CHAPTER 5

SCHEDULED MAINTENANCE

5.1   PREVENTIVE MAINTENANCE

Preventive maintenance is the systematic, daily care and inspection of equipment to prevent equipment failure and reduce downtime.

Table 5-1 contains the checks and services that should either be performed on a daily basis when the equipment is in use or on a weekly basis when the equipment is in a standby condition. Table 5-2 contains the checks and services that should be performed on a weekly basis.

Table 5-1. Daily Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Completeness	Check to see that the equipment is complete.
2	Exterior Surfaces	Remove dust, dirt, and moisture from all surfaces. Only use a soft damp cloth to clean the Broadband Global Area Network (BGAN) Terminal.
3	Operation	Verify connection to BGAN terminal web interface.
4	Installation	Check hardware for looseness. Make sure unit is secure.
5	RF-7800B-VU104 drain holes	There are four separate drain holes on the bottom of the RF-7800B-VU104 that will allow condensation and moisture out of the antenna to prevent any corrosion. Turn the screws clockwise to Open and counterclockwise to Close.

Table 5-2. Weekly Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Connectors	Check all connectors for debris, damage, or corrosion. Elevate to a higher level of maintenance, if required.
2	Antenna	Check for breaks or strains; repair or replace as required.
3	Cables	Check for cracks or cuts; repair or replace as required.

NOTE

To avoid impaired BGAN terminal performance, make sure the antenna is not damaged or the surface is not covered with foreign material like paint of labeling.

5.2   CORRECTIVE MAINTENANCE

Shortcomings and defects which are revealed when the BGAN terminal is in service must be attended to by means of corrective maintenance. The type of work required determines if the corrective maintenance procedure can be performed by the operator, or if it must be performed at a maintenance facility.

The following procedures assume that the operator has determined that the BGAN terminal is faulty. This could be determined in three ways:

- The self-test has been run and a fault code has been identified by the BGAN terminal.

- A run-time fault message is displayed by the Antenna Status page.

- The observed degraded operation suggests that the BGAN terminal is faulty.

Whenever it is believed that the BGAN terminal may be faulty, the troubleshooting procedures in this chapter should be followed to determine the recommended corrective action. If the symptom observed is not covered, report the problem to a Level II or III maintainer (Direct Support, Intermediate Maintenance, or Factory Warranty Support). Faults can be detected by the Built-In Test (BIT) or visual observation.

5.2.1 Troubleshooting Procedures

Self test faults are displayed on the Antenna Status page. The following paragraphs identify probable failure causes, and suggested corrective actions.

5.2.1.1 Power-on BIT Faults

BIT faults are saved following an power-on BIT and are displayed on Antenna Status page.

5.2.1.2 Operator-Initiated BIT Faults

BIT faults are displayed following an operator-initiated BIT. For information on running BIT, refer to Paragraph 4.3.7. When a fault message is displayed, record all fault code information and report the fault to a Level II or Level III maintainer.

5.2.1.3 Run-Time Faults

Run-Time faults mostly occur due to programming errors and are listed in Table 5-3. Sometimes hardware failures can cause run-time failures. Send the radio to a level II or III repair facility for hardware failures.

Table 5-3. Run-Time BIT Faults, Descriptions, and Corrective Action

Text Message	Description/Corrective Action
Hot, Very Hot, Very Very Hot, Too Hot	Temperature warnings. Hot = warning, Very Hot = reducing functionality, Very Very Hot = shutting down calls, Too Hot = imminent shutdown.
Personal Identification Number (PIN) Required	Enter a 4-8 digit PIN to enable non-emergency functions.
Personal Unblocking Key (PUK) Required	Enter a 4-8 digit PUK to revert Subscriber Identity Module (SIM) to the original unlocked state.

5.2.1.4 Non-BIT Faults

Non-BIT faults are operator-observed failures, or cases of degraded operation. Locate the observation in the first column of Table 5-4 and follow the recommended action. If the recommended action is unsuccessful, report the fault to a Level III maintainer.

Table 5-4. Non-BIT Troubleshooting

Observation	Action
BGAN terminal does not power on.	Check batteries and/or power source. Check cable connections.
Battery Box not supplying power. Applies to the RF-7800B-DU024 only.	Check Fuse F1, F2 (Automotive Blade, 5 A 32 V). Check Batteries.
Integrated Services Digital Network (ISDN) calls are not accepted.	The Mobile Subscriber Number (MSN) programmed into the ISDN device does not match the MSN programmed into the terminal.
ISDN calls are not being made.	The ISDN interface is turned off (the interface turns off automatically when the terminal is operating from battery power, or if no ISDN device is detected within five minutes from power on).
BGAN terminal is connected to the BGAN network, but cannot obtain the requested Quality of Service.	The BGAN terminal is not optimally pointed at the satellite. Re-point the terminal.
Terminal does not obtain a Global Positioning System (GPS) fix.	BGAN terminal location limits visibility of four or more GPS satellites. Move the terminal to a location where there are few obstructions.
BGAN terminal makes a continuous beep when an ISDN device is connected to the ISDN port.	The ISDN device is trying to draw too much power from the BGAN terminal's ISDN interface. Make sure it is an ISDN device that draws less than 70 mA of current at 40 V (equivalent power 2.8 W). It might be an Ethernet device.
The terminal will not register with the BGAN Network. ● When viewing the terminal's Web interface, does the terminal have a 3D GPS fix?	The BGAN terminal requires a GPS fix to determine the correct Rx and Tx radio frequencies to use. Using the BGAN terminal's Web interface, wait for the terminal to acquire a 3D fix. Attempt to move the terminal to a location with a more open view of the sky. Once the unit has acquired a GPS fix, it can be moved into a more sheltered location nearby.
The terminal will not register with the BGAN Network. ● Does the terminal have a clear line of sight to the satellite?	Move the terminal to a more open location. In urban environments, buildings produce regions of signal reflection and fade that can result in strong signal readings, but which introduce sufficient noise to prevent communication. In such conditions, often moving the terminal only a couple meters can fix the problem.
The terminal will not register with the BGAN Network. ● Are you in a geographical location where two BGAN satellites have coverage?	The Land Mobile SATCOM-on-the-Move terminal will automatically search for the best satellite connection, but your position may be blocking the view to the nearer satellite. You can force the terminal to search for the other satellite by changing the 'Satellite Selection' setting on the Web interface Setup page from 'AUTO' to the desired satellite.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The terminal will not register with the BGAN Network. • Is the 'Satellite Selection' configured with the appropriate setting?	The 'Satellite Selection' allows for specification of the satellite to use. This can be configured to use a specific satellite, or to automatically locate the most appropriate one. If a specific satellite is selected, ensure that it is within your field of view. Alternatively, select 'AUTO' if the specific satellite is unknown.
Using the Web interface on the Properties screen, the terminal shows the "Registration Status" as "Registered", but the "PS Attach" status as "Not Attached".	Is your BGAN subscription valid? The most common cause for a failure to PS Attach is that your BGAN service provider is denying you service. Contact your BGAN service provider to ensure the subscription is valid.
The Packet Data Protocol (PDP) context activation attempt fails because the requested static Internet Protocol (IP) address is in use or otherwise unavailable. • Are you requesting the correct static IP address?	Confirm you are using the correct Access Point Name (APN), username, and password to obtain the desired IP address. These parameters may vary based on your geographical location. Check with your BGAN service provider.
The PDP context activation attempt fails because the requested static IP address is in use or otherwise unavailable. • Is the requested IP address permitted in your current location?	The use of static IP addresses is specific to geographical regions. Your BGAN service provider will provide the details. Confirm that you are requesting the correct static IP address for your current geographical position.
The PDP context activation attempt fails because the requested static IP address is in use or otherwise unavailable. • Was the last context activation made to the requested IP address properly deactivated?	The BGAN system is designed to allow for short outages in the connection link between the terminal and the satellite. For example, when the vehicle with a BGAN terminal drives behind a building, the BGAN system will allow the Background PDP connection to remain broken for one hour. During that one hour the IP address remains assigned to that context. (Note, if you remove DC power from the BGAN terminal without properly deactivating a context, the BGAN Network will keep the IP address for that context allocated to that BGAN terminal for one hour. Moving the Land Portable power switch to OFF will correctly deactivate the PDP context before shutting off power to the unit.) You can power the terminal back on, reactivate the context, and then properly deactivate it to release the IP address. Alternatively, wait one hour for BGAN to release the IP address, or use a different IP address.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The PDP context activation attempt fails because the requested static IP address is in use or otherwise unavailable. • Is there network congestion in your specific spot beam?	It is possible during periods of heavy network usage that the network is too busy to grant a PDP context request. Continuously retry activation attempts. As soon as the network is able to grant you a PDP context, it will. Additionally, your BGAN Service Provider can determine if the problem is due to network congestion.
The terminal has power, but the Ethernet electrical link indication is not present.	Verify that the MIL Data Connector on the cable is fully connected to the MIL Data Connector on the BGAN terminal. The red outline on the BGAN terminal connector should not be seen when fully screwed in. Cable 12043-0834 contains both a female ISDN and a male Ethernet connector. Ensure the correct connector is used.
The terminal has power, but the Ethernet electrical link indication is not present. • Check computer settings.	Ensure that the Ethernet Device is properly configured on your computer. Refer to Paragraph 2.6 Initial Turn-On / Check.
The terminal Ethernet electrical link is present, but IP traffic to the default IP address of the terminal gets no response. • Was the IP address of the terminal changed from the default?	Retry the communication using the correct IP address for the terminal. If the address was changed and forgotten proceed to the actions below to recover the IP address of the terminal.
The terminal Ethernet electrical link is present, but IP traffic to the default IP address of the terminal gets no response. • Is the DHCP server feature enabled in the terminal?	Configure the communicating device to use Dynamic Host Configuration Protocol (DHCP).
The terminal Ethernet electrical link is present, but IP traffic to the default IP address of the terminal gets no response. • Was the embedded DHCP server turned off?	Configure the communicating device to use DHCP. If the BGAN terminal was changed to a static IP address, and that IP address was forgotten, remove the Universal Mobile Telecommunications System Subscriber Identification Module (USIM) card, then power the terminal up. With the USIM removed, the terminal will automatically enable the DHCP server feature. This will allow a directly connected computer to use DHCP to receive an address from the BGAN terminal, as well as allow the computer to reconfigure the BGAN terminal appropriately. Ensure that the computer is configured to be in the same subnet as the terminal if the terminal is not configured for DHCP. If DHCP is enabled on the terminal, ensure that the computer got an IP Address from the BGAN terminal. Refer to Paragraph 2.6 Initial Turn-On / Check.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The PDP context is active, but data will not flow over the connection.	On the 'PDP-Contexts' Web interface page, confirm that the Local IP address of the active context matches the IP address of the device attempting to send data. Only packets sourced from the Local IP Address will be allowed to pass over the PDP context created. If the addresses do not match, you must deactivate the context and create a new one with the correct Local IP Address. Note that when using DHCP from the computer, the computer IP address may change.
The PDP context is active, but data will not flow over the connection. • Does your Local Area Network (LAN) route packets between the Local IP Address and the BGAN terminal?	Confirm you network configuration is correctly routing packets between the Local IP Address of the active context to the BGAN terminal.
I can't hear pointing tones on my RF-7800B-DU when the switch is in the audio position	Check the 'Bypass Antenna Pointing' setting on the Web interface Setup page. The 'Auto Power On' setting might be disabled on your terminal. Use the switch to power off the terminal and power it back on. Check the 'Auto Power On' feature setting via the Web interface. When the 'Auto Power On' feature is enabled, the terminal will automatically power on when power is applied to the unit and the power switch is not in the OFF position. This feature allows for automatic reboot of the terminal following an unexpected power failure.
What frequency is my BGAN terminal transmitting on?	Check the Web interface 'Antenna' page. It varies slightly by location. Register and create a PDP context with the terminal. Then check the 'Antenna' page on the terminal's Web interface for your spot beam frequency. This is the frequency that user data is transmitted on.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
My RF-7800B-DU does not seem to turn on when power is applied.	Check if the 'Auto Power On' feature is enabled on the Web interface 'Setup' page. The 'Auto Power On' setting might be disabled on your terminal. Use the switch to power off the terminal and power it back on. Check the 'Auto Power On' feature setting via the Web interface. When the 'Auto Power On' feature is enabled, the terminal will automatically power on when power is applied to the unit and the power switch is not in the OFF position. This feature allows for automatic reboot of the terminal following an unexpected power failure.
The BGAN terminal was online, but has since been placed offline (Not Registered) without user intervention. • Has the view of the satellite become obstructed?	Restore a clear line of sight between the terminal and the satellite. The connection will automatically be restored if the interruption was less than one hour.
The BGAN terminal was online, but has since been placed offline (Not Registered) without user intervention. • Was there any data sent over the connection for 12 hours?	The BGAN system will automatically deactivate a context that has not sent any data for 12 hours. Manually reactivate the PDP Context. If desired, enable the '24/7 PDP Context Keep Alive' feature on the 'Setup' page of the Web interface to keep unused connections active longer than 12 hours.
The BGAN terminal was online, but has since been placed offline (Not Registered) without user intervention. • Did you reach the data limit for your BGAN subscription?	To limit BGAN expenses, USIM cards can be commissioned to have a daily/weekly/monthly traffic or monetary limit. Contact your USIM administrator to obtain more air-time. Check with your BGAN Service Provider to determine if this was the cause.

5.3   BATTERIES

The BGAN Battery Box Kit 12091-4010-01 can use one of the following batteries:

- BA-5590/U Lithium Sulfur Dioxide (Li-SO2) non-rechargeable

- BA-5390/U Lithium Manganese Dioxide (Li-MnO2) non-rechargeable

- BB-590/U Nickel-Cadmium (Ni-Cd) rechargeable

- BB-390A/U Nickel-Metal Hydride (Ni-MH) rechargeable

- BB-390B/U Ni-MH rechargeable

- BB-490/U lead-acid rechargeable

- BB-2590/U Lithium-Ion (Li-ION) rechargeable

Refer to Paragraph 3.3.2.5 for information on connecting the battery box to RF-7800B-DU024 Land Portable BGAN Terminal.

5.3.1 Battery Life

The most significant factor in determining battery life is transmission output power level and duty cycle. To maximize battery life, keep BGAN terminal off when not needed, and minimize transmissions.

5.3.2 Battery Safety

⚠ **WARNING**

For batteries containing Lithium, do not charge, short circuit, incinerate, mutilate, recharge non-rechargeable batteries, expose to fire, or expose to temperatures above 130° F (54.4° C). Failure to comply may cause battery to vent, rupture, start a fire, or explode, causing personal injury.

⚠ **WARNING**

Never expose batteries to any amount of water at any time. This could cause a fire or explosion, causing personal injury.

⚠ **WARNING**

Do not activate Complete Discharge Device (CDD) of a damaged Lithium Battery as this could release toxic material that can cause personal injury.

⚠ **WARNING**

If the battery becomes hot, a hissing sound is heard, and an irritating smell occurs; power the radio OFF, disconnect the batteries from the radio and move the equipment to a well-ventilated area. If a battery leak is detected, follow appropriate Hazardous Materials (HAZMAT) procedures to reduce risk of personal injury.

Dispose of partially and fully discharged batteries in accordance with your local directives. Improper disposal of hazardous waste is prohibited by law.

When using BA-5590/U Lithium batteries, it is recommended that the user consult MIL-B-49430 (ER), MIL-SPEC, batteries, non-rechargeable, Lithium Sulfur Dioxide, and MIL-B-49430/3D (ER), MIL-SPEC, batteries, nonrechargeable, Lithium Sulfur Dioxide BA-5590/U.

5.3.3   Rechargeable Battery Packs

⚠ **WARNING**

Do not overcharge, short circuit, incinerate, or mutilate rechargeable batteries. Charge batteries per manufacturer's instructions. Failure to comply could cause personal injury or death.

Optional battery chargers are available to provide fully automatic battery charging and fault detection. Models are available for single or multiple battery charging, and display the status of each connected battery during operation. Contact Harris for particular applications.

5.3.4   Disposing of Lithium Batteries

⚠ **WARNING**

Do not dispose of batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply could cause injury or death to personnel.

⚠ **WARNING**

Store multicell lithium sulfur dioxide batteries in a well ventilated area away from personnel. Do not activate the CDD of a damaged battery. Damaged multicell lithium sulfur dioxide batteries must be processed as hazardous waste and should not be thrown into a local dumpster. Otherwise, personal injury or death may result.

Lithium batteries, whether discharged or partially discharged, should only be disposed of per local directives. Refer to local directives for additional information on lithium batteries. Do not place lithium batteries in trash compactors. Refer to local directives for more information on lithium batteries.

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APPENDIX A

# TECHNICAL INFORMATION

A.1   CHASSIS CONNECTOR PINOUT DATA

Table A-1, and Table A-2, provide pinout data for the connectors mounted to the BGAN terminal. Figure A-1 shows the connector locations and pinouts. For information on connectors that mate to the BGAN terminal chassis connectors, refer to Paragraph A.1.1.

Table A-1. DATA

Pin #	Signal Name	Dir	Description	Specs
1	ISDN_TX-	I	ISDN Receive -	
2	ISDN_TX+	I	ISDN Receive +	
3	ISDN_RX-	O	ISDN Transmit -	
4	ISDN_RX+	O	ISDN Transmit +	
5	ETHER_TX-	I	Ethernet Receive -	
6	ETHER_TX+	I	Ethernet Receive +	
7	ETHER_RX-	O	Ethernet Transmit -	
8	ETHER_RX+	O	Ethernet Transmit +	
9	USB_GND	I	USB Ground	
10	USB_VBUS	I	USB Voltage Bus	
11	USB_D-	I/O	USB Data -	
12	USB_D+	I/O	USB Data +	

Table A-2. POWER

Pin #	Signal Name	Description	Specs
A	DC+	DC +	
B	GND	Ground	No cable connection
C	Power Control (ACTIVATION_SIGNAL)	Jumper to D to enable Power Control Signal	For RF-7800B-VU104 only. Activates power when grounded.
D	GND	Ground	
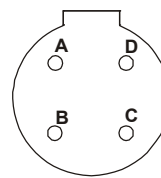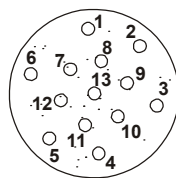
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Figure A-1. RF-7800B Data and Power Connector Pinouts

A.1.1   Mating Connectors

Table A-3 provides part numbers for the cable connectors that mate to the chassis connectors.

Table A-3. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
RF-7800B Data	J09-0024-102
RF-7800B Power	J09-0007-207

APPENDIX B

GLOSSARY

B.1   GLOSSARY

The following provides a glossary of terms used in this manual.

<div align="center">

-A-

</div>

A	Ampere
ABIT	Antenna Built-In Test
AC	Alternating Current
ACA	Automatic Context Activation
AES	Advanced Encryption Standard
APN	Access Point Name
ATB	Antenna Tracking Board

<div align="center">

-B-

</div>

BIT	Built-In Test
BGAN	Broadband Global Area Network
BLOS	Beyond-Line-of-Sight

<div align="center">

-C-

</div>

°C	Celsius, degrees
C/NO	Carrier-to-Noise ratio
CDD	Complete Discharge Device
CE	Conformité Européenne, a French term that can be literally translated into English as European Conformity. The CE Marking is a certification for products within the European Economic Area.
CID	Context Identifier
cm	Centimeter
CS	Circuit Switch

GLOSSARY - CONTINUED

-D-

dB	Abbreviation for decibel, which is one-tenth of a bel.
dBm	The amount of power relative to that represented by a 1 kHz signal which is fed one milliwatt of power into a 600 ohm resistive load; or 1 dB relative to one milliwatt, 0 dBm = 1 mW.
dBW	1 dB relative to one Watt.
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol (Automates the assignment of IP addresses to computers)
DNS	Domain Name System

-E-

E	East
EEPROM	Electrically Erasable Programmable Read Only Memory
EIRP	Effective Isotropic Radiated Power

-F-

°F	Fahrenheit, degrees
FAX	
FCC	Federal Communication Commission
FTP	File Transfer Protocol
FXS	Foreign Exchange Subscriber

-G-

GMPCS	Global Mobile Personal Communications by Satellite
GMT	Greenwich Mean Time
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications

-H-

HAIPE	High Assurance Internet Protocol Encryptors
HAZMAT	Hazardous Materials
HF	High Frequency

GLOSSARY - CONTINUED

-H- (Continued)

HPA	High Power Amplifier
http	Hypertext Transfer Protocol (world wide web protocol)
Hz	Abbreviation for hertz, or cycles per second.

-I-

ID	Identification
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
INMARSAT	International Marine/Maritime Satellite
IP	Internet Protocol
IPSEC	Internet Protocol Security
ISDN	Integrated Services Digital Network
ITM	International Telecommunication

-J-

-K-

k	One thousand
kbps	One thousand bits per second
kg	Abbreviation for kilogram, or one thousand grams.
kHz	Kilohertz or one thousand hertz
km	Kilometers or one thousand meters
km/h	Kilometers Per Hour or one thousand meters per hour.

-L-

LAN	Local Area Network
lbs	Abbreviation for pound
Li-ION	Lithium-Ion
Li-MnO2	Lithium Manganese Dioxide
Li-SO2	Lithium Sulfur Dioxide
LNA	Low Noise Amplifier
LOS	Line-of-Sight

GLOSSARY - CONTINUED

-M-

mA	Milliampere
MHz	Abbreviation for Megahertz, or one million cycles per second.
MIL	Military
MIL-SPEC	Military Specification
MIL-STD	Military Standard
mph	Miles Per Hour
MS-ISDN	Mobile Subscriber Integrated Services Digital Network
MSN	Mobile Subscriber Number
mW	milli Watt

-N-

NAT	Network Address Translation
Ni-Cd	Nickel-Cadmium
Ni-MH	Nickel-Metal Hydride

-O-

-P-

PDA	Personal Data Assistant
PDP	Packet Data Protocol
PIN	Personal Identification Number
PLL	Phase Locked Loop
POTS	Plain Old Telephone System
PS	Packet Switch
PSTN	Public Switched Telephone Network
PUK	Personal Unblocking Key

-Q-

QoS	Quality-of-Service

-R-

RDI	Restricted Digital Information
RF	Radio Frequency

GLOSSARY - CONTINUED

-R- (Continued)

RoHS	Restriction of Hazardous Substances
RSSI	Low Received Signal Strength Indication
Rx	Receive

-S-

SATCOM	Satellite Communications
SIM	Subscriber Identification Module
SOQH	SATCOM-on-the-Quick-Halt
SOTM	SATCOM-on-the-Move
STE	Secure Terminal Equipment

-T-

TCP/IP	Transmission Control Protocol/Internet Protocol
TE	Terminal Equipment
TOC	Tactical Operation Centers
Tx	Transmit

-U-

UDI	Unrestricted Digital Information
UHF	Ultra High Frequency
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	UMTS Subscriber Identification Module

-V-

V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
VHF	Very High Frequency
VPN	Virtual Private Network

GLOSSARY - CONTINUED

-W-

W	Watts, West
WEEE	Waste from Electrical and Electronic Equipment

-X-

-Z-

TECHNICAL PUBLICATION
EVALUATION FORM

To the User of this Instruction Manual:

HARRIS Corporation, RF Communications Division continually evaluates its technical publications for completeness, technical accuracy, and organization. You can assist in this process by completing and returning this form. Please specify section, page number, figure or table number where applicable.

MANUAL TITLE: _____

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GENERAL	EXCELLENT	GOOD	FAIR	POOR
TEXT	[ ]	[ ]	[ ]	[ ]
SETUP/ALIGNMENT INST.	[ ]	[ ]	[ ]	[ ]
TROUBLESHOOTING INST.	[ ]	[ ]	[ ]	[ ]
TABLES	[ ]	[ ]	[ ]	[ ]
ILLUSTRATIONS	[ ]	[ ]	[ ]	[ ]
PARTS LISTS	[ ]	[ ]	[ ]	[ ]
SCHEMATIC DIAGRAMS	[ ]	[ ]	[ ]	[ ]

CHAPTER	EXCELLENT	GOOD	FAIR	POOR
INTRODUCTION/GENERAL INFORMATION	[ ]	[ ]	[ ]	[ ]
OPERATION	[ ]	[ ]	[ ]	[ ]
FUNCTIONAL DESC/THEORY OF OPERATION	[ ]	[ ]	[ ]	[ ]
SCHEDULED MAINTENANCE	[ ]	[ ]	[ ]	[ ]
TROUBLESHOOTING	[ ]	[ ]	[ ]	[ ]
CORRECTIVE MAINTENANCE	[ ]	[ ]	[ ]	[ ]
DOCUMENTATION	[ ]	[ ]	[ ]	[ ]
INSTALLATION	[ ]	[ ]	[ ]	[ ]
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GENERAL COMMENTS: Please include your suggestions for improvements to the manual. Specify chapter, page, paragraph, figure number, or table number as applicable. Attach examples or extra pages if more space is needed.

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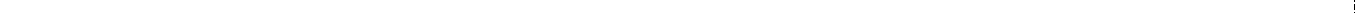**PHONE NUMBER (INCLUDE AREA CODE):** _____

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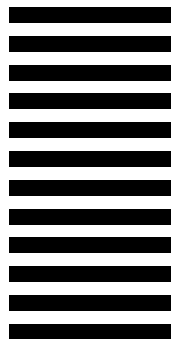CUT HERE

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