

EBT Upgrade Inventory and Shipping Report

Ship to	Ship Date:
site name: _____	
addr: _____	Partial Ship _____ No _____ Yes (IF YES, SEE BELOW)
city/st/zip: _____	Ship carrier: _____
	Air bill #: _____
ATTN: _____	
phone: (____) _____	Installer/Packer: _____
Sequence #: _____	Total # box: _____

√	Box	Value	Qty	Component Description	OATS	
EBT Upgrade Kit						
	1	\$10	1	1. Cable: 6 Printer (DB25M->Centronics)	No	
	1	\$10	1	2. Cable: 10 Printer Extension (DB25M->DB23F)	No	
	1	\$5	1	3. A/B Date Switch Box	No	
	1	\$1	1	4. 3mm Screws (2 Flathead + 2 Roundhead)	No	
	1	\$0	1	5. Paperwork: STB-RIT-004	No	
	1	\$1	1	6. s/w: EBT Upgrade Diskette	No	
	1	\$350	1	7. s/w: Microsoft Word for Windows	No	
	1	\$90	1	8. s/w: Microsoft DOS Upgrade v6.2	No	
	1	\$20	1	9. s/w: Mode-S VHS Video Tape	No	
	1	\$0	1	10. Paperwork: STB-MODES-016	No	
	1	\$300	1	11. Bubble jet Printer	No	s/N: _____
	1	\$200	1	12. Internal SCSI CD-ROM Drive	No	s/N: _____

Shipping Notes

SITE TECHNICAL BULLETIN

DATE: December 27, 1996

NUMBER: STB-RIT-004

SYSTEM/TYPE: Radar Intelligent Tool (RIT)

SUBJECT: RIT System Electronic Book Technology (EBT) Upgrade

1. **PURPOSE.** This site technical bulletin (STB) delivers the Radar Intelligent Tool (RIT) System's Electronic Book Technology (EBT) Upgrade kit. The EBT Project's objective is to host all pertinent system documentation on compact disc - read only memory (CD-ROM) media and use a Microsoft Windows compatible hypertext viewer to display the text.
2. **DISTRIBUTION.** The RIT System EBT Upgrade distribution follows a selected site schedule. Refer to attachment 2.
3. **REFERENCES.** Not applicable.
4. **DESCRIPTION OF PROBLEM.** Refer to Attachment 1.
5. **SITE APPLICATION.** As listed in Attachment 1.
6. **CONTENTS.**

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QTY</u>
Attachment 1	RIT System EBT Upgrade Guide	1
Attachment 2	EBT Upgrade Candidates List	1
Attachment 3	EBT Upgrade Kit (hardware kit)	1

7. **RECOMMENDED SOLUTION.** Refer to Attachment 1.
8. **HARDWARE IMPACT.** Refer to Attachment 1.
SOFTWARE IMPACT. Refer to Attachment 1.
9. **CLARIFICATION OR COMMENTS.** The RIT System EBT Upgrade Kit is delivered under this cover. As it becomes available, additional information will be delivered to the offices identified in attachment 1 EBT distribution list.

For further information or comments, please contact the National Data Communications Systems Engineering Division Radar Branch, AOS-520, on (609)485-HELP.

Program Director for Operational Support

3 Attachments

Attachment 1

RIT System EBT Upgrade Guide

RIT System

Radar Intelligent Tool

EBT Upgrade Guide



Operational Support

AOS-500, FAA William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405
Main & Tech Support: (609)485-HELP
Fax: (609)485-4235

About This Guide

This guide provides you with minimal information to quickly upgrade and power on your Radar Intelligent Tool (RIT) System.

Related Guides

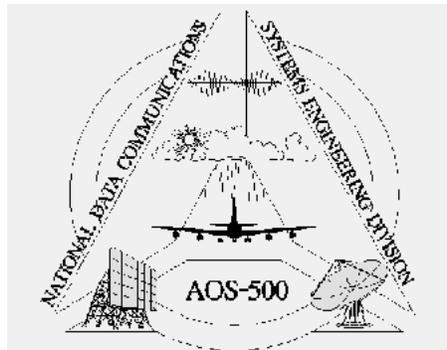
In addition to this Upgrade Guide, the RIT System includes:

1. NEW! The RIT System User Guide
2. NEW! The RIT Analysis Tools Guide

(Both documents are currently under development.)

Change Proposals

Change proposals, comments and requests for copies should be directed to:



FAA Operational Support
National Data Communications System Engineering Division
Radar Branch, AOS-520
FAA William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405

Main & Tech Support: (609)485-HELP
AOS-500 Fax: (609)485-4235

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2. Introduction

Purpose

The EBT (Electronic Book Technology) Upgrade Guide was designed for the site technician to perform a field upgrade to the RIT (Radar Intelligent Tool) System PC. Even though personal computers (PC) are in many of our daily lives, site technicians have different experience levels with PC's. This guide was designed to assist the site technician, no matter the experience level, with a step by step procedure to upgrade the RIT System PC. This guide has two other goals:

- To provide a background understanding of the RIT Project.
- To provide some technical information of the RIT System PC hardware options.

This Guide should accompany the RIT System Electronic Book Technology (EBT) Upgrade Kit.

Who Should Read This

This guide was designed for the technical person who will perform the upgrade of the RIT System and site personnel who use RIT.

Document Organization

Chapter	Description
3	This chapter describes the EBT Project as it relates to RIT.
4	This chapter describes the minimum PC specifications required to support EBT.
5	This chapter describes the EBT Upgrade Kits and their contents. Site technicians should verify that their kits are complete.
6	This chapter describes the step-by-step procedure to install the CD-ROM drive. Site technicians should review this chapter and also chapter 10 prior turning any nuts.
7	This chapter describes the step-by-step procedure to install the bubblejet printer. Site technicians should review this chapter first prior turning any nuts.
8	This chapter describes the RIT Project and is included for reference only.
9	This chapter describes the SCSI Subsystem relating the concepts to RIT. Site technicians should review this chapter to understand the RIT System's SCSI bus and how it is configured.
10	This chapter describes the FAA technical support procedures for the RIT PC's. Site personnel should be familiar with this chapter in the event technical support is required.

3. The EBT Project

Electronic Book Technology Overview

The FAA's Operational Support Service is developing electronic documentation products and procedures in an effort to reduce the documentation production time, delivery and maintenance costs while making the information more user friendly and accessible. This effort, as it pertains to the Radar Intelligent Tool (RIT) is called, the Electronic Book Technology (EBT) Project.

The EBT Project's objective is to host all pertinent technical documentation on compact disc-read only memory (CD-ROM) media. Text documentation will be designed with "hot links" (referred to as hypertext) to related topics and definitions. The system will perform similar to the Microsoft Windows Help system and the Internet World Wide Web documents using a Microsoft Windows compatible hypertext and graphics viewer. Ad-hoc searches via a full-text search engine will be available by subject, by topic, or by document for review of technical details while on-line or can be printed in hardcopy format.

The EBT Pilot Project: Mode-S

The EBT Project will premier with the Mode-S System technical manuals and handbooks. All pertinent technical documentation, schematics, diagrams, figures, tables and checklists will be hosted on CD-ROM media and hot linked and cross referenced. AOS-500, as the project evolves, will establish development methodologies and techniques establishing a common "look and feel".

The electronic documents may be viewed by site users on any Windows compatible PC with a CD-ROM drive. AOS-500 has designated the RIT System as the target platform for the Mode-S electronic documentation.

Host System: RIT

The RIT System hosts several important capabilities for the Mode-S System.

1. Tape drive emulation, using the tape drive interface card (TDIC), to upload and download the operational Mode-S program images.
2. Mode-S Sensor operational certification, using the real-time aircraft display system (RTADS) and the MX-6A Card.
3. Radar analysis using the MX-6A Card to record and analyze radar data for system performance.
4. and now CD-ROM based electronic documentation

4. EBT System Requirements

RIT Systems affected: All field installed RIT Systems

EBT System Requirements

The EBT System includes a Microsoft Windows compatible hypertext and graphics viewer, Worldview. The PC hardware required for the EBT System is:

PC system option	EBT System Minimum Requirements
Microprocessor:	80486DX/33 MHz or better
Video:	SVGA: 800x600x 16 colors (16 shades of gray)
Monitor:	SVGA non-interlaced (the larger the better)
Video Memory:	1 MB
Pointing device:	Microsoft compatible mouse
Hard drive:	50 megabyte for program and data
CD-ROM:	4x speed (600+KB transfer rate)
Printer:	black & white bubblejet (360x360 dpi) capable of 11"x17" output

TABLE 4-1 EBT SYSTEM REQUIREMENTS

Any Microsoft (MS) Windows compatible PC system (laptop, notebook, lunch box, etc.) with a CD-ROM drive and 50 MB of available hard disk space is suitable. Refer to the RIT System Hardware Specification section for more detailed PC requirements

- Even though MS Windows will operate with less than 8 megabyte of RAM, 16 MB is required because system performance is unacceptable with less.
- The EBT System will operate with a slower CD-ROM drive than quad-speed (4x), however, performance may be unacceptable.
- Printed output from The EBT System will be legible from a dot matrix impact printer, however, the resolution is not sufficient for equipment picture details.

The RIT Systems

Since the initiation of the RIT Project, several different COTS PC hardware platforms have been deployed as RIT Systems. All field installed RIT Systems require an upgrade to meet the EBT System requirements.

This upgrade is referred to as the RIT System EBT Upgrade.

RIT Version designation	PC Model
RIT v1	AST Premium 486/33
RIT v2	AST Premium 486/33
RIT v3	AST Premmia 4/66d
RIT v4	AT&T Globalyst 630
E-RIT/R & E-RIT/A	AST Premium SE 4/66d

TABLE 4-1 RIT VERSIONS

5. The EBT Upgrade Kits

RIT Systems affected: All field installed RIT Systems

EBT Upgrade Kits

In order to meet the EBT System minimum configuration requirements, all field installed RIT Systems must be upgraded. The RIT System EBT Upgrade is organized into kits.

All RIT Systems:

- require a CD-ROM drive
- require a bubble jet printer

PC system option	Fielded Config	Upgrade Required
Microprocessor:	80486DX/33MHz or 80486DX2/66MHz	none
Video:	SVGA w/512KB video RAM supports: 800x600x16 colors	none
Monitor:	14" SVGA non-interlaced	none
Memory:	16 MB	none
Pointing device:	Microsoft mouse compatible	none
Modem:	9600 baud or faster	none
Hard drive controller:	SCSI adapter - 16 bit	none
Hard drive:	internal SCSI 500MB or greater	none
CD-ROM:	none	internal SCSI 4x speed drive
Tape drive:	1/4" internal SCSI tape drive	none
Printer:	24 pin dot matrix, color, near letter quality	black and white bubble jet, 11"x17" print page capability and data switch

TABLE 5-2 RIT SYSTEM UPGRADE REQUIREMENTS

EBT Upgrade Kit

The contents of the EBT Upgrade are listed below, you should insure that you have a complete kit by verifying you have all the components listed below. The original equipment manufacturer (OEM) package inventory has been included in the below list.

CD-ROM Upgrade

- EBT Hardware Configuration Diskette
- Roundhead 3mm chassis mounting screws
- Flathead 3mm chassis mounting screws
- OEM Product Box Contents
 - OEM CD-ROM User's Manual
 - CD-ROM Drive

Printer Upgrade

The printer upgrade includes a A/B data switch and cables allowing both printers to be available for use.

- Data Switch Box
- Parallel Printer Cable (DB25 male to Centronics)
- Parallel extension Cable (DB25 male to DB25 male)

- OEM Product Box Contents
 - Canon OEM Printer Installation diskette
 - Canon OEM Printer User's Manual
 - Canon BJ230e Bubble Jet Printer

NOTE: If you determine your kit is missing any of the above listed items, please report the deficiency to AOS-500 by calling the AOS Help Line: (609)485-HELP.

6. CD-ROM Drive Installation

RIT Systems affected: All field installed RITs (v1, v2, & v3)

Introduction

This chapter will provide you with the information you need to install the internal SCSI (Small Computer System Interface) CD-ROM drive quickly. The installation is simple and straightforward so that you should be able to successfully operate the RIT System after installing the CD-ROM drive in the PC chassis and SCSI driver software.

All versions of RIT require the CD-ROM drive upgrade. The CD-ROM drive is an internally mounted SCSI device. Successful installation requires configuration of the hardware and software components. Site users should review the following procedures carefully prior to opening the PC cabinet.

CD-ROM Kit Inventory

Carefully remove the contents of the CD-ROM kit from the EBT Upgrade Kit. Please insure you have all the components listed below. The original equipment manufacturer (OEM) package inventory has been included in the below list.

The following items are included in your EBT Upgrade Kit to install the internal SCSI CD-ROM drive:

- (1) EBT Hardware Configuration Diskette
- (2) Roundhead 3mm chassis mounting screws
- (2) Flathead 3mm chassis mounting screws
- OEM Product Box Contents
 - OEM CD-ROM User's Manual
 - CD-ROM Drive

NOTE: If you determine your kit is missing any of the above listed items, please report the deficiency to AOS-500 by calling the AOS Help Line: (609)485-HELP.

Tools Required

The following tools are recommended to have on hand to successfully perform this upgrade.

- Phillips screwdriver
- pliers

Hardware Installation

STEP 1. Power off the PC. Disconnect the MX-6A patch cables from the Mode-S System.

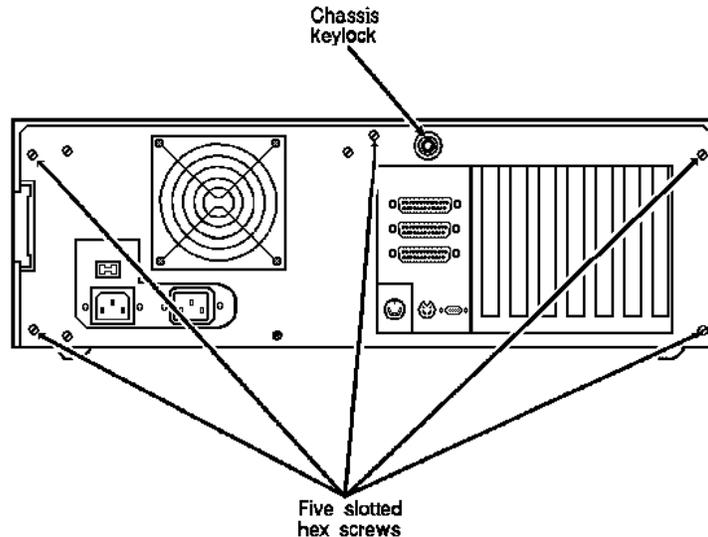


FIGURE 6-1 PC CASE SCREWS (RIT v1 & v2 AST PREMIUM 486/33)

STEP 2. Remove PC case.

- (a) Insure the PC case is unlocked.
- (b) Remove screws securing PC case.
- (c) Slide PC case off.
 - (i) RIT v1 & v2 AST Premium 486/33 (refer to Figure 6-1). Pull cover out towards front of PC approximately two inches (2") so that case clears power on switch panel. Lift PC case straight up until clear of PC chassis.
 - (ii) RIT v3 AST Premmia 4/66d. Pull cover out towards front of PC approximately one inch (1") so that case clears disk drive front panels. Lift PC case straight up until clear of PC chassis.

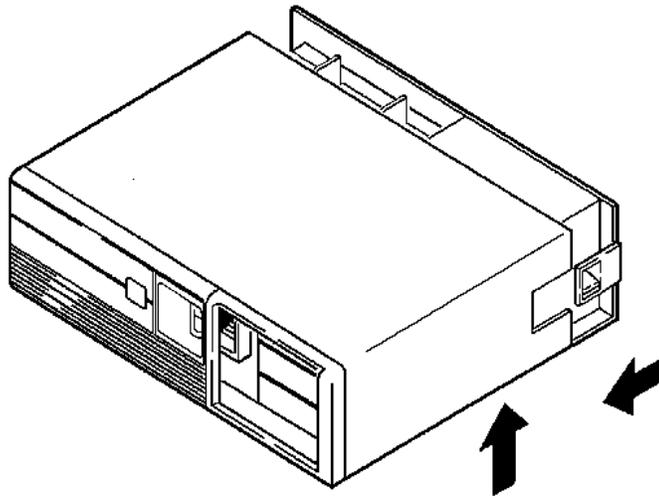


FIGURE 6-2 PC CASE REMOVAL

STEP 3. Ground yourself. Discharge any static electricity by touching both hands on the PC power supply case.

WARNING! Static electricity destroys computer components. Before handling any internal computer components, discharge any static electricity by touching both hands on a grounded surface, such as the computer's power supply.

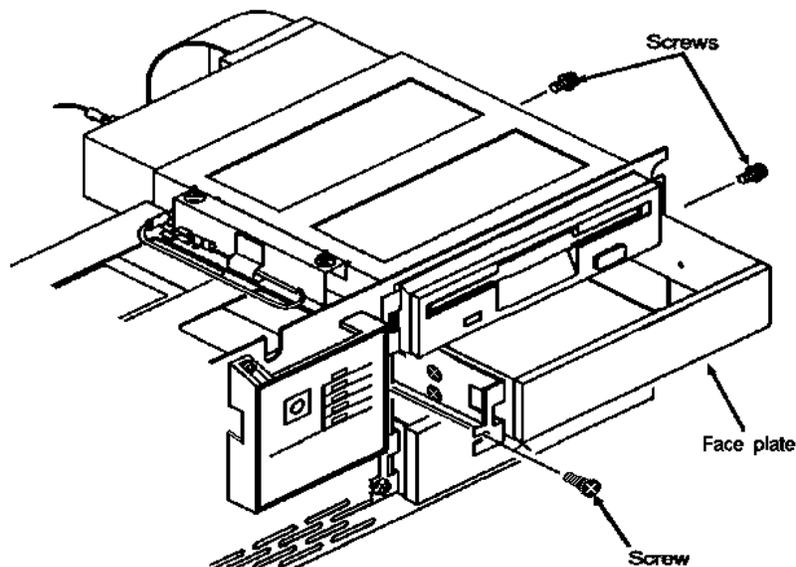


FIGURE 6-3 DRIVE BAY FACE PLATE REMOVAL

STEP 4. Remove drive bay face plate (refer to figure 6-3).

- (a) RIT v1 & v2 AST Premium 486/33. Remove screw from the front bracket of the PC chassis, save screw for later reinstallation. Remove two screws from side frame chassis, these screws will not be reused. Remove four flathead screws from the side rail of drive bay face plate (refer to figure 6-3) these screws will not be used.

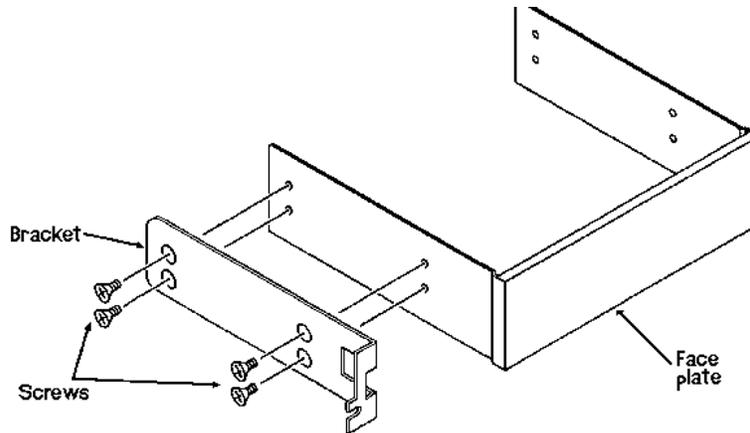


FIGURE 6-4 REMOVE MOUNTING RAIL FROM FACE PLATE

- (b) RIT v3 AST Premmia 4/66d. Remove the two screws securing the face plate to the system chassis, save screws for later reinstallation.

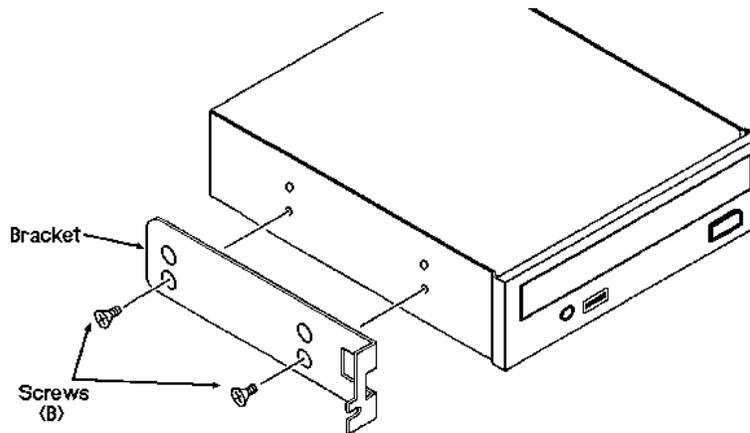


FIGURE 6-5 ATTACH MOUNTING BRACKET TO CD-ROM DRIVE.

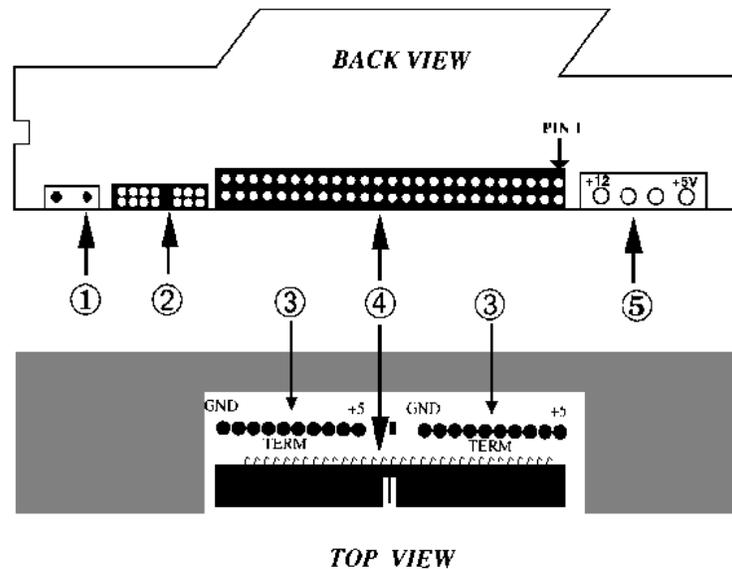
STEP 5. (RIT v1 & v2 AST Premium 486/33 only) Attach mounting bracket to CD-ROM drive.

- (a) Use the two flathead 3mm metric screws designated as screws (B) included in upgrade kit (refer to figure 6-5). The CD-ROM drive mounting holes have metric threads.

NOTE: RIT v3 AST Premmia 4/66d. RIT v3 will not use a mounting bracket. The bare CD-ROM drive slides into the empty drive bay and is secured using the same flathead and roundhead screws.

- (b) Secure the mounting bracket to the right side (when looking at the drive front) of CD-ROM drive case.
 - (i) Secure the screws in the lower holes in the CD-ROM case.
 - (ii) Tighten screws until snug and bracket is secure from movement.

STEP 6. Remove terminating resistors.



- 1 = Audio output plug
- 2 = Mode select jumpers
- 3 = SCSI bus terminators
- 4 = SCSI ribbon cable connector
- 5 = DC power input plug

FIGURE 6-6 CD-ROM TERMINATORS

- (a) To avoid bending pins, use pliers to remove the two SCSI bus terminating resistor packs from the CD-ROM drive (indicated by 3 in figure 6-6).

NOTE: The installed tape drive is the terminating SCSI device (last device on cable) on the internal SCSI bus.

- (b) DO NOT discard the SCSI bus terminators.
 - (i) Place terminators in the small plastic bag the metric screws came in the upgrade kit.
 - (ii) Tape bag flat to the top of the CD-ROM case.
 - (iii) Terminators will be used for future configuration changes and troubleshooting.

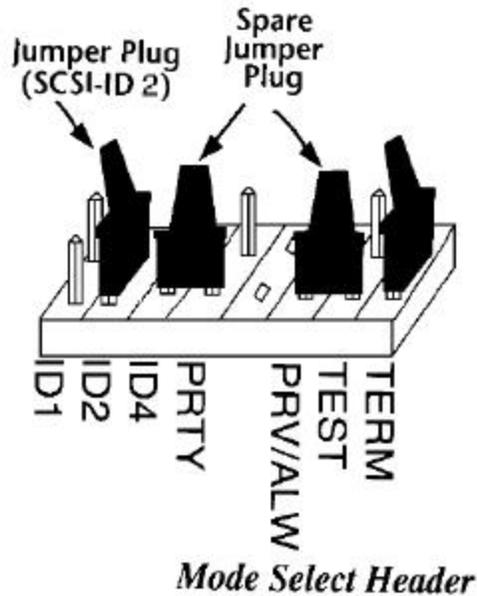


FIGURE 6-7 SET CD-ROM SCSI-ID = 2

STEP 7. Set CD-ROM drive SCSI-ID to 2.

- (a) Remove jumper from across ID1-ID2 (factory setting) and place jumper on ID2 as shown in figure 6-7.
- (b) Place remaining spare jumpers across ID4-PRTY and PRV/ALW-TEST to “store” for future use as shown in figure 6-7.
- (c) Insure there is a jumper across both poles of TERM to enable (factory default setting).
- (d) ID1 should have no jumper across it.

STEP 8. Slide the CD-ROM drive into empty drive bay.

- (a) Prepare drive power plug, routing wire around power supply case. It may be necessary to cut the wire ties securing all power plugs.
- (b) Prepare SCSI ribbon cable, route cable around power supply case for proper orientation. Tape drive should be the last physical device connected on the last cable connector.

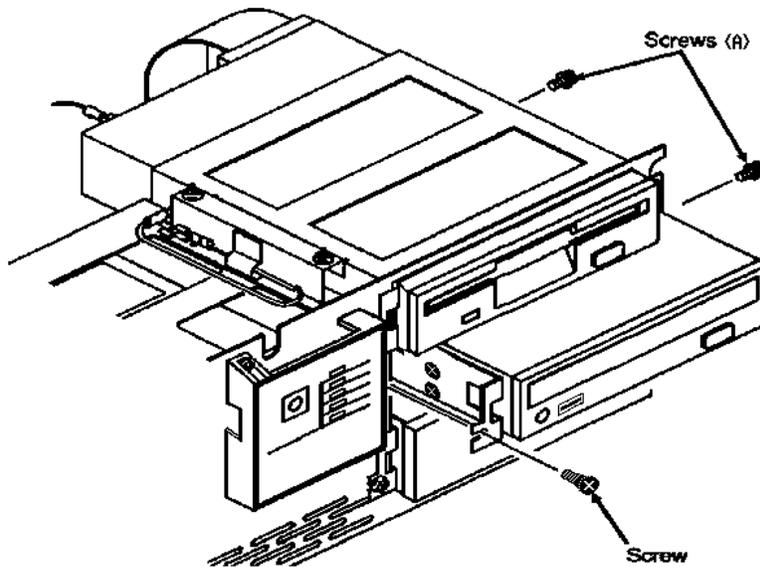


FIGURE 6-8 INSTALL CD-ROM IN PC CHASSIS

NOTE: It may be necessary to shift cable connector attaching the hard drive to the next connector on the cable.

- (c) Slide CD-ROM drive into empty drive bay.

STEP 9. Connect power plug to the CD-ROM drive's power connector receptacle (verify correct orientation, plug is keyed).

STEP 10. Connect SCSI ribbon cable to the CD-ROM drive's SCSI connector receptacle.

- (a) Verify correct orientation of connector - connector is keyed, ribbon cable has red stripe on pin 1.
- (b) It may be necessary to move the cable into position, being careful not to disconnect the other devices.

STEP 11. Secure the front mounting screw to the CD-ROM bracket.

- (a) Secure the CD-ROM drive to the drive bay side rail chassis using the two roundhead 3mm metric screws designated as screws(A) in Figure 6-8.

NOTE: RIT v3 AST Premmia 4/66d. RIT v3 will not use a mounting bracket. The bare CD-ROM drive slides into the empty drive bay and is secured using the same flathead and roundhead screws.

- (b) Tighten screws until snug and CD-ROM is secure from movement.

STEP 12. Replace the PC case.

- (a) Slide the PC case back onto the chassis the opposite way it was removed. Be careful not to disconnect any cables.
- (b) Tighten screws until snug.

Software Installation

Automated Procedure

STEP 1. Power on and boot up the PC to the DOS prompt.

- (a) If the PC automatically boots into MS Windows, open the Program Manager's File menu and select Exit or press: <ALT>, <F>, <X> keys in sequence.

STEP 2. Place the "EBT Hardware Configuration" diskette into the floppy diskette drive (A:).

STEP 3. Run the GOGOEBT DOS batch file.

- (a) Switch the active drive to the floppy drive by: at the DOS prompt type:

A : <ENTER>

- (b) At the DOS prompt type:

GOGOEBT <ENTER>

NOTE: The automated procedure will rename the AUTOEXEC.BAT and CONFIG.SYS files to AUTOEXEC.PRV and CONFIG.PRV respectively.

STEP 4. Reboot the computer.

- (a) The changes made will be enabled when the computer reboots. The CD-ROM drive should now be accessible from DOS and Windows.
- (b) Customize the newly installed CONFIG.SYS file by removing the ASPI Managers that are not required for you model PC (see the table 6-1) - on bootup the computer will beep and display errors when attempting to load the wrong drivers.

RIT Version designation	PC Model	config.sys statement
RIT v1	AST Premium 486/33	DEVICE=C:\SCSI\ASPI4DOS.SYS /D
RIT v2	AST Premium 486/33	DEVICE=C:\SCSI\ASPI4DOS.SYS /D
RIT v3	AST Premmia 4/66d	DEVICE=C:\SCSI\ASPIEDOS.SYS /D
RIT v4	AT&T Globalyst 630	DEVICE=C:\SCSI\ASPI8DOS.SYS /D
E-RIT/R & E-RIT/A	AST Premium SE 4/66d	DEVICE=C:\SCSI\ASPIEDOS.SYS /D

TABLE 6-1 RIT C\NFIG.SYS STATEMENTS

NOTE: Verify that the TDIC and the RTADS/MX-6A systems work.

Manual Procedure

STEP 1. Power on and boot up the PC to the DOS prompt.

- (a) If the PC automatically boots into MS Windows, open the Program Manager's File menu and select Exit or press: <ALT>, <F>, <X> keys in sequence.

STEP 2. Place the "EBT Hardware Configuration" diskette into the floppy diskette drive (A:).

STEP 3. Copy Microsoft CD-ROM driver into the \DOS subdirectory.

- (a) At the DOS prompt type:

```
COPY A:\MSCDEX.EXE C:\DOS<ENTER>
```
- (b) Do NOT overwrite if prompted.

STEP 4. Use an ASCII editor to modify the AUTOEXEC.BAT file.

- (a) Using the DOS editor modify the AUTOEXEC.BAT file
 - (i) At the DOS prompt type:

```
EDIT AUTOEXEC.BAT
```
 - (ii) Press <ENTER> to execute the command.
- (b) Navigate down the file to the line following :GAZELLE END label
 - (i) Use the ↑ and ↓ keys to move the cursor.
 - (ii) Type the line:

```
C:\DOS\MSCDEX.EXE /D:RITCD /M:12 /L:E
```

NOTE: The MSCDEX.EXE enables the computer to recognize a CD-ROM drive as a single logical drive letter under DOS. The /L: option indicates the logical drive letter and may be any letter not in-use and less than the LASTDRIVE= command in CONFIG.SYS file.

- (iii) The text will be inserted at the cursor location moving all other text to the right.
 - (iv) Press <ENTER> to move the other text to the next line.
- (c) Save the modified file.
- (i) Press: <ALT>, <F>, <X> keys in sequence.
 - (ii) Answer YES to dialog box "LOADED FILE IS NOT SAVED. SAVE IT NOW?".

- (iii) The file will be saved and return you to the DOS command prompt.

STEP 5. Modify CONFIG.SYS file.

- (a) Using the DOS editor modify the CONFIG.SYS file
 - (i) At the DOS prompt type:

```
EDIT CONFIG.SYS
```
 - (ii) Press <ENTER> to execute the command.
- (b) Navigate down the file to the line following DEVICE=C:\SCSI\ASPIDISK.SYS.
 - (i) Use the ↑ and ↓ keys to move the cursor.
 - (ii) Type the line:

```
DEVICE=C:\SCSI\ASPIDISK.SYS /D:RITCD
```
 - (iii) The text will be inserted at the cursor location moving all other text to the right.
 - (iv) Press <ENTER> to move the other text to the next line.
- (c) Save the modified file.
 - (i) Press: <ALT>, <F>, <X> keys in sequence.
 - (ii) Answer YES to dialog box “LOADED FILE IS NOT SAVED. SAVE IT NOW?”.
 - (iii) The file will be saved and return you to the DOS command prompt.

STEP 6. Reboot the computer.

- (a) The changes you made will be enabled when the computer reboots. The CD-ROM drive should now be accessible from DOS and Windows.

NOTE: Verify that the TDIC and the RTADS/MX-6A systems work.

Troubleshooting the Installation

Following the Hardware and Software installation procedure outlined in this Guide should provide successful CD-ROM drive operation. However, sometimes things do not work the first time for a variety of reasons. This installation requires tedious changes to the hardware and software components.

Below is a list of some areas to check before calling AOS-500 for support:

1. ✓ Check that the CD-ROM tray closes completely. If the tray does not close completely the hardware drive does not allow DOS access. The CD-ROM drive activity light should illuminate for a second or two, then go out.
Solution: Push the tray closed and verify that the system works.
2. ✓ Check both AUTOEXEC.BAT and CONFIG.SYS files for accuracy. Verify the /d:<label> option are spelled exactly the same. We are using the label: "RITCD".
 - the AUTOEXEC.BAT statement: c:\dos\mscdex.exe /D:RITCD /M:12 /L:E" and
 - the CONFIG.SYS command: "device=c:\scsi\aspicd.sys /D:RITCD"*Solution:* If they are different, edit them to make them exactly the same.
3. ✓ Check both AUTOEXEC.BAT and CONFIG.SYS files to determine if there is a drive letter conflict. We are using drive letter "E:" to reference the CD-ROM drive.
 - verify the AUTOEXEC.BAT file MSCDEX.EXE /l:<drive letter> option is not in conflict with another drive letter already used by another device.
 - verify the AUTOEXEC.BAT file MSCDEX.EXE /l:<drive letter> (<drive letter> = E is used here) is less than the LASTDRIVE= command in the CONFIG.SYS file.*Solution:* If the /l:<drive letter> is in conflict with a drive letter already in use or is greater than the LASTDRIVE= command, select another drive letter (you may change the LASTDRIVE= command letter).
4. ✓ Verify the cables are connected. Sometimes while putting the case back on, the SCSI ribbon cable is disconnected. Power down the PC and remove the case. Ground yourself.
 - check that all the SCSI devices have the ribbon cable connected.
 - check that all the devices have a power plug connected.*Solution:* Connect the cable to all SCSI devices making the tape drive connected to the last connector on one end of the ribbon cable and the SCSI Host Adapter connected to the other end. The SCSI hard drive and the SCSI CD-ROM should be connected using middle connectors. You may have to twist or fold the ribbon cable.
5. ✓ Verify the CD-ROM terminators are removed. If the terminators are not removed, sometimes the drive works properly and sometimes it does not. Power down the PC and remove the case. Ground yourself.
 - check that the CD-ROM drive has it's terminators removed.
 - check that the tape drive has it's terminators installed.*Solution:* Remove the CD-ROM terminators. You may have to take the drive out of the chassis.
6. ✓ Verify the SCSI-Id settings are correct.

SCSI Id #	RIT System
Target Id	(v1, v2, v3 & v4)

3 (int bus)	int. tape drv (term dev.)
2 (int bus)	int. CD-ROM drv
1 (int bus)	not used
0 (int bus)	int. boot hard drv C:

Power down the PC and remove the case. Ground yourself.

- check that the CD-ROM drive's SCSI-Id is set to 2.
- check that the tape drive's SCSI-Id is set to 3.

Solution: Usually, as is the case on the CD-ROM and tape drive, the SCSI-Id is set using a combination of three jumpers (binary, 2 = 010, 3 = 011).

NOTE: If you continue to experience problems with this upgrade contact AOS-520.

AOS Support

FAA Operational Support

National Data Communications Systems Engineering Division

Radar Branch, AOS-520

FAA William J. Hughes Technical Center

Atlantic City International Airport, NJ 08405

Main & Tech Support: (609)485-HELP

Fax: (609)485-4235

The FAA Operational Support's Radar Branch, AOS-520, provides site users with technical phone support to resolve RIT System hardware and software problems.

7. Bubble Jet Printer Installation

RIT Systems affected: ALL (v1, v2, & v3)

Introduction

This chapter will provide you with the information you need to install the Bubble Jet printer quickly. The installation is simple and straightforward so that you should be able to just plug and play after installing the printer and software drivers.

All original configurations of RIT included an Advanced Matrix Technologies' Accel-500 or Accel-535 color dot matrix printer with a parallel port interface. Color capability is a feature of several of the FAA TRACS-9 suite of radar analysis programs and must be retained.

The EBT System requires a printer output capability of 11"x17", with a resolution of 360x360 dots per inch, and black and white color for schematic drawings. The Canon Bubble Jet BJ-230e has been procured for this upgrade and is included in the EBT Upgrade Kit.

All versions of RIT will require the bubble jet printer added to its original configuration. A parallel port data switch and cable has been included in the upgrade kit in order to have both printer capabilities available.

Printer Hardware Inventory

Carefully remove the contents of the printer hardware. You should verify that all the components listed are present. The original equipment manufacturer (OEM) package inventory has been included in the below list.

The following items are included in your EBT Upgrade Kit to install the bubble jet printer drive:

- Data Switch Box
- Parallel Printer Cable (DB25 male to Centronics)
- Parallel extension Cable (DB25 male to DB25 male)
- OEM Product Box Contents
 - Canon OEM Printer Installation diskette
 - Canon OEM Printer User's Manual
 - Canon BJ230e Bubble Jet Printer

Tools Required

The following tools are recommended to have on hand to successfully perform this upgrade.

- slotted screwdriver

Hardware Installation

STEP 1. Reference the “Canon Quick Start Guide” (pages 1-12) included in the OEM printer box for unpacking and printer setup.

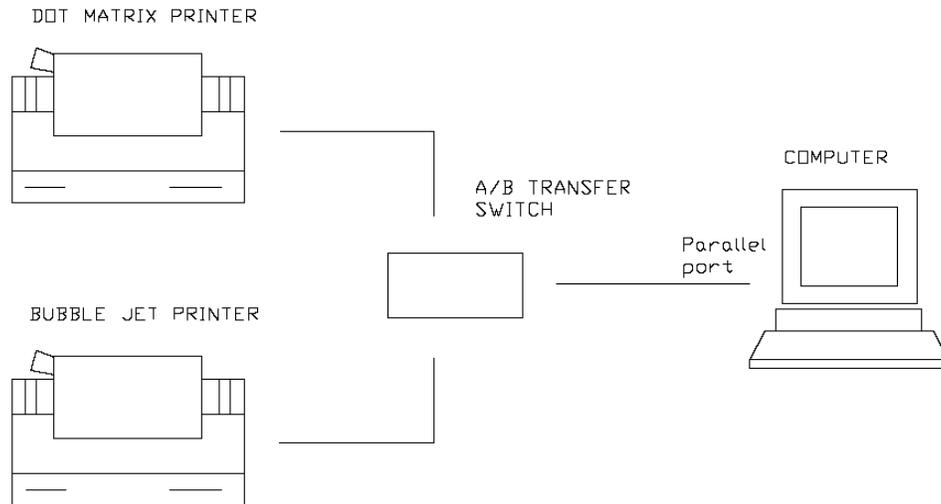


FIGURE 7-9 A/B DATA SWITCH CONFIGURATION

STEP 2. Setup the data switch to connect both printers (refer to Figure 7-9).

- (a) Connect one of the DB25 male connectors of the parallel extension cable into the data switch INPUT/OUTPUT port and the other end to the PC's parallel port (unplug the AMT Accel printer cable).
- (b) Connect the DB25 male connector of the AMT Accel printer cable to the data switch port A and the other end (36 pin Centronics male) to the AMT Accel printer's parallel port.
- (c) Connect the DB25 male connector of the printer cable supplied in the EBT Upgrade Kit to the data switch port B and the other end (36 pin Centronics male) to the Canon BJ230e printer's parallel port.
- (d) Position the data switch where it would be accessible to the PC operator. (The PC operator will switch the data switch to the port of the desired printer.)

Software Installation

Printer Driver Install

To utilize the Canon bubble jet printer, the correct printer driver needs to be installed. A printer driver is a program that enables Windows to communicate with the printer. For each type of printer used, the appropriate printer driver must be installed.

WARNING ! By not having the correct Windows printer driver installed, Windows is unable to communicate with the printer or if the incorrect driver is installed, printing will not be legible.

To install a Windows printer driver, use the printer install utility located in the “Control Panel” found in the Windows Main program group. The Following is a simple procedure to install the Canon bubble jet printer driver.

NOTE: Have the Canon OEM “Windows 3.0 & 3.1 Driver Software for the BJ-230 Bubble Jet Printer” diskette ready.

STEP 1. Install Windows printer driver

- (a) To open the Windows Control panel double-click on the icon in the Main program group.

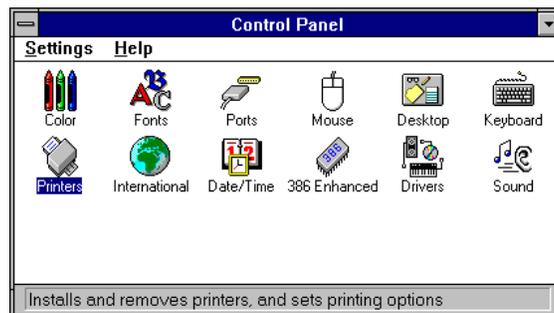


FIGURE 7-10 WINDOWS CONTROL PANEL

- (b) To open the Printers dialog box, double-click on the Printers icon in the Control Panel window (refer to Figure 7-10).

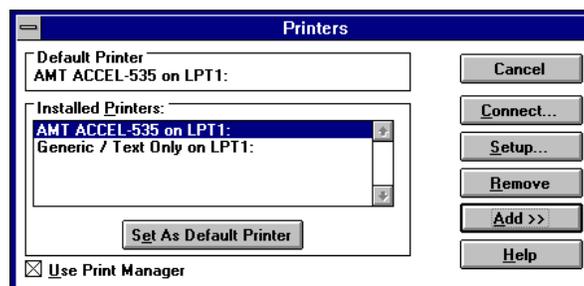


FIGURE 7-11 PRINTERS DIALOG BOX

- (c) The Printers dialog box displays the installed printer drivers (refer to Figure 7-11). To add an additional printer, choose the Add command button to extend the Printers window.

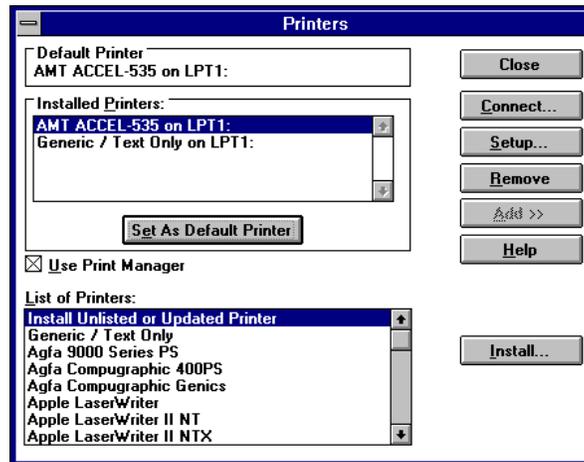


FIGURE 7-12 PRINTERS DIALOG BOX EXTENDED

- (d) The List of Printers list box (refer to Figure 7-12) allows users to choose a printer from the available drivers Microsoft supplies with the Windows installation diskettes. The Canon BJ230 printer is not listed. Use the Canon OEM “Windows 3.0 & 3.1 Driver Software for the BJ-230 Bubble Jet Printer” diskette.
- (e) Select Install Unlisted or Update Printer from the list box and choose the Install command button to open the Install Driver dialog box (refer to Figure 7-12). Insert the Canon OEM “Windows 3.0 & 3.1 Driver Software for the BJ-230 Bubble Jet Printer” diskette into the floppy drive (A:).

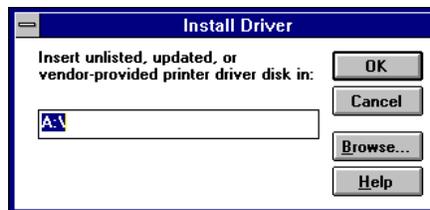


FIGURE 7-13 INSTALL DRIVER DIALOG BOX

- (f) Choose the OK command button (refer to Figure 7-13) to search the diskette in drive A: and to display the Add Unlisted or Update Printer dialog box.

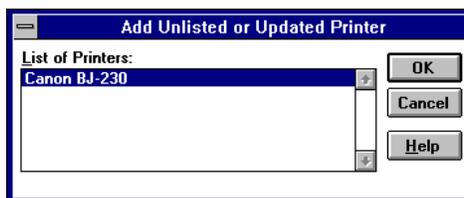


FIGURE 7-14 ADD UNLISTED OR UPDATE PRINTER DIALOG BOX

NOTE: The original RIT System printer configuration included an AMT Accel 530/535 dot matrix color impact printer. The original installed Windows printer driver was Epson (the AMT printer was configured to emulate an Epson printer). The AMT Accel 530/535 Windows printer driver is located on the EBT Upgrade diskette under the subdirectory: A:\amt.driv\.

- (g) Select the Canon BJ-230 choice in the list box of supported printers (refer to Figure 7-14). Choose the OK command button to activate the printer driver install program.

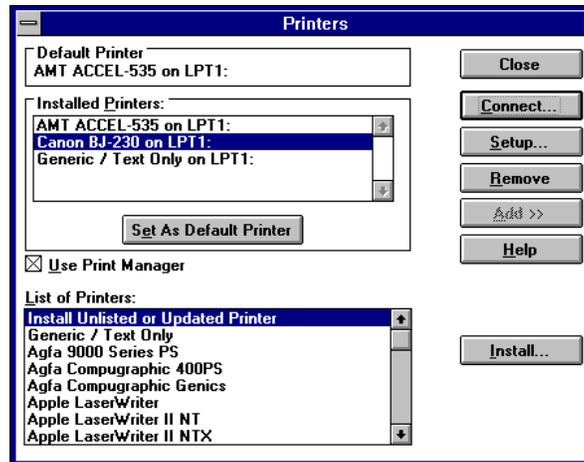


FIGURE 7-15 PRINTERS DIALOG BOX WITH CANON PRINTER LISTED

- (h) Windows has now installed the Canon printer and used default the Canon printer configuration (refer to Figure 7-15).

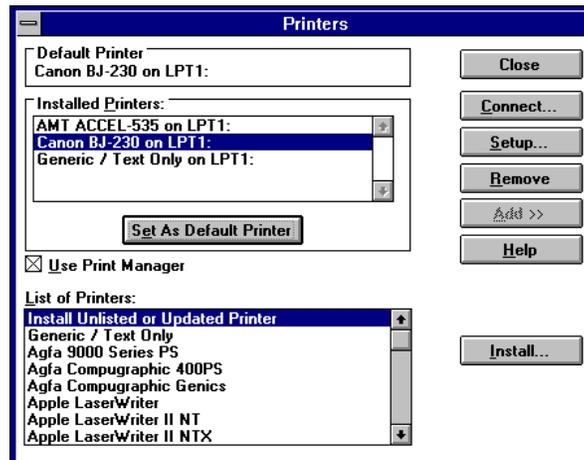


FIGURE 7-16 CANON BJ-230 PRINTER SET AS DEFAULT WINDOWS PRINTER

- (i) To set the Canon BJ-230 printer as the default printer, select the Canon BJ-230 on LPT1: from the Installed Printers list box (refer to Figure 7-16).
- (j) Then choose the Set As Default Printer command button.

NOTE: At this point you may choose to stop because the printer driver installation is complete. The RIT System will use the default Canon printer configuration.

- (k) To verify the printer connect settings, choose the Connect command button from the Printers dialog box while the Canon printer is selected (refer to Figure 7-16). This will display the Printer Connect dialog box.

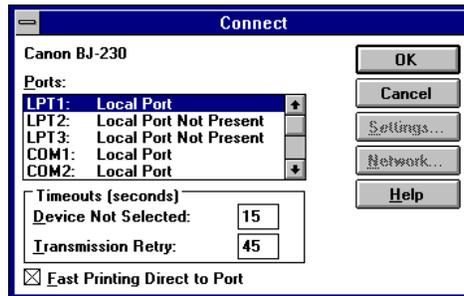


FIGURE 7-17 PRINTER CONNECT DIALOG BOX

- (l) To connect the printer to the parallel (LPT1) printer port, select LPT1: from the Ports list box (refer to Figure 7-17).
- (m) Time-outs pertains to Windows communications with the printer. The RIT System will use the normal Windows time-out defaults of 15 seconds for a printer not selected and 45 seconds for a faulty printer connection (cable).
- (n) Since the RIT System is not connected to a network, enable Fast Printing Direct to Port. This will improve printing performance.
- (o) Choose the OK command button to accept these settings and return to the Printers dialog box.

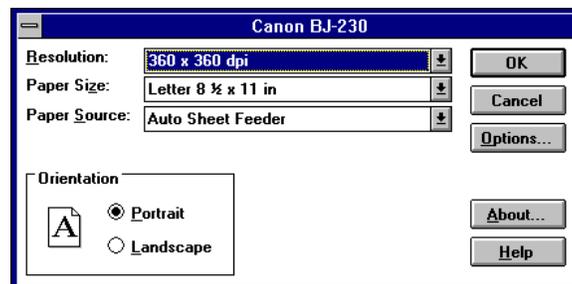


FIGURE 7-18 PRINTER RESOLUTION DIALOG BOX

- (p) Choose the Setup command button from the Printers dialog box to verify the printers resolution and paper setup.

- (q) The maximum printer resolution (refer to Figure 7-18) of the Canon BJ-230 printer is 360 dots per inch (dpi). Paper size should be standard 8½ x 11 inch paper (photocopier plain paper size). Paper source should be Auto Sheet Feeder (manual is used only when the operator feeds paper one at a time). Paper orientation should be Portrait (top of page is 8½ inch side). Landscape orientation (top of page is 11 inch side) would be used for schematics and drawings.
- (r) Choose the Options... command button from the Printer resolution dialog box to verify the printer's print quality.

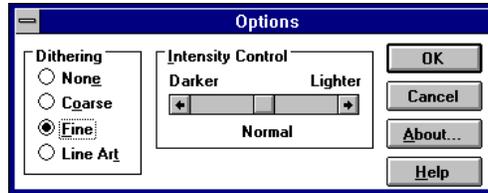


FIGURE 7-19 PRINTER PRINT QUALITY DIALOG BOX

- (s) Select the Fine dithering (the closeness of the line pixels) radio button and Normal intensity control, adjust when photographs are primarily dark which will consume more ink (refer to Figure 7-19).

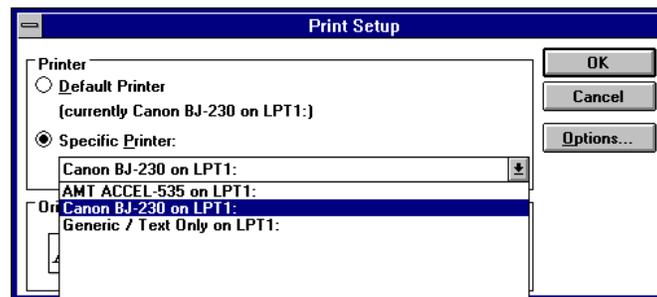


FIGURE 7-20 PRINT SETUP DIALOG BOX - DEFAULT PRINTER

- (t) From each application, users must verify the active printer. From the File menu, choose Print Setup. The default printer should be the Canon BJ-230 (refer to Figure 7-20).

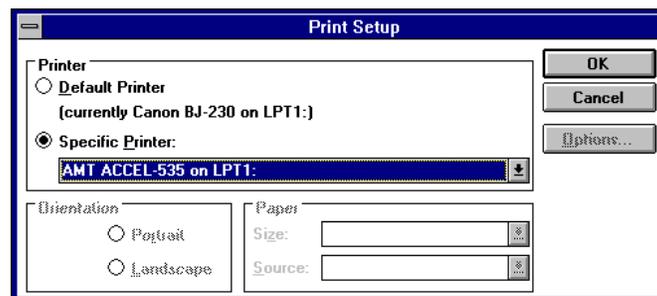


FIGURE 7-21 PRINTER PRINT QUALITY DIALOG BOX - SPECIFIC PRINTER

- (u) To select a printer for the Specific Printer option, click on the down arrow button of the drop down list box. Select the AMT Accel 535 printer, then choose the OK command button (refer to Figure 7-21).

NOTE: The active printer in Windows will be the printer selected in the Print Setup dialog box. Windows will always boot (started) with the default printer as the active printer.

The active printer may be changed during a Windows session. The selected radio button (Default Printer or Specific Printer) is the active printer selection for the remainder of the Windows session.

8. RIT Overview

AOS's standardization effort to commonize and modernize the FAA's radar analysis tasks and methods via software tools and personal computers (PC) was initiated in 1991 under the CIP 56-41, The Radar Intelligent Tool (RIT, pronounced: /writ/) Project and the Enhanced - Radar Intelligent Tool (E-RIT, pronounced: /ee-writ/) Project.

RIT Project

The RIT Project is the FAA's effort to rehost all FAA radar analysis algorithms to a Microsoft DOS/Windows 3.1 PC platform. AOS-520's objective is to standardize the radar analysis algorithms and to make available as many radar analysis functions as possible to the radar analyst in a single operating environment.

RIT System Hardware

A RIT System is a commercial off the shelf personal computer, Windows compatible. A desktop, lunchbox or notebook type PC will be able to execute the RIT Analysis Tools.

Each RIT System is outfitted with a radar data capture system (the MX-6A Card or the RDI System) to record radar data to hard disk or any PC secondary storage medium. A Windows compatible black and white, wide carriage, near-letter quality printer is used to print hardcopies of radar analysis summaries.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows v3.1

Management reports (COTS):

1. MS Word v6.0
2. a screen capture utility for including screen images in reports

Housekeeping (COTS):

1. a backup utility for system backups
2. a hard drive maintenance utility

Radar Analysis Tools (GFE):

1. TRACS-9 software suite - DOS based
2. NEW! RIT Analysis Tools - Windows based

Radar Analysis Tools

All of the various FAA radar analysis programs and functions (HOST, UNIX, and DOS based) are currently being redeveloped for the Microsoft Windows 3.1 environment. RIT will interpret and analyze prerecorded radar data files providing graphical and statistical summaries to assist radar analysts to maintain the various radar sensors in the FAA's inventory.

E-RIT Project

The Enhanced - Radar Intelligent Tool (E-RIT) Project is the FAA's PC based continuous radar data recorder system. E-RIT is designed to provide multi-sensor sites (primarily ARTCC's) with PC based radar data recording and analysis tools.

E-RIT System Hardware

An E-RIT System consists of two commercial off the shelf personal computers, both Windows compatible. One PC is the E-RIT/Recorder and the second PC is the E-RIT/Analyzer.

E-RIT/Analyzer

The E-RIT/Analyzer is a RIT System with the addition of a single optical drive. The E-RIT/A is used by site personnel to analyze pre-recorded radar data files recorded on the optical disk using the FAA RIT Analysis Tools.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows v3.1

Management reports (COTS):

1. MS Word v6.0
2. a screen capture utility for including screen images in reports

Radar Analysis Tools (GFE):

1. TRACS-9 software suite - DOS based
2. NEW! RIT Analysis Tools - Windows based

E-RIT/Recorder

The E-RIT/Recorder is a commercial off the shelf personal computer with two optical drives and one or more radar data capture boards (the Radar Data Interface System).

The E-RIT/R provides the means of capturing all radar data products using one or more RDI Systems to record radar data to an optical drive or any PC secondary storage medium (hard drives, LAN based drives, removable media drives, etc.). The removable optical disk containing the pre-recorded radar data, is then analyzed on the E-RIT/A.

Software required:

System operation (COTS):

1. MS DOS
2. SCSI device drivers
3. MS Windows v3.1

Radar Analysis Tools (GFE):

1. RDI Recording software

Radar Data Capture Boards

In order to record radar data using a PC, a radar data capture system must be employed. The FAA has employed several types of PC compatible radar data capture systems in the past. Currently, the FAA has standardized on the MX-6A Card and the newly developed RDI System. Following is a brief discussion of both systems, site users should refer to the respective reference manuals for a more in-depth discussion.

MX-6A Card System

The MX-6A Card is designed to capture most radar data products, making them available for real-time display or storage. The MX-6A can capture six channels of synchronous serial radar data for display or recording on the PC.

The MX-6A Card is designed to be a passive, non-intrusive radar data interface and is currently used by the FAA, the U.S. Air Force and several other government organizations at operational sites. The MX-6A is used in the RIT System for radar data recording and analysis.

The MX-6A is designed to operate in an 8/16/32 bit AT bus slot using interrupts to notify the PC that data is available for display or storage. The MX-6A can accept RS-232, RS-422 or TTL type input signals with a maximum throughput of 9600 baud of data.

The on board firmware and the PC program (currently DOS based) are selected dependent on the application. PC programs record the radar data in data files on the PC's secondary storage devices (such as a hard drive, an optical drive, or network drive).

RDI System

The Radar Data Interface (RDI) System is designed to capture all the radar data products, making them available for real-time display or storage. The RDI System comprises three hardware components: the RDI Board, the RDI Cable and the RDI Adapter box.

The RDI System is designed to be a passive, non-intrusive radar data interface and currently used by the FAA and U.S. Air Force at operational sites. Both RIT and E-RIT Systems will use the RDI System for radar data recording, analysis and playback.

RDI Board

The RDI Board (RDIB) is a 16 bit PC AT (ISA) bus card which can capture or transmit eight channels of synchronous serial radar data for display or recording on the PC. It is designed to operate in a 16/32 bit AT bus slot in a 80386 or better PC. The RDI Board receives and transmits TTL level signals up to 19.2K baud per channel to its single DB44 high density connector.

The RDI Board hosts a Motorola MC68000 microprocessor, 768 Kbytes of onboard RAM, 4 Kbytes of dual ported RAM and an eight serial port VLSI chip. The RDI Board receives and transmits TTL level signals up to 19,200 baud per channel to its single DB44 high density connector.

The PC and RDI Board communicate via the PC polling the RDI Board to verify if there is data present. Each and every radar message is transferred in upto 2000 byte blocks. Radar idle messages are counted.

RDI Cable

The RDI Cable (RDIC) is a 50 conductor twisted pair shielded cable with high density DB44 connectors on both ends. The RDI Cable connects the RDI Board with the RDI Adapter Box.

RDI Adapter

The RDI Adapter (RDIA) hosts RS232 and RS530 transceivers to convert the radar data signals to TTL levels compatible with the RDI Board for each of the eight radar channel interface ports. The RDIA connects to the RDI Board via the RDI Cable and provides a hardware interface for cables connected to the radar data source.

Radar Data Recording Software

MX-6A Recording Software

The MX-6A has a multitude of unique software applications which receive the radar data from the card and process it. There is no one MX-6A software standard. The MX-6A has no playback capability.

RDI Recording Software

The RDI Recording Software is a Microsoft Windows application allowing site personnel to customize/configure (radar type, site designator, file type, etc.) the RDI System recording or playback configuration.

Radar Sensor Interface Cables

The RIT / E-RIT System requires interface cables designed to connect the radar data source with the RIT / E-RIT data capture system. The interface cables should be shielded plenum rated cables designed to be installed under the floor at each site.

Using various interface cable designs, the MX-6A or RDI can interface to a variety of radar sensors (CD-1, CD-2, ARSR-3, ASR-9, Mode-S, and FPS-117). For additional information on the MX-6A Card, RDI System or the applicable cables designs, refer to the MX-6A Users and Technical Reference Manual or the RDI System Users and Technical Reference Manual.

Due to the fact that each site is custom configured, cables required to interface the MX-6A Card or RDI System with a specific radar data source is the responsibility of the site user.

NOTE: AOS-500 has cable designs for interfacing either system, MX-6A or the RDI System to a variety of radar sensors.

RIT / E-RIT System Deployment

The RIT / E-RIT Systems will not be reflected in the PMSRS. AOS-500 shipped the systems using the OATS Technical Orders and instructed each site personnel to incorporate the hardware systems into their local property custodian lists.

Each shipment included a detailed shipping and inventory document which listed every component included in the shipment. This document listed the serial number and value for each item.

Site users will use their own local bar codes and retain full ownership and custodianship over each system once it arrives at their facility. Bar-coding should be limited to the main components that have serial numbers; e.g., the CPUs, printers, magneto-optical drives, monitors, etc. Items such as the mouse and keyboard need not be bar coded.

Radar Data File Formats

The FAA is standardized on the CD-record message format for all radar data communications. Newly developed radar sensors and any upgrades or enhancements to existing sensors have the capability to provide much more data than just primary and secondary radar message formats. These sensors require special consideration in the standard CD-record formatted files.

CD-record File Format

The CD-record file format is a very rigid and static file format that does not provide for expansion and flexibility. Frequently, various civilian and military organizations require specific groups of data blocks in the CD-record header for comments or special information. These set aside areas are frequently overwritten by legacy software. As new radar sensors and radar messages are required by radar analysts, the CD-record standardization is modified, further exacerbating the legacy radar analysis software compatibility problem.

RDI File Format

AOS has, in conjunction with the Air Force, developed and established a new radar data file format designated, the Radar Data Interface (RDI) File Format. The RDI File Format provides more dynamic and flexible data storage capabilities for post analysis functions. Conversion programs to convert legacy file formats to the RDI format are currently under development at AOS-500 and the Air Force. A RDI recording driver (DOS and Windows) for use with the MX-6A Card is under development to promote the RDI standard.

Electronic Documentation

AOS-500 in conjunction with the FAA's Gemini Team, is developing electronic documentation products and procedures in an effort to shorten and reduce the technical documentation production, delivery and maintenance time and costs while making the information more user friendly and accessible. This effort, as it pertains to RIT and the E-RIT Project is called, the Electronic Book Technology (EBT) Project.

The EBT Project's objective is to host on-line, all pertinent technical documentation on compact disc-read only memory (CD-ROM) media. A Microsoft Windows compatible hypertext viewer (SGML compliant) will be used to view the information (text and graphical) on-line allowing the user to perform text based searches for specific topics, allowing the user to make notes and remarks electronically, and permit viewing schematics and printing hardcopies when necessary.

The EBT Pilot Project: Mode-S

The EBT Project will start with the Mode-S System technical documentation manuals and handbooks as the pilot system. All pertinent Mode-S technical documentation, schematics, diagrams, figures, tables and checklists will be hosted on CD-ROM media with hypertext links. As the EBT Project evolves, AOS will be establishing electronic media and hypertext development methodologies and techniques for long term documentation configuration management and maintenance.

These documents will be available to site personnel via the EBT hypertext viewing system, Dynatext, included with each CD-ROM delivery. Ad-hoc searches via a full-text search engine will be available by subject, by topic, or by document for review of technical details while on-line or can be printed in hardcopy format. The hardware platform designated to host the EBT System is the RIT System.

EBT & RIT

Each RIT System will host a CD-ROM drive and a super VGA monitor to view the hypertext documents. A black and white 11"x17" bubblejet printer will provide hardcopy output capability for text as well as graphical schematic diagrams.

All of the field installed RIT Systems will be upgraded to meet the minimum EBT configuration. The upgrade as it pertains to the RIT System is referred to as the RIT System EBT Upgrade.

EBT & E-RIT

Each E-RIT/A System will host a CD-ROM drive and a super VGA monitor to view the hypertext documents. A black and white 11"x17" bubblejet printer will provide hardcopy output capability for text as well as graphical schematic diagrams. The RIT System EBT Upgrade will be included with the E-RIT System deployment.

9. SCSI Subsystem

Introduction to SCSI

Small Computer System Interface (SCSI) is an intelligent device interface specification that permits multiple peripheral devices to be attached to a computer system. A SCSI system must always include at least one SCSI Host Adapter and one SCSI peripheral device. This section discusses the SCSI concepts you should understand and provides general guidance to help you set up your SCSI system.

Every SCSI system requires that you

- provide communication between SCSI devices and your computer
- uniquely identify each SCSI device
- daisy-chain SCSI devices together
- terminate the devices at each end of the daisy-chain

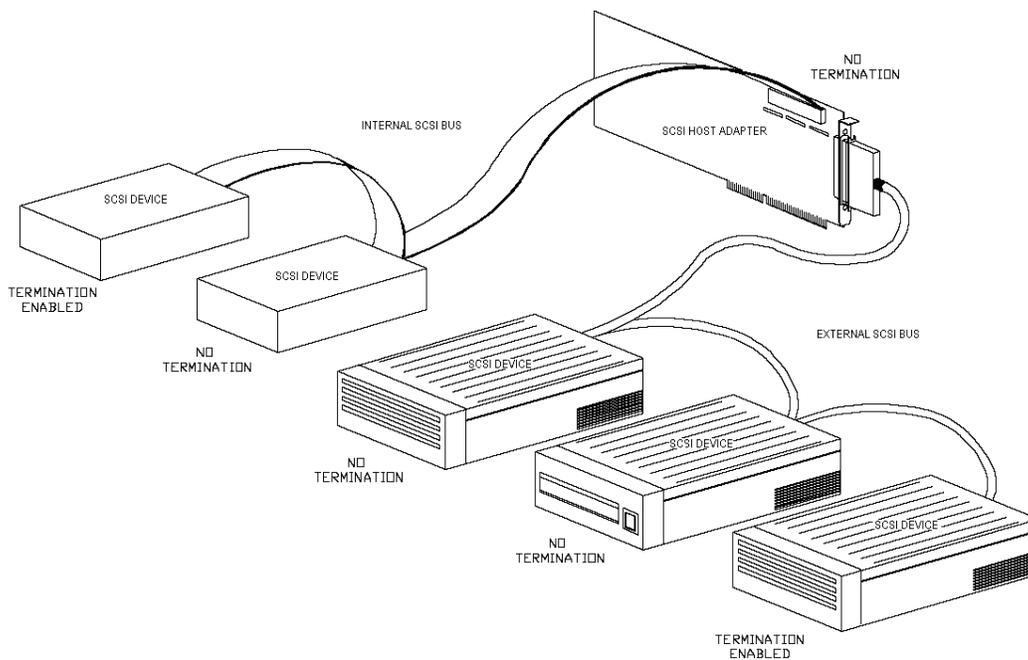


FIGURE 9-1 SCSI BUS

Figure 9-1 illustrates the components of a SCSI subsystem that consists of five SCSI devices and a host adapter.

Function of Controllers

Controllers act as mediators between the computer system bus and the SCSI bus. But device-specific controllers are not necessary in SCSI devices. Device controllers are either built in the device (an embedded controller) or reside in the an external box (a bridge controller).

SCSI Host Adapter Provides Control

The SCSI Host Adapter provides the interface between the SCSI data devices and the operating system. All read and write requests to devices are first made to the SCSI Host Adapter, which then calls the device via the appropriate SCSI address.

True Device Independence

SCSI provides device independence. You can add a different type of device without modifying generic system hardware or software. You do not have to depend on specific hardware because SCSI permits multiple devices to run from a single SCSI Host Adapter. A SCSI system easily integrates new devices.

Intelligent Drives

All SCSI drives are intelligent. They all have a built-in microprocessor. This microprocessor assumes some of the duties of the operating system, increasing overall system performance. You must use at least one SCSI Host Adapter to connect SCSI devices to a system. The host adapter communicates with the devices on the SCSI bus.

SCSI Targets

Logical Unit Number (LUN)

The computer identifies the SCSI Host Adapters by their LUN. A single computer system can host multiple SCSI Host Adapters (LUN 0, LUN 1, etc.). The LUN 0 is the standard industry setting for computers hosting a single SCSI Host Adapter. A host adapter does not support SCSI devices with multiple LUNs.

SCSI Id # Target Id	RIT System (v1, v2, v3 & v4)	E-RIT System
7	Host Adapter (term dev.)	Host Adapter
6 (ext bus)	not used	ext. mag-optical drv (term dev.)
5 (ext bus)	not used	ext. mag-optical drv
4 (ext bus)	not used	not used
3 (int bus)	int. tape drv (term dev.)	int. tape drv
2 (int bus)	int. CD-ROM drv	int. CD-ROM drv
1 (int bus)	not used	not used
0 (int bus)	int. boot hard drv C:	int. boot hard drv C: (term dev.)

TABLE 9-2 RIT SYSTEM STANDARD SCSI-ID SETTINGS.

NOTE: Some SCSI tape drive devices have hard-coded SCSI-Id's.

SCSI Identifiers

The SCSI target identifier (0 - 7) identifies the target device on the SCSI bus. Each SCSI device must have a unique SCSI target identifier or SCSI Id. Each SCSI device address (as referenced by the operating system) consists of the SCSI Id and the LUN together.

Example:

A single computer with two host adapters and devices:

adapter #1: LUN 0, SCSI Id 3

adapter #2: LUN 1, SCSI Id 3

The first SCSI Host Adapter in a computer is LUN 0 (zero), SCSI Id #7 (SCSI Id #7 is reserved industry wide for the SCSI Host Adapter).

The boot SCSI hard disk drive is connected to the SCSI Host Adapter, LUN 0, SCSI ID #7. Normally, the boot SCSI hard disk drive is assigned SCSI Id #0 and additional SCSI devices may use the rest of the available SCSI Id's (refer to Table 9-2).

Each RIT System model adheres to the industry standard SCSI-Id settings for the SCSI Host Adapter, and the boot hard drive. Table 9-2 lists the SCSI-Id settings for the RIT Systems.

The external bus (ext. bus) and the internal bus (int. bus) SCSI-Id settings are only recommendations for organization purposes only. The computer will usually operate normally if the settings are different for internal or external SCSI devices. Use the default industry settings whenever possible, future upgrades (additional devices) usually assume the industry standard settings which provides for easy installation and technical support.

Types of SCSI Devices

- hard disk drives
- removable hard disk drives (ex. optical disk drives)
- tape drives
- CD-ROM drives
- jukebox
- multifunction drives

SCSI Bus Termination

SCSI is an intelligent device interface specification that permits multiple peripheral devices to be attached to a computer system. A SCSI system must always include at least one the SCSI Host Adapter and one SCSI peripheral device.

With non-SCSI devices, you must add a device controller as well as the device, such as an Integrated Drive Electronics (IDE) hard drive.

Connecting Cables

SCSI devices are cabled together in a single continuous daisy-chain of devices, called the SCSI bus. The bus may have no branches, and must run from device-to-device in a continuous series. The host adapter need not be at the end of the SCSI bus, unless only one device is on the bus.

If the host adapter supports both internal and external SCSI devices, the host adapter will be at the junction between the internal and external SCSI bus (refer to Figure 9-1).

SCSI Bus Termination

The first and last physical devices (not the first and last SCSI Id devices) on the ends of the SCSI bus must have a set of resistors called terminators. All other SCSI devices must have terminators removed/disabled. The host adapters and most SCSI devices come equipped with built-in terminators that can be enabled or disabled.

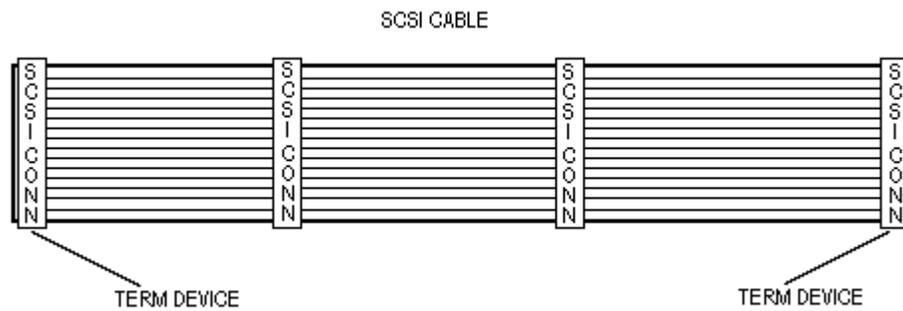


FIGURE 9-2 SCSI CABLE

Exactly two devices must be terminated on the SCSI bus, one at each physical end of the cable(s) (refer to regardless of what their SCSI-Id's are. Table 9-2 shows the terminating devices (term dev.) for the RIT Systems.

The internal SCSI tape drive and the Host Adapter terminate (refer to Table 9-2) the internal SCSI bus in RIT v1, v2, v3 and v4. The tape drive and the SCSI Host Adapter are the last physical devices on the ribbon cable of the internal SCSI bus.

In the E-RIT System, since the internal and external SCSI buses are used, the terminator resistor packs are removed from the Host Adapter. On the internal SCSI bus, the hard disk drive is the terminating device and the magneto-optical drive is the terminating device on the external SCSI bus.

ASPI Managers

The Advanced SCSI Programming Interface (ASPI) managers are software modules that provide an interface between ASPI device drivers, a host adapter, and the SCSI devices connected to the host adapter. ASPI managers are written for specific operating systems and for specific models of the Adaptec host adapter.

The RIT Systems use the DOS/Windows ASPI managers.

ASPI Manager	Supported Host Adapter	RIT System
ASPI4DOS.SYS	AHA-1540B/1542B	RIT v1
	AHA-1540C/1542C	RIT v2
	AHA-1740A/1742A (in standard mode)	RIT v3, E-RIT
ASPIEDOS.SYS	AHA-1740A/1742A (in enhanced mode)	RIT v3, E-RIT
ASPI8DOS.SYS	AHA-2940	RIT v4

TABLE 9-3 ASPI MANAGERS

The RIT System uses several different ASPI managers, refer to Table 9-3.

config.sys statement	RIT System
DEVICE=C:\SCSI\ASPI2DOS.SYS /D	RIT v1
DEVICE=C:\SCSI\ASPI4DOS.SYS /D	RIT v2
DEVICE=C:\SCSI\ASPIEDOS.SYS /D	RIT v3, E-RIT

DEVICE=C:\SCSI\ASPI8DOS.SYS /D	RIT v4
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TABLE 9-4 ASPI MANAGER SETTINGS FOR RIT

Use the /D switch to display information about the ASPI manager when you boot your computer.

NOTE: You can change the configuration to load the ASPI manager and the ASPI device drivers in high DOS memory by changing the CONFIG.SYS DEVICE= to DEVICEHIGH=.

ASPI Device Drivers

ASPI device drivers are software programs that enable your computer to communicate with SCSI devices such as hard disk drives, CD-ROM drives, magneto-optical drive, and scanners. Each kind of device requires a different driver. Device drivers reside on your hard drive and when you boot your computer, these files load into memory from command lines in the CONFIG.SYS file.

ASPIDISK.SYS

Each RIT System loads ASPIDISK.SYS DOS/Windows device driver from the CONFIG.SYS file. ASPIDISK.SYS controls DOS-partitioned SCSI disk drives that are not controlled by the SCSI Host Adapter BIOS. ASPIDISK.SYS is required if the host adapter BIOS is disabled, the device is the third or higher hard disk (the BIOS can only control the first two hard drives), or the SCSI-Id is not 0 or 1.

NOTE: Removable-media must not be installed at SCSI-Id of 0 or 1.

config.sys statement	RIT System
DEVICE=C:\SCSI\ASPIDISK.SYS /D	All RIT Systems

TABLE 9-5 ASPIDISK.SYS SETTINGS FOR RIT

Use the /d switch to display information about the ASPIDISK.SYS device drive when you boot your computer. The RIT System CONFIG.SYS, command line is shown in Table 9-5.

If ASPIDISK.SYS finds a removable-media drive that is not controlled by the host adapter BIOS, it loads itself into memory, reserving one DOS logical drive per removable-media device.

RIT Systems have the host adapters BIOS enabled. The host adapter BIOS controls the boot hard drive (SCSI-Id 0). Although, RIT Systems (v1, v2, v3, & v4) do not have removable media, CONFIG.SYS has attempts to load ASPIDISK.SYS. E-RIT has up to two removable-media devices and loads ASPIDISK.SYS into memory.

NOTE: If a drive is under host adapter BIOS control, the DOS C:\DOS\FDISK.EXE utility can be used to create DOS partitions (compatible with AFDISK.EXE). If the drive is not under host adapter BIOS control, then the C:\SCSI\AFDISK.EXE utility should be used to create DOS partitions.

ASPICD.SYS

Each RIT System configured with a SCSI CD-ROM drive loads ASPICD.SYS device driver for DOS/Windows from the CONFIG.SYS file.

config.sys statement	RIT System
DEVICE=C:\SCSI\ASPIDC.SYS /D:ASPID0	All RIT Systems

TABLE 9-6 ASPICD.SYS SETTINGS FOR RIT

The /D:<name> option must be included in the CONFIG.SYS command line to assign a name to the CD-ROM driver so that MSCDEX.EXE (Microsoft CD-ROM Extensions) can install the CD-ROM as a DOS logical drive letter. This option must match the syntax of the /d:<name> option in the AUTOEXEC.BAT command that executes MSCDEX.EXE. The RIT System CONFIG.SYS, command line is shown in Table 9-6.

The Microsoft CD-ROM Extensions

The Microsoft CD-ROM Extensions (MSCDEX.EXE) enables your computer system to recognize a CD-ROM drive as a single logical drive letter under DOS. Each RIT System configured with a SCSI CD-ROM drive executes the MSCDEX.EXE command from the AUTOEXEC.BAT file.

autoexec.bat statement	RIT System
C:\DOS\MSCDEX.EXE /D:ASPID0 /M:12 /L:E	All RIT Systems

TABLE 9-7 MSCDEX.EXE SETTINGS FOR RIT

The /D:<name> option must be included in the CONFIG.SYS command line to assign a name to the CD-ROM driver so that MSCDEX.EXE (Microsoft CD-ROM Extensions) can install the CD-ROM as a DOS logical drive letter. This option must match the syntax of the /d:<name> option in the CONFIG.SYS command line that loads the ASPICD.SYS device driver. The RIT System AUTOEXEC.BAT, command line is shown in Table 9-7.

The /M:<number of cache buffers> option specifies how much memory is allocated as sector buffers for caching CD-ROM data. Each buffer uses 2048 bytes of RAM.

The /L:<drive letter> option is the logical drive letter that DOS will assign to the CD-ROM drive. This letter must be less than the value specified by the LASTDRIVE= command in CONFIG.SYS.

Using Removable Media

Removable media is disk media such as the cartridges used with the magneto-optical drives, that can be removed from the disk drive after data is copied to them. The media can then be stored or can be inserted in another removable-media drive. Removable media should be controlled by ASPIDISK.SYS, not by the host adapter BIOS.

The E-RIT System is currently the only RIT model that utilizes removeable magneto-optical (MO) disk cartridges to record radar data files that are later transported and analyzed on another system.

Partitioning and Formatting New Media Disks

New media disks need to be partitioned and formatted before use. AFDISK.EXE is a DOS partitioning and high-level formatting utility for SCSI hard disks and removable media disks. Each side of the media disks must be partitioned and formatted using AFDISK.EXE

E-RIT System users must partition and format each new magneto-optical drive disk on both sides before use.

All RIT Systems are delivered with AFDISK.EXE located in the C:\SCSI subdirectory.

WARNING ! Use AFDISK.EXE utility to partition and format the MO disks. Do <u>not</u> use the DOS FDISK.EXE or FORMAT.EXE utilities.
--

Running AFDISK.EXE

AFDISK.EXE is a DOS partitioning and a high-level formatting utility for removable SCSI media devices, such as the MO drives. Before running AFDISK.EXE be sure the disk device you want to format is connected to the host adapter, is powered-up and the media is inserted in the drive. Run AFDISK.EXE from the DOS prompt.

NOTE: Before running AFDISK.EXE, Windows must be closed completely. The AFDISK.EXE utility can not run from under MS Windows in the Windows MS-DOS Prompt.

1. At the DOS prompt type: afdisk<ENTER>
2. AFDISK.EXE lists all the installed SCSI disk devices, including removable media drives. Use the ↑ and ↓ keys to highlight the desired disk device, then press <ENTER> to select.
3. To create a new partition, press the <Ins> key.
4. For one partition on the disk, press the <Esc> key.
5. To create the partition, select yes, then press <ENTER>.
6. If you have more disks to format repeat steps 3 thru 5 otherwise to exit press <Esc>.
7. To quit AFDISK utility, press <Esc> and select yes when asked to quit? You will be reminded to reboot your computer before you can access the newly-created partitions.

10. Technical Support

RIT Systems affected: All field installed RITs

Component/System Failure

As with any hardware system, component failure is a reality and site users are urged to backup important files to tape or diskette. The Gazelle Backit software utility has been supplied for this reason.

AOS has shipped each RIT System with a Master Restore Tape or an optical disk and a Boot diskette (some systems also required the EISA Configuration Disk). These items are provided in the event of hard drive failure or a configuration corruption occurs.

NOTE: Be assured that each system is rigorously tested prior to shipment by the manufacturer and then again by AOS-500 prior to deployment.

COTS Hardware Support

The RIT System is a Commercial Off-the-shelf (COTS) system procured under the FAA AT&T/NCR Office Automation Technology and Services (OATS) contract. With every RIT System, AOS-500 procured an OATS "on-site, on-call" service support contract.

Accordingly, any requirement for repair service to the PC machine hardware should first be referred to OATS "HOTLINE", (800) 322-OATS (have your PC model numbers and serial numbers ready). However, that service warranty expired at the end of the first year following acceptance by the FAA.

Unfortunately that clock was ruled to have started when AOS-500 accepted the equipment at the FAA William J. Hughes Technical Center!!

NOTE: Accordingly, AT&T Globalyst 630 PC's at ASR-9 sites not collocated with Mode-S have an OATS warranty in effect as of September 01, 1996, with an expiration on August 15, 1997. ASR-9 only sites should contact OATS first.

Warranty Cards

The Original Equipment Manufacturer's (OEM) warranty registration cards were included for every component and software package in the RIT System.

Recommendation AOS-500 recommends that the site user should complete and return each card to the respective OEM for upgrade notification and telephone technical support.

Options for PC Repair Support

Sites requiring repair services for RIT PC's or MODE-S terminal PC's, their options are to:

- Contact the FAA Logistic Center's Micro Computer Lab at (405) 954-9651; or
- Call the OATS Hotline to extend the "on-site, on-call" service contract (at site's expense); or
- Call the OATS Hotline for "on-site, by-call" (charge by the hour) service support contract (at site's expense); or
- Contract with a local PC repair contractor for PC service support (at site's expense).

Warranty Service

For the COTS hardware under warranty (AT&T Globalyst 630 PC's at ASR-9 sites not collocated with Mode-S), site users are encouraged to use the following support services in the order that they are listed:

1. OATS support; (800) 322-OATS.
2. The FAA Logistics Center's Micro Computer Lab, AML-442 (during normal business hours) at (405)954-9651.
3. The National Data Communications Systems Engineering Division, AOS-500 (609)485-HELP.

PC Hardware not under Warranty

Effective September 01, 1996, the National Data Communications Systems Engineering Division, AOS-500 and the FAA Logistics Center, AML-200 and AML-400 have entered into a Memorandum of Agreement (MOA) which provides repair services to all RIT PC's and MODE S terminal PC's.

For the COTS hardware not under warranty, site users are encouraged to use the following support services in the order that they are listed:

1. The FAA Logistics Center's Micro Computer Lab, AML-442 (during normal business hours) at (405)954-9651.
2. The National Data Communications Systems Engineering Division, AOS-500 (609)485-HELP.
3. Contract locally for PC repair (at site's expense).

The FAA Logistics Center's Micro Computer Lab, AML-442 provides Exchange and Repair (E&R) services for failed RIT System PC's. AML-442 will assemble, test and ship a replacement system with the appropriate specialty cards (Exchange & Replacement program). Site Users will be required to unpack the replacement system, connect appropriate interface cables and make the system operational, then pack the failed system and ship to AML-442.

NOTE: Site users should be aware that their organizations will be financially liable for returning the complete failed PC system (including all specialty boards, memory, etc.) or they will be charged for the shortfall.

Site User Upgrades

For those sites with skilled PC repair personnel, site users have the option of locally purchasing PC repair or upgrade parts. When sites are ready to upgrade, a quick check with AOS-500 regarding any replacements or substitutions prior to installation (purchase) for compatibility issues may save much time and dissatisfaction when incompatibilities crop up.

NOTE: AOS-500 maintains a telephone 24 hour support line, (609) 485-HELP. Your call will be directed to the proper RIT System Support group.

Verification with AOS-500 by sites upgrading RIT will avoid inadvertently purchasing and installing a functionally incompatible component which is not compatible with FAA software or specialty hardware components.

Caution ! Please note that such changes as substituting larger capacity hard drives, more RAM, or a faster CD-ROM will not usually affect RIT/E-RIT operations. In order to avoid expensive mistakes, contact AOS-500 when ready to upgrade.

Non-COTS Hardware Support

In addition to the COTS hardware, each RIT System includes various specialty FAA interface boards (i.e., MX-6A, RDI System, TDIC, etc.). Documentation for each specialty FAA interface board is included in the RIT System documentation.

For support on these specialty FAA interface boards, site users should call the FAA Logistics Center's Micro Computer Lab (AML-442). If the Logistics Center is unable to assist the user, they will be directed to the AOS-500 telephone support line, (609) 485-HELP.

Software Support

Each RIT System includes several packages of COTS software and the FAA's suite of radar analysis functions, i.e., the Transportable Radar Analysis Computer System, Version #9 (TRACS-9) software.

COTS Software Support

Each RIT System includes several packages of COTS software already installed and configured on the hard drive for the site users' convenience. Each package (single user license) of commercial software has been procured with the OEM reference manuals and the original OEM installation diskettes.

Recommendation AOS recommends site users should place the original diskettes and the Master Restore tapes in a safe (secure) location.

To answer questions of "How do I ...?", site users should first familiarize themselves with the contents of each of the COTS reference manuals. The Original Equipment Manufacturers (OEM) usually provide very clear and informative documentation (both hardcopy and on-line). Commercial software manufacturers provide several methods of support:

- Internet Web Sites (WWW)
- dial-in Bulletin Board System (BBS)
- 1-900 tech support lines (paid via credit card per minute or per hour)

Recommendation The OEM warranty registration cards are included for every commercial software package. AOS-500 recommends that the site user should complete and return each card to the respective OEM for software upgrades/bug fixes and telephone support.

For COTS software support, site users are encouraged to use OEM support when available before calling AOS support. For radar analysis support, AOS maintains a telephone support line, (609) 485-HELP.

Radar Analysis Software Support

In addition to the COTS software, each RIT System includes the FAA's suite of radar analysis functions, i.e., the Transportable Radar Analysis Computer System, Version #9 (TRACS-9) software. Documentation for each radar analysis function (program) is included in the electronic form installed on the hard disk. Site users may printout a hardcopy at their convenience.

NOTE: For radar analysis support, AOS maintains a telephone support line, (609)485-HELP.

AOS Support

FAA Operational Support
National Data Communications Systems Engineering Division
Radar Branch, AOS-520
FAA William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405

Main & Tech Support: (609)485-HELP
Fax: (609)485-4235

The Operational Support Service's (AOS) Radar Branch, AOS-520 provides site users with technical phone support to resolve RIT and E-RIT System hardware/software problems.

FAA Logistics Center Support

FAA Logistics Center
Micro Computer Lab, AML-442
Mike Monroney Aeronautical Center
P.O. Box 25082, 6500 S. MacArthur Blvd.
Oklahoma City, OK 73135

Technical Support: (405)954-9651

The FAA Logistics Center's Micro Computer Lab, AML-442 can provide site users with technical phone support to resolve RIT and E-RIT System hardware problems.

Attachment 2

EBT Upgrade Candidates List

RIT System EBT Upgrade Candidate List

FIRST NAME LAST NAME	COMPANY	ADDRESS	PHONE NUMBER
Jerry McCollough	FAA/AFSFO/ARTS/RAD/C	5839 22nd Street McClellan AFB Rio Lend, California	(916) 929-5533
Lorraine Gonzales	FAA/AFSFO	337 N. 2370 W. Salt Lake City, Utah 84116	(801) 524-5180
John Kilburn	Moisant Radar Unit	Moisant Airmail Facility New Orleans, Louisiana 70141	(504) 466-9001
Robert Stovall	FAA/AFSFO	322 Knapp Blvd. Nashville, Tennessee 37217	(615) 781-5456
Ray Keller	FAA/AFSFO 843.3	Syracuse/Hancock Arpt. North Syracuse, New Jersey 13212	(315) 423-5590
Al Cook	FAA/AFSFO 8475	1029 Grumman Street Building L827 Oakland, California 94614	(510) 273-7746
Issac Cooper	FAA/Radar Unit	ATC Tower Building DFW Int'l Arpt. Dallas, Texas 75261	(214) 453-4390
William Hui	FAA/AFSFO	6105 W. 147th Street Oak Forest, Illinois 60452	(708) 671-5942
Harold Hess	FAA/AFSFO/TRACON	100 Tracon Hill Offott AFB Bellevue, Nebraska 68005	(402) 291-2230
John Gillespie	FAA/AFSFO	9399 Airport Blvd. West Orlando, Florida 32827	(407) 648-6902
Clarence Speers	Austin RAD/ARTS Unit	3600 Manor Road Tracon Bldg. Austin, Texas 78723	(512) 472-5024
Frank Johnson	FAA/AFSFO	Cleveland R/D/C SFO Room 314 Cleveland, Ohio 44135	(216) 265-4804
Ben Miquel	FAA/AFSFO	11759 Western Avenue Stanton, California 90680	(714) 898-0401
Reynaldo Herrera	FAA/AFSFO Radar/ARTS	Seattle Tacoma Int'l Arpt. Room 429 Seattle, Washington 98158	(206) 764-3450
Charles Gooding	FAA/AFSFO 840.1	Andrews AFB Building 1205 Camp Springs, Maryland 20331	(301) 763-5303
Carl Wisnburger	FAA/Covington AFS	2243 Tower Drive ATCT Building Erlandger, Kentucky 41018	(704) 371-6440
Raymond Carter	FAA/AFS	4500 SW 67th Street Oklahoma City, Oklahoma 73159	(405) 682-1770
Al Cook	FAA/AFS - 48457	827 Grumman Street Oakland, California 94614	(510) 273-7746
Peter Ladd	FAA/RDSFO	Coventry Air National Guard St. Coventry, Rhode Island 2916	(401) 738-8925

FIRST NAME LAST NAME	COMPANY	ADDRESS	PHONE NUMBER
William Hui	FAA/AFSFO	1801 Pratt Boulevard O'Hare Int'l Airport Chicago, Illinois 60626	(708) 671-5942
Norbert Duello	FAA/AFSU	2 International Square Kansas City Arpt. Kansas City, Missouri 64153	(816) 243-3830
Bruce White	FAA/AFSFO	9434 Airport Building Room 2 San Antonio, Texas 78216	(210) 822-3754
Gary Gallant	FAA Academy	6506 MacArthur Boulevard Oklahoma City, Oklahoma 73125	(405) 954-6463
Paul Fischel	FAA/AFSFO 835.1	Air Traffic Control Tower Harrisburg Airport Middletown, Pennsylvania 17057	(717) 948-9187
William Lorenz	FAA/AFSFO	3860 Airport Drive Charlotte, North Carolina 28208	(704) 344-6410
J. Fry	FAA/AFSFO Radar	10805 Lambert Int'l Bridgeton, Missouri 63044	(314) 427-4580
Ron Burgandine	FAA/AFSFO Miramar	Miramar Naval Air Station Miramar Way, Bldg. 561 San Diego, California 92145	(619) 537-5776
Mike Wayne	FAA/AF Radar/Data UN	Bradely Airport Bldg. 85-214, 2nd Floor Windsor Locks, Connecticut 6906	(203) 627-3410
Shirley Case	RAD/COM SFO 1	7000 N.E. Airway Way Portland Int'l Airport Portland, Oregon 97218	(503) 326-5483
James Wallace	FAA/AFSFU Radar Unit	2196 Airport Road Midcontinent Airport Wichita, Kansas 67209	(316) 946-0078
William Strickland	FAA/AFSFO	2515 Winchester Road Room 103 Memphis, Tennessee 38116	(901) 345-7457
Harry Browder	FAA/AF/SFO 843.9	165 Holtz Road Greater Buffalo Int'l Arpt. Cheekiwaga, New York 14225	(716) 626-1765
Steve Conkin	FAA/ATC Tower	6301 N.W. 20th Street Miami, Florida 33122	(305) 526-2750
Bill Divenney	FAA/AFSFO 844.6	Hog Island Road Philadelphia, Pennsylvania 19153	(215) 492-4126
E. Argleben	El Toro/AFSFO	Air Operations Building 372 Room 224 Santa Ana, California 92709	(714) 559-1074
James Morris	FAA/TRCO	Kirkland Air Force Base Building 633 Albuquerque, New Mexico 87117	(505) 764-6960
Meric Gringer	FAA	6311 34th Avenue South Minnesota St. Paul Arpt. Twin Cities, Minnesota 55450	(612) 725-4376
Gene Foist	FAA/R/A/C SFO	2951 Midfield Road Indianapolis, Indiana 46241	(317) 247-2436

FIRST NAME LAST NAME	COMPANY	ADDRESS	PHONE NUMBER
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Charles Thompson	FAA/Radar	617 Griffin Road Building 508 Banzer, Maine 401	(207) 945-6544
George Dalton	FAA/AFSFO 840.2	BWI International Airport Terminal Bldg. 4th Floor Baltimore, Maryland 21240	(410) 962-3400
Dale Campbell	FAA Denver Radar/ARTS SFO	26905 E. 68th Avenue Room 144 Denver, Colorado 80249	(303) 398-0908
Dwain Rosenberger	FAA/AFSFO	2535 Wright Brothers Blvd. SW Cedar Rapids, Iowa 52404	(319) 363-4517
William Inglis	FAA/SFO Tulsa Radar/Comm Unit	3232 N. Memorial Drive Tulsa, Oklahoma 74115	(918) 831-6750
Robert Mather	FAA/Dayton SFO	Terminal Building Room 214 Vandalia, Ohio 45377	(513) 898-3934
Andy Leone	FAA Radar Facility	Pleasant Mills Road Elwood, New Jersey 08217	(609) 485-5578
Oscar Nuckols	FAA/AFSFO 842.1	Norfolk, Virginia 23518	(804) 441-6340
Noe Valdez	FAA/Radar/AFSFO	4201 Empire Avenue Burbank, California 91505	(818) 845-4615
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Ed Egan	FAA/AFSFO	Logan Airport 600 Old Control Tower Bldg. East Boston, Massachusetts 02128	(617) 561-5726
Russ Anile	FAA/AFSFO	Municipal Airport ATC Tower - 2nd Floor Birmingham, Alabama 35212	(205) 731-0344
Jess Rizan	FAA/AFSFO RAD COM	699 Wright Brothers Lane Las Vegas, Nevada 89119	(702) 388-6200
Ron Valenza	FAA/AFSFO - 840.4	400 West Service Road Chantilly, Virginia 22021	(703) 661-5675
Richard Casson	FAA/AFSFO Radar	3000 McKinley Avenue Des Moines, Iowa 50321	(515) 287-1687
Allen Cloud	FAA/COMM SFO	#1 Airport Drive Little Rock, Arkansas 72202	(501) 324-5507
Dave Nash	FAA/AF GRR SFO 1	"5500 44th Street S.E." Grand Rapids, Michigan 49508	(616) 949-2080
Doug Yarborough	DOT/FAA AFSFO	1020 Standiford Lane Louisville, Kentucky 40213	(502) 582-5910
Martin Harper	FAA/AFSFO 841.2	JFK International Airport ATCT Building 156	(718) 553-1713

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Andres Rocha	AFS/Radar/ARTS Unit	2050 Hawkins Road Tower Building El Paso, Texas 79925	(915) 540-7894
John Hughes	FAA/AFSFO	1100 South Service Road Atlanta, Georgia 30328	(404) 669-1260
Lloyd Jones	FAA William J. Hughes Tech. Cnt.	Radar Analysis Lab - AOS-520 Atlantic City Int'l Airport Atlantic City, New Jersey 08405	(609) 485-4959
John Guillanz	FAA Bellville BLU SFO	Building No. 5485 Scott AFB, Illinois 62225	(618) 256-4821
Danny Guitierrez	LAX Radar/SFO	5885 W. Imperial Highway Los Angeles, California 90045	(310) 215-2196
Culbert Poff	FAA/AT/SFO 817.8	Regional Airport Building 1 Roanoke, Virginia 24012	(703) 982-4779
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Howard Roland	FAA/AFSFO	4150 S.W. 12th Terrace Ft. Lauderdale, Florida 33315	(305) 356-7212
Bill Yakich	FAA/Wisconsin South SFO	5330 S. Howell Avenue Milwaukee, Wisconsin 53207	(414) 747-5525
Jim Edwards	IAH Radar/ARTS Unit	18825 Colonel Fisher Road Houston, Texas 77032	(713) 230-8472
Tom Thornton	FAA Bldg. International Airport	14400 Whirlwind Avenue Jacksonville, Florida 32229	(904) 741-0290
Terry Apkarian	FAA/ASR-9 Site	52365 Ten Mile Road Lyow, Michigan 48165	(313) 955-5140
Phillip Brown	DOT/FAA	24665 Smokey Hill Road Aurora, Colorado 80015	(303) 690-4711
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Jim Edwards	FAA/DOT IAH SFO II	Houston International ATCT 2700 W. Terminal Road Houston, Texas 77032	(713) 230-8472
Ron Swartz	FAA Columbus R/D/C SFO	Port Columbus Int'l Airport Columbus, Ohio 43219	(614) 237-1071
John Wilson	Angel Peak FAA L/R/R/S	6020 S. Spencer Suite B14 Las Vegas, Nevada 89119	(702) 382-9967
Von Garden	FAA Tower Building	6 Tampa International Arpt. Rd. Tampa, Florida 33607	(813) 228-2560
Ken Hansen	FAA Salt Lake City SFO 1	337 North 2370 West Salt Lake City, Utah 84116	(801) 320-2253
Jerry DuPont	AFS Radar/COMM Unit	"Building 6394 Range Road" Barksdale AFB, Louisiana 71110	(318) 456-4110
	FAA/AFSO	470 East 5th Street Battle Mountain, Nevada 89820	(702) 635-2611
Joe	Unisys Corporation	600 N. Cedar Hollow	(215) 648-2802

FIRST NAME LAST NAME	COMPANY	ADDRESS	PHONE NUMBER
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Stephen Lucero	Trinidad Radar	38280 County Road Trinidad, Colorado 81082	(219) 846-9628
John Buehler	Evansville SFO	7405 Indianapolis Road Evansville, Indiana 47711	(812) 423-7195
Robert Johnson	FAA/AFSFO	Raleigh Durham Int'l Airport 1000 Sawyer Circle Morrisville, North Carolina 27560	(919) 840-5515
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Tom Williams	Billings Radar/ARTS SFO	Logan International Airport "Admin. Building, Room 219" Billings, Montana 59105	(406) 657-6981
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Arthur Clark	PNS Regional Airport	2440 Airport Boulevard "FAA Tower Bldg., Room 113" Pensacola, Florida 32504	(904) 444-5600
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Michael Brownlee	AF/FAA	Building 2 Rabbins AFB, Georgia 31099	(912) 922-6221
Larry Barrett	Davis - Monthan AFB/Radar AFSO	Building 4816 Tucson, Arizona 85708	(602) 607-6165
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	"FAA AFSSO	Radar/ARTS" Honolulu International Airport 760 Worchester Avenue Honolulu, Hawaii 96818	
	"FAA	ATCT Base" New Hanover County Airport 2220 East Ramp Road Wilmington, North Carolina 28405	
Raymond McMillan	"FAA	LBF Airport Terminal" RR # Box 292 North Platte, Nebraska 69101	(308) 532-5590
Charles Owens	FAA/SFO	Route 3 Box 2 Suite 107 Lake Charles, Louisiana 70605	(318) 477-5425
Larry Miller	FAA	Hector International Airport "Tower Building, 4th Floor" Fargg, North Dakota 58102	(701) 239-5186
Rod Irvesdell	FAA	1503 Cook Place Coletta, California 93117	(805) 967-4185
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Ron Hicks	FAA/AF/FSO	2525 Highway 75 Bluntville, Indiana 37617	(615) 323-6284
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Tom Karsuda	FAA/AFSFO	50055 E. Anderson Avenue Suite 1B Fresno, California 93727	(209) 487-5536
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Andy Leone	FAA/Technical Center	Atlantic City International Arpt. Building 269 Atlantic City, New Jersey 08405	
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FIRST NAME LAST NAME	COMPANY	ADDRESS	PHONE NUMBER
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Clarence Baren	FAA Cedar City SFO 1	2448 West Kittyhawk Drive Cedar City, Utah 84720	(801) 586-4875
Larry Angell	West Mesa SFO	"14901 Central Avenue N.W." Albuquerque, New Mexico 87121	(505) 831-3535
Flarian Drexler	FAA Radar Site	1000 Mammston Avenue Gettysburg, South Dakota 57442	(605) 765-2425
Marvin Walker	FAA/AFSFO	19735 Ridge Road Red Bluff, California 96080	(916) 527-7920
Art Henrich	FAA Cascade Long Range Radar	120 N. Main Street Cascade, Idaho 83611	(208) 343-1846
Bruce Maupin	FAA/SFO	100 International Drive Suite 175A Jackson, Mississippi 39208	(601) 965-4625
Paul Luker	FAA ASCS Office	905 S. Main Street Suite 118 Lusk, Wyoming 82225	(307) 334-3570
Isaac Cooper	Radar Unit	International Parkway ATC Tower Building DFW Airport, Texas 75261	(214) 453-4390
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Kenneth Crittenda	Abilene SFO	1217 E. South 11th Street Abilene, Texas 79602	(915) 676-1017
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Richard Christensen	FAA/Radar AFSFO	2800 Sky Harbor Boulevard FAA ARTS Unit Room 203 Phoenix, Arizona 85034	(602) 379-4209
Rick Hurst	Amarillo Enroute Radar Unit	FM 1912 Quarter Mile South Amarillo, Texas 79107	(806) 335-1933

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Attachment 3

EBT Upgrade Kit (hardware kit)