Press **ENT**. NOTE: Input preset information from left to right, top to bottom.
 - a. Enter **FREQUENCY CODE** (3 digit code if known or 999 for manual entry). Press **ENT**.
 - b. Enter/Verify **RECEIVE FREQUENCY**. Press **ENT**.
 - c. Enter/Verify **TRANSMIT FREQUENCY**. Press **ENT**.
 - d. Select **RECEIVE ONLY? – NO**. (If YES, then radio will not transmit). Press **ENT**.

3. Cursor to **COMSEC**. Press **ENT**.
 - a. Select **CRYPTO MODE** as **KG-84**. Press **ENT**.
NOTE: Must choose KG-84 or NONE for HPW presets.
 - b. Select **ENCRYPTION KEY** (i.e. **TEK 01**). Press **ENT**.
NOTE: This selection determines which TEK, from the COMSEC loading procedure, will be applied to the preset.
 - c. Select **SYNCHRONIZATION** as **REDUNDANT (MODE 1)**. Press **ENT**.
NOTE: Must choose MODE 1 for HPW presets.
 - d. Select **HPW TRANSEC KEY ID** (i.e. **01**). Press **ENT**.
NOTE: This selection determines which SATELLITE TSK, from the COMSEC loading procedure, will be applied to the preset.

4. Cursor to **DATA/VOICE**. Press **ENT**.
 - a. Select **MODULATION** as **HPW**. Press **ENT**.
 - b. Select **BAUD RATE** as required by satellite type to **NB**, **WB**, or **UFO**.
NOTE: NB should be selected for all 5 kHz channels. WB should be selected for FLTSAT 25 kHz channels. UFO should be selected for UFO 25 kHz channels.
 - c. Select **ENABLE TCPIP** as **NO**. Press **ENT**.
NOTE: This option is only present if the radio is configured to include the optional Embedded SATCOM IP capability. Choose NO for HPW WMT operations. Choose YES for HPW IP operations.

5. **SQUELCH** is not a selectable item for an HPW preset.

6. Cursor to **POWER**. Press **ENT**.
 - a. Select **TX POWER LEVEL**. Press **ENT**.

7. Cursor to **NAME**. Press **ENT**.
 - a. **CHANGE NAME** - Enter a name for this preset (up to 12 characters). Press **ENT**.

8. Press **PRE +/-** or **CLR** to exit net programming and return to operating net.

Entering HPW Time of Day

HPW uses a Time-of-Day based TRANSEC (TSK) to cover protocol information such as the source address, destination address, and priority of a message. The current 'seconds' position of the radio's HPW TOD is passed over-the-air in the protocol headers. The receiving radio's HPW TOD must

be within **+/- 30 sec** of the transmitting radio for it to uncover the protocol header correctly. The two radios must be using the same TRANSEC keys (just as they must use the same COMSEC keys when sending cipher-text traffic). The TRANSEC covering is done whether the crypto mode switch is in CT or PT.

1. Press **OPT**.
 - a. Select **TIME**.
 - b. Select **HPW**.
 - c. Select **USER_ENTRY** or **GPS_SYNC**.
2. Load the Time of Day.

If **USER_ENTRY** is chosen:

 - a. Use the number keys on the KDU to enter the time.
 - b. Hit **ENT** to start the clock at the new time.

If **GPS_SYNC** is chosen:

 - a. Connect GPS unit to the J2 port.
 - b. Select **GPS_SYNC** and press **ENT**.

NOTE: The GPS unit can be either a PLGR or NMEA compatible device (i.e. Garmin 12 Series commercial type unit). The radio needs to be configured for the type of GPS unit that is being used. This is done by pressing the **PGM**, selecting **CFIG**, selecting **GPS**, and choosing the GPS unit you are using. The default is PLGR.

Once the time is entered, use the **CLR** button to exit out of the time menu and then again to exit out of the options menu. At this point the radio should be completely configured for HPW. Make the active net the HPW net that was just programmed to begin using the HPW Messaging Terminal software.

Configuring the Wireless Messaging Terminal Software

WMT can be reconfigured after installation and the first time setup using the three icons that get installed on the PC desktop when installing the RF-6710 WMT software. They are Wireless Messaging Settings, Network Database, and Repair and Compact.

The Wireless Messaging Settings should have the following settings:

- Local Station – This is your HPW address and should be one of the addresses defined in the Network Database. This address should also not be set as any other user's local station that you wish to communicate with.
- MAPI Profiles – Should have "Event Log Profile", "HF Gateway Subsystem", and "Wireless Message Terminal" profiles defined. If not, simply click "Recreate Wireless Profile" and accept the defaults.

The Network Database is where all HPW addresses in your communications network are defined. Your local address as well as all destinations must be defined here. The available address range is 1 – 65535. Address 0 is reserved for broadcast communications in which there are no acknowledgements from receiving stations. The HPW Station Name can be what ever you wish. The network database file is stored at "c:\program files\harris rf communications\wmt\ld_wmt.mdb".

Repair and Compact is used to repair a database damaged by unpredictable operation such as power loss or other interruptions. Compacting rearranges how the database file is stored on file.

Microsoft Outlook should have the Personal Address Book updated with the HPW Station Names. Open the Microsoft Outlook Address Book and click on the "New Entry" tab and select "Other Address". The new entry needs to have the "Display name" and "E-mail address" defined as the HPW Station Name. The "E-mail type" needs to be defined as "Harris". The Personal Address Book file created for HPW is stored at "c:\program files\harris rf communications\wmt\exchange\wmt.pab". Note that WMT-HPW Version 3.2 and Version 3.2.1 will add these automatically if the option is selected in the Wireless Messaging Settings.

Note: Whenever changes are made to the Personal Address Book in Microsoft Outlook or to the Local Address in Wireless Messaging Settings, the PC should be restarted so as to allow Microsoft Outlook and WMT to work properly together.

Connecting the Radio to the PC

The AN/PRC-117F radio should be connected to the PC using the HPW Cable (Harris P/N 10513-0710-A006). The connection between the radio and PC is a Point-to-Point (PPP) connection that uses Dial-Up Networking. You can verify that the Dial-Up Networking Connection is setup properly by doing the following:

Windows 98:

- Open up 'My Computer' from the PC's desktop and double-click on the 'Dial-Up Networking' icon.
- Right click on the 'Harris Radio Connection' and select 'Properties'.
- Verify that the connection speed is 115200. The format is 8 data bits, no parity, 1 stop bit, and no flow control (usually under the advanced options).
- To verify the proper networking parameters, open the 'Control Panel' and double-click on the 'Network' icon.
- Choose the 'Dial-Up Adapter' and select 'Properties'.
- Under the 'Advanced' tab, make sure that 'IP Packet Size' is set to 'Large' and not 'Automatic'. This can have an effect on attachments if not set properly.
- The Internet Protocol (TCP/IP) properties should be setup to specify the IP address as 10.0.0.2. The advanced TCP/IP settings should not have IP header compression selected for the PPP link.

Windows 2000:

- Open the 'Control Panel' and double-click on the 'Network and Dial-Up Connections' icon.
- Right click on the 'Harris Radio Connection' and select 'Properties'.
- Under the "General" tab, click the 'Configure' button and verify that the connection speed is 115200. All 'Hardware Features' should not be selected.
- Under the 'Networking' tab, click the 'Settings' button and verify all the 'PPP Settings' are not selected and click 'OK'.
- Select the 'Internet Protocol (TCP/IP)' from the components list and click the 'Properties' button.
- Verify that the IP address is set to 10.0.0.2 and then click on the 'Advanced' button.
- Verify that the 'Use IP header compression' is not selected.

Once the settings have been verified, double clicking on the 'Harris Radio Connection' can test the connection to the radio. If successful, the connection status should change to 'Connected'. If the connection fails, verify that the cable is connected to the proper COM port on the PC and to the J3 port of the radio. Verify you are using the correct cable. The radio should be turned on into PT, CT, or TD mode. The current net does not have to be configured for HPW, nor does COMESC need to be loaded for this test to be conducted, but will need to be configured when using the RF-6710 WMT software for HPW operations.

Frequently Asked Questions

- Q: Why does the Harris Protocol Status window report that the protocol state is "Not in HPW Mode"? A: The active net on the radio is not an HPW net.
- Q: Why does the Harris Protocol Status window report that the protocol state is "Unoperational"? A: The cable may not be connected properly. The Dial-Up Networking connection properties may be wrong. See the "Connecting the Radio to the PC" section of this application note and verify the correct parameters are set.
- Q: Why does the message I just finished receiving not show up in the Inbox and the Event Log reports "Failure to decrypt message"? A: The KG-84 TEK is not the same at the transmitting radio as your radio.
- Q: Why does the Harris Protocol Status window report that received probes are from erroneous and changing HPW addresses? A: The HPW Time of Day in your radio is offset by more than 30 seconds from the transmitting radio.
- Q: Why aren't I seeing probes from a transmitting station or acknowledges back from a receiving station? If a voice check on a non-HPW net is successful, the Satellite TSK is most likely not the same between your radio and the user with whom you are trying to communicate.