A. Software: Basics, Installation and Backup

A.1 Overview

The RVP8 and RCP8 are implemented using standard PCI components with some custom cards supplied by SIGMET. While seemingly very different products, these actually have very similar hardware and software. The software installation, configuration and backup/recovery procedures are nearly identical. For this reason, this appendix is written to cover both the RVP8 and RCP8.

This appendix covers the following topics:

Login, logout and shutdown	**Section A.2**
Software installation	**Section A.3**
Software configuration	**Section A.4**
System backup/recovery	**Section A.5**
Software upgrade	**Section A.6**
Network basics	**Section A.7**

Your system is shipped with all software installed so you are really ready to start using the unit immediately after opening the box. You should read this appendix to become familiar with the general operating procedures, especially the system backup procedures which will help you if you ever need to re-install the software after a disaster or install an upgrade provided by SIGMET.

Other references related to the software are:

- ***RVP8 Programmer's Manual:*** Describes the development environment, public source and API's provided by SIGMET.

- ***IRIS Utilities Manual:*** Describes utilities for radar calibration, test and maintenance that are shipped with the RVP8 and RCP8

A.2 Basics of Login, Logout and Shutdown

The RVP8 and RCP8 both use the Linux operating system and X–Windows. When logging into the RVP8 either locally or over the network via "telnet" you will need to supply a user name and password. The system is tolerant of the AC power being suddenly turned-off, but in general it is recommended to follow a power-off shutdown procedure. These procedures are described in this section.

⚠ **Important: For network security reasons, both the RVP8 and RCP8 are shipped with remote access disabled. To learn how to enable telnet, refer to the end of Section A.7.2.**

A.2.1 Power up procedure

The power switch is located on the lower right front of the unit. When you power the unit on, the RVP8 goes through an automatic startup of the operating system at the end of which the RVP8 software and performs power–up self tests. This is described in detail in **Section 2.3.5**.

If you are not doing any diagnostic or software maintenance work on the system, there is no need to log-in after power-up; simply turn the unit on and your application software will take over. No operator intervention is required. However, to perform maintenance functions such as software upgrades, testing and backup/recovery, you will need to log-in.

A.2.2 Local and remote login

There are two ways to login to the RVP8:

- **Local login:** The local keyboard, mouse and monitor can be used. Note these often are not connected on operational systems. SIGMET provides a keyboard and mouse with each system. The monitor is optional and may be provided by the customer, to SIGMET specification. Most VGA monitors will work.

- **Remote login:** If **telnet** is enabled you can use this for remote access. Check with your network administrator.

For the remainder of this discussion it is assumed that local login is used.

A.2.3 Default operator and root login passwords

There are two default users defined in the standard software installation:

- "**root**" with   password "**xxxxxxxx**" (8 lower case x's). This is for Operating System maintenance functions.

- "**operator**"with password "**xxxxxx**" (6 lower case x's). This is for RVP8 application software maintenance functions. For a complete list of supported utilities see **Section 1.6**. These are all described in detail in the *IRIS Utilities Manual*.

Your system administrator can change either of these passwords by using standard Linux password support.

A.2.4 Login procedure

Local login as operator after power−up

- Connect keyboard, mouse and monitor and then cycle power on the system to force a reboot. This causes Linux to recognize these devices on power-up.

- At the power-up "**login**" prompt type "**operator**" and press **Enter**. When prompted, provide the appropriate password (factory default is "xxxxxx", 6 lower case x's).

Logging-in as operator you will be taken to an X-Window screen.

- Right-click the mouse and select "**New Window**" to get a terminal window.

The top of the terminal window shows, for example:

```
operator on rvp8-1 : /home/operator
```

i.e., your user name, the node name of the system and the current directory path.

ⓘ   **If you would like to have a terminal with a bigger font, you can type "sigterm".**

Switching from operator to root login using "su"

The easiest way to switch to a root login for system administration work is to type the super user command "**su**" and then give the root password. The prompt will change from $ to # indicating that you are root.

Exiting "su" root login to return to operator

In an X–terminal where you have become the "super user (su)", simply type "exit" to return to operator. The prompt will change from # to $.

Local root login after power-up

To login as root after a power–up or after exiting X–Windows, simply type "**root**" and press **Enter** at the login prompt, then give the appropriate password (factory default is "xxxxxxxx", 8 lower case x's).

You will be in a full screen terminal. This is not as convenient as X–Windows since only one terminal can be displayed on the screen.

ⓘ   **If you need a second full screen terminal type "Alt-F2". You can return to your original terminal by typing "Alt-F1". The other function keys can provide additional terminals.**

A.2.5 Logout procedure

Logout from X-Windows

- Method 1: Right-click the mouse and select "**Exit**".

- Method 2: Simultaneously click "**Ctrl-Alt-Backspace**".

You will be logged out and the screen will show the initial login prompt. on the full screen terminal.

Root Logout from full screen terminal

If you logged–in as root from the power-up full screen terminal,

A.2.6 Poweroff shutdown procedure

ⓘ   **If you need to swap PCI cards in the chassis, you must first do a poweroff shutdown as described here..**

As either operator or root type "**poweroff**". The system will go through a shutdown sequence. When it is done "**Power down**" will be displayed. At this point you can press the power switch located on the right lower front of the chassis.

A.3 Software Installation

A.3.1 When to perform software installation

When your unit arrives, it is shipped with all software installed. Therefore, software installation is usually not necessary at the initial installation. There are two occasions when you might want to re-install the software:

- Installation of a new CDROM release from SIGMET.

- Recovery in the event of disk corruption or failure.

A.3.2 Preparing for the installation

The following should be done before you perform the software installation:

- Either locate or, if possible, make a backup of your custom configuration files per **Section A.5.** If you have made a backup in advance, then you will make the re–installation much easier.

- Locate your software installation CDROM that was originally supplied by SIGMET or perhaps you will perform an installation of an upgraded version supplied by SIGMET. In the event that you need a software installation CDROM, contact SIGMET (support@sigmet.com). These are provided free of charge by SIGMET. However, the specific version that was originally shipped with your system may no longer be available. In this case you will install an updated version.

- Make sure that all PCI cards are properly installed.

- From the "as-Built" documentation that is supplied with your system, verify the type of motherboard or SBC that is installed. If you cannot locate this, then you can check directly on the board itself by removing the top cover of the unit. For example, the Super Micro G2 motherboard is labeled in the rear left part of the board (relative to the front of the chassis). You may need a flashlight to read:
                    Super P4DPE–G2

- Connect the connector panel to the I/O-62 via the cable that is provided.

- Connect the keyboard, mouse and monitor. Note that the VGA monitor is typically supplied by the customer.

- For the RVP8, the IFD should be installed and powered so that it can pass its self tests later in the procedure. If an external reference clock is used for the IFD, then this should be active so that the unit can pass self tests.

For complete information on hardware installation see **Section 2.**

Once you have completed these steps, go to Section A.3.3 below.

A.3.3 Installing the system software

After you have prepared for the installation, as described in the previous section, you are ready to install the software.

Initial software installation steps

- Ready the unit with keyboard, mouse, monitor, etc. as described in the previous section.

- Switch the power on using the switch on the lower right front of the unit.

- Press the eject button on the CDROM drive and when it opens, insert the RDA CDROM into the drive.

- When prompted, press **Del** to enter the setup (lower right of number pad).

ⓘ   **Hint: If you get too busy inserting the CDROM and miss the BIOS setup prompt, simply power the unit off and on to start again, this time with the CDROM already in the drive.**

Setting the BIOS

ⓘ   **If the BIOS has been configured already during a previous installation or at the factory, then you should skip this step.**

ⓘ   **Note that specific BIOS keystrokes and menus often change. Use this section as a general guide.**

- **Reset to Defaults:** In the BIOS setup, reset BIOS to default parameters. This is typically done by pressing **F9** or in the **Exit** section and then confirming the YES/NO question.

- **Set Time:** In the **Main** section, set the system time and date to UTC. This is a 24 hour clock (8:00 pm = 20:00).

- **Enable Floppy:** In the **Main** section, set **Legacy Diskette A: 1.44MB   3.5"**.

- **Set Device Boot Order:** In the Boot section, select the boot order to be:

        CDROM
        Floppy   (sometimes listed under "Removable Devices")
        Hard Drive

- Select **SAVE and EXIT**. The unit will reboot automatically from the CDROM.

Booting from the RDA Installation CDROM

- When the **BOOT:** prompt is presented, type the following command, depending on the version of CPU that is in your system:

  For Supermicro –G2 board type:

  `linux ks=cdrom:/ks/ks-gb-hda.cfg`

  For Supermicro –Q board type:

  `linux ks=cdrom:/ks/ks-100.had.cfg4.8`

  After typing the appropriate command press **ENTER.**

- The software is installed automatically at this point. If prompted with:

  "Would you like to initialize this drive?",

  select **YES** (using the TAB key) and then select ENTER.

- After about 10 minutes, the CDROM ejects. Remove it. The PC reboots automatically. Continue to next section.

Installation steps to enable automatic startup of the RDA software

- At login prompt, login as: "**root**" and password "**xxxxxxxx**" (8 x's)

- If you are installing an RVP8, type:

  `chkconfig --level 2345 dspexport_init on`
  `chkconfig --level 016 dspexport_init off`
  `chkconfig --level 2345 rvp8_init on`

- If you are installing an RCP8, type:

  `chkconfig --level 2345 rcp8_init on`

- Logout of root by typing "**exit".**

Installation steps to "flash" FPGA's in SIGMET devices

In this section you will be installing FPGA software into each of the SIGMET components. You will need to make an inventory of what is in your system and then issue an "**rdaflash**" command to each one as described below:

- Login as "**operator**" with password "**xxxxxx**" (6 x's)

- You will enter X–Windows. Right click the mouse and start a terminal window.

- For each SIGMET component (*italic*) type the appropriate command (**bold**):

SIGMET Component	Unit ID	If RVP8, type:
Standard RVP8/Rx Card	*–0*	**rdaflash –program rvp8rx–0**
Standard I/O–62 Card	*–0*	**rdaflash –program io62–0**
Standard Connector Panel	*–0*	**rdaflash –program io62cp–0**
Optional RVP8/Tx Card	*–0*	**rdaflash –program rvp8tx–0**
Optional 2nd RVP8/Rx	*–1*	**rdaflash –program rvp8rx–1**
		If RCP8, type:
Standard I/O–62 Card	*–0*	**rdaflash –program io62–0**
Standard Connector Panel	*–0*	**rdaflash –program io62cp–0**

- Do a system shutdown by typing "**poweroff**"

- When "**Power down**" is displayed, turn power off with power switch on lower right of front panel.

This completes the FPGA software installation.

Reboot power-up check and RDA diagnostics

After you have completed the installation steps above, you should reboot the unit. You can observe the progress of the reboot on the monitor. In addition, the front panel LED display will show the time of the reboot and display diagnostic messages. Typically about 1 minute is required for the system to complete reboot.

After the reboot is completed:

- Verify that the front panel LED display does not indicate any faults.

- Log-in as operator, run dspx and issue the "v" command. Check the results against the example in **Section 3.1.4.** Note that both the IFD and connector panel should be installed and connected. An example session is shown below:

```
$ dspx
Digital Signal Processor 'Chat' Mode
Checking for code upgrades... Okay
(Type ^C to exit Chat Mode)

(hit "Esc" to start)


        SIGMET Incorporated, USA
RVP8 Digital IF Signal Processor V1.10(Pol)
-------------------------------------------

RVP8> v
```

ⓘ   **Important: When you are done, type "quit" and then "Ctrl-C" to exit dspx.**

- Stop the rvp8 (or rcp8) process by typing:

```
$ killall rvp8 (or rcp8)
```

- Run the following diagnostics and observe the results:

```
(for RVP8 and RCP8 systems)
$ rdadiags io62-0          tests I/O-62
$ rdadiags io62cp-0        tests connector panel

(for RVP8 systems only)
$ rdadiags rvp8rx-0
```

Run these also for any optional RVP8 cards such as:
```
$ rdadiags rvp8tx-0        tests RVP8/Tx
$ rdadiags rvp8rx-1        tests 2nd RVP8/Rx
```

- Restart the RVP8 or RCP8 process by typing (for the RVP8 example):

```
$ rvp8 &
```

- Verify that the restart messages show no faults.

A.4 System Software Configuration

After the receiving your unit from the factory, or after software re–installation, there are several configuration steps required to customize your system for your particular environment and application. The configuration tools available for this are summarized in the table below.

Configuration Tool	RDA Device	Description of Configuration Features
setup utility `setup_dsp.conf`	RVP8	Configures the local environment required to run RVP8 the support utilities such as **ascope** and **dspx**. Examples include radar equation parameters that are required for calibration, pulse width definitions and PRF request limits.
`setup_ant.conf`	RCP8	Configures the local environment required to run the RCP8 support utilities that such as **antenna** or **bitex**. Examples include, max allowed AZ/EL velocity request, MIN and MAX elevation angles that can be requested and LAT/LON of radar for sun tracking.
TTY setups `rvp8.conf`	RVP8	Defines the details of the sampling and processing algorithms as well as the operational configuration of the system. Examples include, IF filter design and selection, PRF limits, relative trigger timing, dual polarization features.
`rcp8.conf`	RCP8	Used to configure which status and control bits are available and define the antenna servo control parameters. Examples include, physical or virtual tachometer selection, shutdown safety criteria and internal antenna simulator on/off.
`softplane.conf`	RVP8	File that is edited which defines the various I/O signals on the I/O-62 connector panel, pin-by-pin. For example, whether a line is an input or output, electrical spec such as RS422 or TTL, what local variable name is associated with each line.
	RCP8	

ⓘ   **Important: Both the setup utility and the TTY setups must be configured to customize your system. This is part of the installation procedure.**

All of the configuration results are stored as ASCII text ".conf" files, typically in a directory called **/usr/sigmet/** (factory default). The file names are indicated in the table above. Each file has a factory default configuration file that is stored in the template directory (the default is **/usr/sigmet/config_template/init/**). An advantage of this approach is that for a radar network with identical hardware, configuration maintenance can be performed by copying pre-tested files over the network.

The following serve as references and are not repeated here:

setup utility   **IRIS Utilities Manual**

RVP8 TTY setups   **RVP8 User's Manual**

RCP8 TTY setups   **RCP8 User's Manual**

The configuration of the softplane.conf file is described below.

A.4.1 Configuring the softplane.conf file

What is the softplane.conf file ?

The softplane.conf file is used to define pin–by–pin assignment of I/O functions to various connectors on the I/O-62 connector panel. It is a plain text ASCII file that is self-documented. Since the RVP8 and RCP8 have virtually no jumpers, or wirewrap, all I/O configuration on the I/O-62 connector panel is done by software approach according to this file.

Where is softplane.conf ?

The file resides in the IRIS_CONFIG directory. Typically this is **/usr/sigmet/config** (this is the default directory that is factory installed). The factory configurations are also available in the **/usr/sigmet/template/init** directory so that you can always return to the factory defaults if you need to.

When do I need to change softplane.conf ?

The softplane.conf file that is shipped with your system is configured for a standard connector panel with I/O as described in **Appendix B**. As long as you use the standard I/O pin assignments, then you do not need to change softplane.conf.

If you need to redefine some of the I/O pins on the connector panel, or add additional SIGMET cards such as a second I/O-62 then you must change softplane.conf.

Editing softplane.conf

You will need to use a text editor to modify the softplane.conf file. There are two editors included in the system:

- **vi**   The generic UNIX editor that is available on every UNIX system. It is really arcane to use, but many people know how to use it out of necessity or they are simply used to it now.

- **emacs**:   This is more user friendly with keyboard commands and mouse support when you are in X–Windows so it a little easier to learn than **vi**.

If you are not familiar with either of these, then you will need to either find someone who is or learn how to use these tools.

To start an editing session you would do the following as **operator**:

```
$ cd /usr/sigmet/config
$ vi softplane.conf    or     emacs softplane.conf
```

softplane.conf file example

An example from the beginning and some excerpts from the softplane.conf file are shown below
(note that the command "**cat**" causes the file to be listed on a terminal):

```
$ cat /usr/sigmet/config/softplane.conf
# *********************************
# *                               *
# *   Softplane Configuration File *
# *                               *
# *********************************

# The following general purpose control and status signals
# can be routed to/from any available hardware pin.  The '~'
# prefix character may be used for signal inversion.
#
#          Control Outputs                Status Inputs
#          ---------------                -------------
#             cPedAZ[15:0]                  sPedAZ[15:0]
#             cPedEL[15:0]                  sPedEL[15:0]
#           cEarthAZ[15:0]                    sServoPwr
#           cEarthEL[15:0]                       sLocal
#               cServoPwr                      sStandby
#            cCabinetRelay                     sLowerEL
#             cTransmitPwr                     sUpperEL
#             cPWidth[3:0]                  sTransmitPwr
#               cTrigBlank                sTransmitLocal
#               cRadiateOn                  sPWidth[3:0]
#              cRadiateOff                    sTrigBlank
#                   cReset                      sRadiate
#            cIrisMode[2:0]                   sAirflowFlt
#               cAux[63:0]                    sWavegpFlt
#                     true                  sInterlockFlt
#                    false                 sMagCurrentFlt
#                                                 sReset
#                                          sIrisMode[2:0]
#                                            sAux[319:0]

splConfig.sVersion = "7.32"


# -------------------- IO62 Slot #0 --------------------
#
splConfig.Io62[0].lInUse = 1

# The remote backpanel type should be one of the following:
#     Direct : Direct I/O with IO62 connector itself
#     IO62CP : Standard IO62-CP connector panel
#     RVP88D : RVP8 portion of WSR88D panel
#     RCP88D : RCP8 portion of WSR88D panel
#
splConfig.Io62[1].sExtPanel = "IO62CP"

# TTL/CMOS on J1
#
splConfig.Io62[0].Opt.Cp.J1.pin01 = "sPedAZ[0]"
splConfig.Io62[0].Opt.Cp.J1.pin02 = "sPedAZ[1]"
splConfig.Io62[0].Opt.Cp.J1.pin03 = "sPedAZ[2]"
...
```

```
# Relays and relay drivers on J6
#
splConfig.Io62[0].Opt.Cp.J6_IntRelay1 = ""
splConfig.Io62[0].Opt.Cp.J6_IntRelay2 = ""
splConfig.Io62[0].Opt.Cp.J6_IntRelay3 = ""

splConfig.Io62[0].Opt.Cp.J6_ExtRelay1 = ""
splConfig.Io62[0].Opt.Cp.J6_ExtRelay2 = ""
splConfig.Io62[0].Opt.Cp.J6_ExtRelay3 = ""
splConfig.Io62[0].Opt.Cp.J6_ExtRelay4 = ""

# BNC testpoint monitors
#
splConfig.Io62[0].Opt.Cp.J13_BNC = ""
splConfig.Io62[0].Opt.Cp.J16_BNC = ""

# BNC trigger drivers direct from IO62 PCI card.
# Special signals 'trigger[8:1]' may also be used here.
#
splConfig.Io62[0].Opt.Cp.J14_BNC = ""
splConfig.Io62[0].Opt.Cp.J15_BNC = ""
splConfig.Io62[0].Opt.Cp.J17_BNC = ""
splConfig.Io62[0].Opt.Cp.J18_BNC = ""

# RS232 TTY transmitters from IO62
#
splConfig.Io62[0].Opt.Cp.TTY0_Tx = ""
splConfig.Io62[0].Opt.Cp.TTY1_Tx = ""

# ------------------- IO62 Slot #1 -------------------
#
splConfig.Io62[1].lInUse = 0

# ------------------- IO62 Slot #2 -------------------
#
splConfig.Io62[2].lInUse = 0
....
#     <End of softplane definitions>
```

softplane. conf organization and syntax

The softplane.conf file is used to define every I/O pin on every connector, on the PCI cards themselves and on the connector panel. There are two primary definitions that are made for each pin:

- **Physical interface-** the electrical properties (RS422 output, analog input, TTL output, etc.).

- **Logical interface-** The internal variable name that is associated with each pin.

With this in mind, we can describe the syntax of the file.

- "**#**" at the beginning of a line indicates a comment. These are used for internal documentation and if you make changes you should comment them, for example
  ```
  # TTL I/O on J7
  #
  # Modification by REP on 2 Apr 03
  # Added new interlock input on connector panel J7 pin07
  ...
  ```

- The top part of the file provides a list of internal variables names that are used to define the logical interface to the softplane. These are divided into status inputs (also called indicators) and control outputs (also called requests). For example, sPedAZ0 corresponds to the LSB of a digital azimuth angle relative to the antenna pedestal. The tables on the next page provide a summary of the available status and control variable names.

 ⊕   **Important: This table is subject to change**

- Each definition line in the file starts with the keyword text:

  ```
  # splConfig...
  ```

- The first un-commented line of the file indicates the version of the IRIS support software that was last used to machine–generate the file. This is an information only field for traceability purposes and is thus not edited. In the example we have this shown as:

  ```
  # splConfig.sVersion = "7.32"
  ```

Summary of softplane.conf Status and Control Bits

Control Output	Meaning/Interpretation
cPedAZ[15:0]	16 bits of antenna azimuth angle relative to the pedestal (fixed base system)
cPedEL[15:0]	16 bits of antenna elevation angle relative to the pedestal (fixed base system)
cEarthAZ[15:0]	16 bits of antenna azimuth angle relative to the earth (moving platform)
cEarthEL[15:0]	16 bits of antenna elevation angle relative to the earth (moving platform)
cServoPwr	To control servo power on
cCabinetRelay	To control a relay signal
cTransmitPwr	Request transmit power on
cPWidth[3:0]	Request one of four pulse widths
cTrigBlank	Trigger blanking signal
cRadiateOn	Request radiate on
cRadiateOff	Request for radiate off
cReset	Request a reset of external equipment
cIrisMode[2:0]	Request the application software (e.g., IRIS) to switch to 1 of 8 operating modes.
cAux[63:0]	Arbitrarily assigned output requests
true	Internal logic variable
false	Internal logic variable

Status Input	Meaning/Interpretation
sPedAZ[15:0]	16 bits of antenna azimuth angle relative to the pedestal (fixed base system)
sPedEL[15:0]	16 bits of antenna elevation angle relative to the pedestal (fixed base system)
sServoPwr	Servo power on indicator
sLocal	Antenna local mode indicator, usually tied to an external local/remote switch.
sStandby	Radar ready to radiate indicator
sLowerEL	Lower limit switch indicator
sUpperEL	Upper limit switch indicator
sTransmitPwr	Transmitter cabinet power on indicator
sTransmitLocal	Transmitter local mode indicator, usually tied to an external local/remote switch.
sPWidth[3:0]	Indicator of the current pulse width
sTrigBlank	Indicator that trigger blanking is requested, usually from an external source.
sRadiate	Radiate on indicator
sAirflowFlt	Cooling airflow fault indicator
sWavegpFlt	Wave guide pressure fault indicator
sInterlockFlt	Master interlock fault indicator
sMagCurrentFlt	Transmitter overload fault indicator
sReset	Request for reset coming from external source
sIrisMode[2:0]	Information on which operating mode is active in the application software
sAux[319:0]	Arbitrary status indicators

- Next, each piece of hardware is identified as being either in use or not in use.

```
splConfig.Io62[0].InUse = 1  if in use
splConfig.Io62[0].InUse = 0  if unused or not installed
```

  Currently, the I/O-62 is the only I/O device supported by the softplane.

- The method of connecting to the I/O-62 is specified next, for example**:**

```
splConfig.Io62[0].sExtPanel = "DIRECT"
```

  Currently, the options are:

Type of Connection	softplane Descriptor
Direct connect to I/O-62 via 62 pin connector	**DIRECT**
I/O-62 Connector Panel (used for RVP8 and RCP8)	**IO62CP**
WSR88D connector panel, RVP8 portion	**RVP88D**
WSR88D connector panel, RCP8 portion	**RCP88D**

- The assignments for each connector and each pin are then made. For convenience, these are usually grouped together by connector. For example let's say that , Pin 1 of connector J1 on the I/O-62 connector panel is assigned to be the LSB of the input azimuth angle, i.e.,

```
# TTL/CMOS on J1
#
splConfig.Io62[0].Opt.Cp.J1.pin01 = "sPedAZ[0]"
...
```

- The notation ″ ″ indicates that no assignment is made.
```
# BNC testpoint monitors
#
splConfig.Io62[0].Opt.Cp.J13_BNC = ""
```

  In the example above the "pin name" is J13_BNC.

- Putting a ~ in front of a logic variable inverts the variable.

```
splConfig.Io62[0].Opt.Cp.J1.pin03 = "~sPedAZ[2]"
```

Check in the /usr/sigmet/config_template/init directory for other examples of softplane configurations.

A.5 System Backup and Recovery

Because both the operating system and the RDA software are contained on the RDA CDROM, in the event of a serious failure, the complete software is simply re-installed from scratch. There are however, a few files that contain your custom configurations. In general these are files in the /usr/sigmet/config directory and the /etc directory. In fact, since they are all simple text files, they will, in most cases, fit onto a 1.44 MB 3.5" floppy diskette.

SIGMET provides two utilities for backup/restore:

- rda_backup- finds all files modified after the original installation (or re–installation), puts them into a compressed UNIX "tar" file and copies the result to either a floppy disk or a directory on the hard disk. System created files in directories such as /tmp and /var are excluded from the backup.

- rda_restore- restores the contents of a backup tar file from floppy disk to the hard disk to the RVP8.

In the case where the backup tar file is written to a directory on the hard disk, the user can then use ftp to put it on another computer on the network, or alternatively, put the file on CDROM via the CDRW device. This section describes the use of the rda_backup and rda_restore utilities.

A.5.1 System Backup

When to make a backup

You should make a backup whenever you have made a change to the configuration of your system: Examples include:

- Changing softplane.conf or other .conf files in /usr/sigmet/config.

- Changing files related to networking or security in /etc.

SIGMET does not recommend that you attempt to backup individual files. Instead you should use the backup procedure described here since it will make the restore much easier, plus you might miss something important that rda_backup will find.

Backup Media

There are two primary media for backup:

- 1.44 MB floppy disk drive (FDD)
- A directory on the local hard disk drive (HDD)

In most cases you will use the 1.44 MB FDD approach. You would backup to an HDD directory in the event that a backup, because it is too large, fails on the floppy .

ⓘ   **If you use the HDD approach you must either transfer the backup to a CDROM via the CDRW, or use ftp to copy files to another machine. See Section A.5.3 for the procedure.**

The next two sections describe how to prepare these two media.

Preparing the floppy backup media

Every time you backup, you should use a freshly formatted floppy. It is possible to have several backups on a single floppy, but this is a bit risky if that diskette fails. Indeed some system managers even make two backups for added security. This is a smart thing to do.

There are three ways to format a floppy:

- **Purchase formatted floppies.** This is the easy way.

- **Format the floppy on a Windows machine.** Simply select the floppy drive (usually A:) under "My Computer" and then right click the mouse to select "Format"

- Use Linux to format the floppy. The command (as root) is:

```
# mkfs.msdos –v –n RVPBACKUP /dev/fd0
```

Here the text RVPBACKUP serves as the DOS volume label for the floppy. For and RCP8 use the text RCPBACKUP. You can use other text if you want, but do it in upper case with no spaces or special characters. It is also assumed that the floppy drive is /dev/fd0.

After you have a formatted floppy, the next thing to do is to **LABEL IT**, for example, write on the label

RVP
Date e.g.,YYMMDD

Mounting the floppy backup media

Insert the floppy disk into the drive and then mount it (first use the su command to become root):

```
$ su
Password:
# mount /dev/fd0 /mnt/floppy
```

If there is a problem with this, check that there is a directory called /mnt/floppy. If not, create it as root with:

```
# mkdir /mnt/floppy
```

It is a good idea to make sure that the floppy does not contain anything from a previous backup that you want so after you mount it check it with:

```
# cd /mnt/floppy
# ls -als
```

If the floppy disk contains files from a previous backup that you want to keep, select another disk.

Preparing a hard disk backup directory

In the case that you are using a directory on the hard disk, as operator create a directory such as /tmp/backup.

```
$ cd /tmp
$ mkdir backup
```

Backup files will be written to this directory with unique, machine generated file names that contain the YYMMDDHHMMSS time code.

Running rda_backup

After the media has been prepared and mounted (in the case of an FDD), then simply type the command:

    $ rda_backup –v /mnt/floppy   *for floppy disk back-up*

In the case of a hard disk backup to a directory such as **/tmp/backup** you would type:

    $ rda_backup –v /tmp/backup   *for hard disk backup*

The rda_backup utility will then check all of the directories where you have likely made configuration file changes. Any files that were modified since the original installation will be included in the backup.

If you use the **–v** option when starting **rda_backup**, then a listing of files will be displayed on the terminal. When the backup is complete, the terminal will show:

```
...
Backup Complete:  <File name>      0.9 MB   20 Files
$
```

Un-mounting and removing the floppy

To unmount the floppy, become root via the "**su**" command and type:

```
$ su
Password:
# cd /
# umount /dev/fd0
```

You may now push the eject button on the front of the drive to remove the floppy. Double check that it is labeled with the proper date.

The most common problem encountered when un-mounting is that the FDD is "in use". This means that a terminal is in the /mnt/floppy directory. Typing "**cd /**" will take a terminal out of the FDD directory.

A.5.2 System Recovery

Recovering an entire system

In the event that your system becomes "un–bootable" perhaps because of a disk failure or corruption, you will simply re–install the entire system per **Section A.3.3**, and then use your rda_backup floppy disk and the rda_restore utility to recover your custom configuration files. Recovering the configuration files is described below:

ⓘ **In the event of a hard disk failure, you will first need to replace the standard IDE hard disk before attempting to recover your system. Most computer stores will carry such a disk or you can contact support@sigmet.com to purchase a new one.**

Mounting the floppy or CDROM

If you are recovering from a floppy drive or CDROM, then you must first mount these devices.

- Mounting the floppy is described in **Section A.5.1**.

- Mounting the CDROM is described in **Section A.6.5**.

ⓘ **You must be root to mount devices. Use the "su" command to switch from operator to root. Type "exit" to switch back to operator.**

After the floppy is mounted, you should check to verify that the backup file that you want is indeed on the disk. Do this as follows:

```
$ cd /mnt/floppy
$ ls –als
```

This will give you a listing of files on the floppy. The procedure for a CDROM is the same except the device is /mnt/cdrom.

Running rda_restore

After the media has been mounted, run the **rda_restore** utility as **operator**. In the example below, it is assumed that the device is /mnt/floppy.

```
$ rda_restore –v /mnt/floppy
```

Other possible devices are a CDROM (e.g., /mnt/cdrom) or a hard disk drive directory (e.g., /tmp/backup). The –v command will provide a list of all files that were restored. At the end of the restore you will get a message:

```
...
Restore Complete  <filename>        0.9 MB   20 Files
$
```

All that remains is to unmount and remove the floppy (this is done as root) as described below.

Un-mounting and removing the floppy or CDROM

In the case of a floppy, become root and then issue the "**umount**" command:

```
$ su
Password:
# cd /
# umount /dev/fd0   (Note: spelling is indeed "umount")
```

You may now push the button to eject the floppy.

For a CDROM, you can use the eject command (instead of "**umount**"):

```
# eject
```

This completes the restoration of your custom configuration files.

A.5.3 Transferring a backup file from the RVP8 hard disk

If you used rda_backup to make a backup file on the hard disk (e.g., in the /tmp/backup
directory), then you need to transfer this file to another medium for safety in case the hard disk
fails. There are three options:

- ftp to another networked computer
- Copy to the floppy
- Copy to the CDROM

These are described below.

ftp to another computer

This assumes that there is another computer on the network, that you know its IP address or it is
configured in your /etc/hosts file and that the security settings on the other computer permit ftp.
Check with your network manager to verify these criteria.

For this example, it is assumed that you made your backup to a directory called /tmp/backup and
that you are going to send it to another computer in the /tmp directory. To copy the backup file
login as operator and in an X-Terminal type:

```
$ cd /tmp/backup   (or use the actual directory if different)
$ la -als          (to view the files in the directory)
```

Identify the file that you want to transfer via ftp and write down its name, then:

```
$ ftp <hostname or IP address>
ftp> cd /tmp
ftp> put <filename of backup in /tmp/backup>
ftp> quit
$
```

The backup file is now on the other computer in the directory /tmp

Copy to a floppy

First check the size of the backup file to determine if it will fit on a floppy. To do this for backup files stored in /tmp/backup:

```
$ cd /tmp/backup

$ ls –als
```

The file size in bytes is shown just to the left of the date column. To fit on a floppy the backup file that you want to copy it must be less than 1,440,000 bytes (1.44 MB). If it is larger than this you cannot use the floppy approach.

Note backup filename that you want to copy from the /tmp/backup to the floppy. Then:

- Mount the floppy as described in **Section A.5.1**.

- Copy the file to the floppy using the **cp** command:

  ```
  # cp /tmp/backup/<filename> /mnt/floppy
  ```

  where the filename corresponds to the backup file that you want to copy.

- Verify that the file was properly copied by typing:

  ```
  $ cd /mnt/floppy

  $ ls –als
  ```

- Un-mount the floppy as root with the commands:

  ```
  # cd /

  # umount /dev/fd0
  ```

Copy to a CDROM

For large backup files that exceed 1.44 MB, then you can use the CDRW to write a CDROM. To do this **cd** to the root of the directory you want to make into a cdrom. Using the example of backups stored in /tmp/backup, as operator type,

```
# cd /tmp/backup

# mkisofs –v –V "RVP8 SETUP" –o /tmp/rvp8.iso /tmp/backup
```

Where the volume label is arbitrary text specified in the quotes (e.g., **"RVP8 SETUP"),** file /tmp/rvp8.iso is the the temporary iso image file you are building. You can call this anything. To actually burn the cdrom, place a blank write-once or re–writeable disk into the CDRW and then type:

```
# cdrecord –v speed=8 dev=0,0,0 –eject /tmp/rvp8.iso
(Note the comma delimiters in 0,0,0)
```

The specific options might be a bit different based on hardware. For example the max speed, or the device if there are more than one scsi devices. You can type "**cdrecord –scanbus**" to see all the scsi devices. If the CDROM drive is not in the list then you cannot use this procedure. However, for a standard SIGMET installation it will show in the list.

A.6 Software Upgrade and Support

A.6.1 Where to get software upgrades

The RVP8 and RCP8 (collectively the RDA) are active products. New features and bug repairs are provided in the form of software upgrades. Software upgrades from SIGMET can be obtained from two sources:

- **RDA Network Upgrades**- These are available from ftp.sigmet.com. For example, to obtain the release RDA 8.00 you would go to:

  ftp.sigmet.com/outgoing/releases/rda-8.00

  Section A.6.4 shows a typical ftp session. These public releases are FREE of charge but do not include support services unless you are under warranty or have purchased a support contract from SIGMET. Contact support@sigmet.com if you need to arrange a support contract.

- **CDROM Upgrades**- these are provided as part of a support contract and contain manuals and source code as well as the operational software.

A.6.2 When should I upgrade

If your system is working fine and you do not require the new features of a release, then often the best thing is to NOT upgrade. Check the release notes available at www.sigmet.com in the customer support section to see what changes have been made since your current release was installed. Be sure to check the release notes for all intervening releases.

To check the release that you have currently installed, you can type the command:

```
$ show_machine_code -version
IRIS Version 8.00   (indicates version 8.00)
```

A.6.3 How should I upgrade

There are two basic upgrade techniques:

- **CDROM Full Re-Install**- Backup your configuration files and network files and then do an install from scratch as described in **Section A.3.3**. This is not the preferred technique since it is possible that the backup of configuration files will be incomplete.

- **Upgrade using "install" utility**- This is the preferred technique since it leaves all configuration files intact. This is described in **Section A.6.5**.

Once you have decided on either a network or CDROM upgrade, then proceed with the upgrade installation as described in the sections below.

A.6.4 Getting the network upgrade files

There are two ways to get the network upgrade files. Both techniques use ftp to get the files from ftp.sigmet.com. The ftp client service is enabled on the RVP8 allowing you to run an ftp session on the RVP8 and "get" files from another networked computer:

- **Use the RVP8 to get the files-** a one-step procedure that requires that you have internet access from the RVP8.

- **Use another machine on the network–** a two-step procedure to first ftp the files from SIGMET to another computer, and then "get" them from this machine by running ftp on RVP8. Note that an alternative is to copy the files to a CDROM and then mount the CDROM on the RVP8 and copy the files.

No matter what technique you use, you will need some basic familiarity with ftp. Here we will assume that the RVP8 has direct internet access (the one-step procedure). The two-step procedure is analogous.

Important: The default security configuration allows the ftp client to run locally on the RVP8, but does not allow ftp access from other systems to the RVP8. Therefore, you must always run ftp from the RVP8 to "get" the files there.

The one-step approach: Direct download to RVP8

- On the RVP8, create a directory called /tmp/rda–X.XX. Here the X.XX is the version number of the RDA software that you want to install. This naming convention makes it easy to identify the version of the install files. As **operator** type (assuming version 8.00 for all examples here):

  $ cd /

  $ mkdir /tmp/rda–8.00

- Position yourself in the /temp directory by typing:

  $ cd /tmp/rda–8.00

Note that on a windows machine, all of the commands below can be typed in the MS–DOS prompt window (remember to use the "\" backslash for DOS).

- Start ftp and follow the sample session below (your responses are indicated by **bold**)

  $ ftp ftp.sigmet.com
  Connected to ftp.sigmet.com
  220 Welcome to SIGMET
  Name: **anonymous**
  331 Guest login ok, send your complete e-mail address as password.
  Password: ***<Use your email address>***
  230 Guest login ok, access restrictions apply.
  ftp> **cd outgoing/releases/**

```
ftp> dir
```

- You will see a directory listing of available releases. You are looking for an "rda" release. Assume it is rda–8.00, then:

```
ftp> cd rda-8.00
```

```
ftp> dir
```

- Now you will see a list of files with file sizes. If you have a low-speed link, then you will want to download only a minimal installation which consists of:

    app.gz
    install
    install.gz
    install.rf
    instiris

- Make a list of the files that you want to download including at least the five files in the list above, and then prepare to download by selecting BINARY file transfer:

```
ftp> bin
200 Type set to I.
```

Important: If you do not specify BINARY transfer, the download will not work.

- Now "get" the files, for example:

```
ftp> get app.z
```

```
200 PORT command successful.
```

```
150 Opening BINARY mode data connection for app.gz (4897560 bytes)
```

```
226 Transfer complete.
```

You will get a confirmation that BINARY transfer is being used and the size of the file in bytes is displayed. Depending on the size of the file and the speed of your connection, the download could take many minutes. When the file transfer is completed, you will get a confirmation message.

You can also use the multiple get command "**mget**" to get all of the files:

```
ftp> mget *
```

You will be prompted for each file download so you can still pick- and-choose by typing "**y**" or "**n**" to select (yes or no).

- After you have downloaded all of the files, then end your session by typing:

```
ftp> quit
```

```
221 Goodbye
```

```
$ (back to UNIX prompt)
```

For the one-step approach, you have all of the files that you need in the directory /tmp/rda–8.00 on the RVP8.

Completing the two-step approach using another computer

The two step approach is to use another computer to get the upgrade files and then get these files on the RVP8. The first step of getting the files from SIGMET is done analogus to the one-step approach described above. The second step is to ftp the files from the other computer to the RVP8. This is also analogous to the procedure described above. An alternative is to put the files on a CDROM, mount the CDROM on the RVP8 and then copy the files to the RVP8.

The end result of all these various procedures is that the upgrade files are on the RVP8 in a directory called /tmp/rda–X.XX. N

Set the modes on the files

Become root using the **su** command and password. Go to the RVP8 directory where the files were downloaded and change the mode on two of the files that require execute privilege, i.e.,

```
# cd /tmp/rda-8.00
# chmod +x install
# chmod +x instiris
```

You are now ready to move on to the next section.

[i]   ## Alternative download technique using a browser

An alternative, but somewhat less reliable approach to using the manual ftp commands is to use a browser such as Netscape. To connect to the SIGMET ftp site, simply type–in the address

```
ftp://ftp.sigmet.com
```

You can then click on outgoing/releases/rda–XX.X to get a list of files to download. While holding the "Shift" key, click the file that you want to download. You will be prompted to select a destination directory and file name:

⚠   **Warning: Use this technique with caution only if you are sure that you know how your browser is functioning. Each browser is different. Some may performASCII rather than BINARY transfers. Also, some may re-name the files when they are copied. If this is the case, then be sure to re-name them back to the original name, with lower-case letters.**

A.6.5 Starting the "install" utility

The **install** utility is a graphical user interface that allows you to install SIGMET-supplied software either as a new installation or as an upgrade. In the case of the RDA, **install** is used to perform software upgrades only. New RDA installations use the procedure described in **Section A.3.3** since this also conveniently installs the proper Linux operating system in one step.

install can be used to upgrade from either of two sources:

- From a release CDROM provided by SIGMET.
- From files placed in a local directory (e.g., /tmp/rda–X.XX). These files are obtained via an ftp download as described in the previous sections.

Login as operator to start X–Windows

Install uses X–Windows, so must be run from an X–terminal rather than the full scree text display. Login initially as **operator** to start X–Windows. Start a terminal and become root by issuing the "**su**" command and password (default is 8x's- xxxxxxxx).

Stop all SIGMET applications and processes

Before you can actually do the upgrade, you must make certain that all SIGMET applications are stopped. You can do this by exiting any utilities and then typing (as root) "**killall rvp8**" (or rcp8). Then type **ps_iris** to verify that all SIGMET processes are stopped. If there are remaining processes, you can stop them as root with the "**kill** <process ID number>" command. The process ID number is the first column of numbers displayed in the **ps_iris** result.

Running "install" from a SIGMET RDA release CDROM

If you have a SIGMET release CDROM, **install** can be run directly from it. First either login as root or become root using the "su" command. Then mount the CDROM:

```
$ su
password:
# mount /dev/scd0 /mnt/cdrom
```

OR if this does not work because of the specifics of your hardware type:

```
# mount /dev/hdb /mnt/cdrom
```

After you have successfully mounted the CDROM, run install as follows:

```
# cd /mnt/cdrom/linux
# ./install
```

When you have finished running install, you need to unmount the CDROM and eject it:

```
# cd /
# eject /mnt/cdrom
```

Running "install" from a local directory

The procedure is identical to the CDROM procedure described above, except you invoke install in the local directory (e.g., first **"cd /tmp/rda–8.00"**).

A.6.6 Using the install utility

The **install** utility is shown below. The utility allows you to select the source for the files and the system on which you want to do the installation. You can also select which files you want to install. The menu fields are described in the following sections.
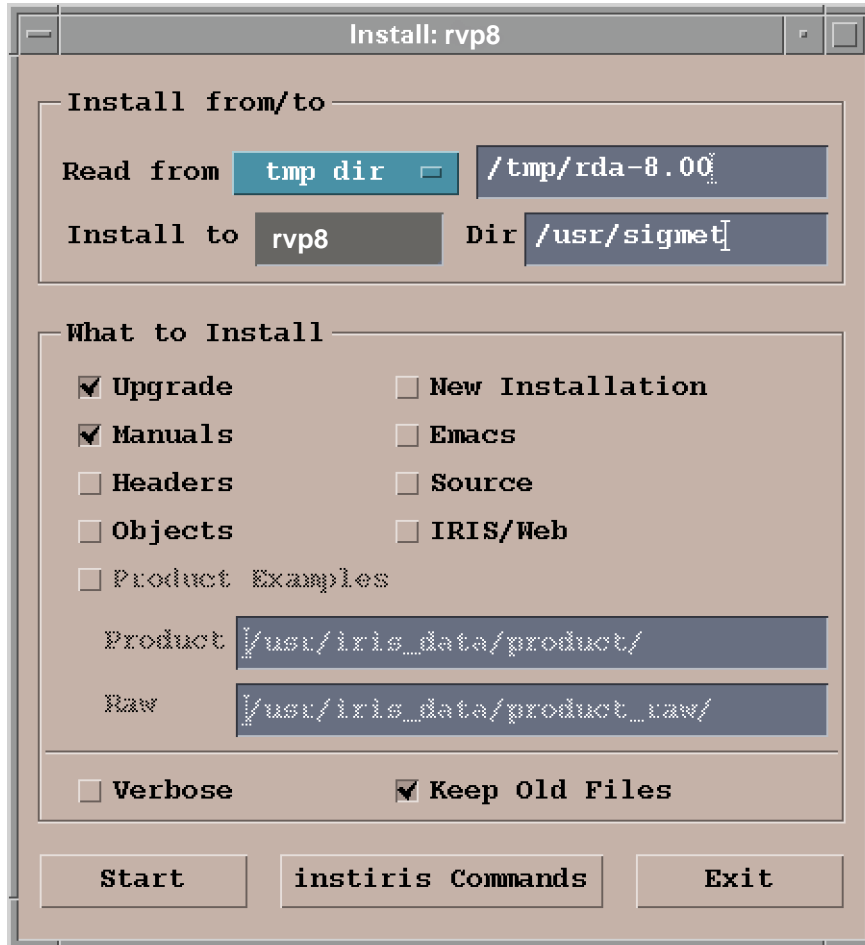
Install from/to, Read from- select whether you are installing from a temporary directory or a CDROM. Type-in the directory that contains your install files. In the example, this is **/tmp/rda–8.00**

Install from/to, Install to- Type-in the network node name of your RVP8 or RCP8. If you are unsure, look at the very top of the menu. In the example, the nodename is **rvp8**. Enter the directory anchor point for the install– typically this is **/usr/sigme**t (the factory default).

What to install- click the **Upgrade** button and any special packages that you may want to install. In the case of an installation from a local directory, be sure that you have downloaded the corresponding files from SIGMET. For a minimal installation you would select only the **Upgrade** option. If you are installing from CDROM then you have the manuals there so also select **Manuals** to get the most up to date documentation.

Keep old files- should be clicked-in, unless the release notes specify otherwise.

When you have finished making your selections, then click **Start** to do the install. A text status screen will show you the progress of the install. If you had clicked Verbose, then this status screen would show more detail.

install error message that applications are still running

The most common problem in running **install** is that SIGMET application processes are still running on the system. You will get a message complaining that there are processes still running. Perhaps you forgot to do a "killall rvp8" or have other utilities running. Check **Section A.6.5** for instructions on stopping SIGMET processes.

After all processes are stopped (a clean **ps_iris**), then click **Start** again.

A.7 Network Basics

The RVP8 and RCP8 are generally delivered from SIGMET packaged as fully integrated Linux based computers running the SIGMET RDA application software. Being Linux computers, they have the ability to interface to a computer network- in fact, for normal operation in communicating with host software running on a different computer, they must be connected to a network. This chapter gives some helpful information for:

- The default RVP8 or RCP8 configuration as delivered

- How to change this default configuration

- How to use the RVP8 and RCP8 in conjunction with other hosts on the network

A.7.1 Default Out Of The Box Configuration

When delivered as fully integrated Linux computers, the RVP8/RCP8 has two LAN interfaces. These are designated as ETH0 and ETH1. The ETH0 interface is the only one that is enabled by default. The ETH1 interface is available, but no enabled. Both of the LAN interfaces are RJ–45 style ports that accept a standard LAN twisted pair style cable. SIGMET recommends that CAT 5e or better cable be used for this connection.

[i]   **On most systems there are two network connectors. Usually ETH0 is the left one (looking at the back of the unit) next to the VGA connector.**

Depending on the version of the motherboard, the LAN interfaces are both either 10/100 Mbps, or 100/1000 Mbps. In both cases the interfaces will negociate to the highest speed allowed by the device (often a hub or a switch) that they are connected to. To determine the style of motherboard, look at the Model Number in the back corner of the motherboard. If it has a –Q suffix, the LAN speeds are 10/100. If it has a –G2 suffix, the LAN speeds are 100/1000.

The IP address of the RVP8/RCP8 out of the box is 192.168.76.90 with subnet mask of 255.255.255.0. There is no default route nor DNS server configured. Thus the RVP8/RCP8 could be used immediately on network identified as 192.168.76.0.

The RVP8/RCP8 is configured with only a minimum number of network services running. This implies a very conservative (safe) network security profile. The only service that is running is the portmapper as this service is required by the SIGMET RDA application software. With a very safe and conservative security policy such as this out of the box configuration, the RVP8 and RCP8 will be able to exist on the network and have no security concerns.

A.7.2 Making Changes to Default Configuration

The one change that probably will be needed to the RVP8/RCP8 in almost every instance is to change the default IP address of ETH0. This will of course allow you to use the RVP8/RCP8 on a pre–existing computer network.

IP Address Configuration

To change the IP address, you must edit the file /etc/sysconfig/network_scripts/ifcfg–eth0. The default version of this file will have about 10 lines and two of them of the format:

> **IPADDR=192.168.76.90**

> **NETMASK=255.255.255.0**

You may change the IPADDR to any valid address and if necessary, you should also change the NETMASK. You should contact your network administrator for assistance in identifying appropriate values for these lines. The other lines in the file require no change. It should be noted that the RVP8/RCP8 requires the same IP address all the time, thus dynamic IP addressing (such as DHCP) is not appropriate. After making the above changes to the ifcfg–eth0 file, you should reboot to make the changes take effect.

If you wish to use the second LAN interface (ETH1), to configure this, you should create the file ifcfg–eth1 in the /etc/sysconfig/network–scripts directory. The easiest say to do this is to just copy the ifcfg–eth0 file to ifcfg–eth1. Then edit the ifcfg–eth1 file and change the "**DEVICE=eth0**" line to read "**DEVICE=eth1**", and change the IPADDR and NETMASK lines as appropriate. Again, contact your network administrator for assistance in identifying the appropriate values. In addition, you must edit the file /etc/modules.conf and for –Q series motherboards, add to the end a line reading "**alias eth1 eepro100**". For –G2 series motherboards, add a line reading "**alias eth1 e1000**". Then reboot to make these changes take effect.

Default Routes and Hostname

In the default configuration, the RVP8/RCP8 can communicate with any other computer on the local network, but is not configured to communicate with computers on other networks.

To allow such communication, edit the file /etc/sysconfig/network and add the line "GATEWAY=192.168.76.1". Of course substitute the IP address of your default gateway for the 192.168.76.1 value in this example. You system administrator can provide you with the correct value.

Also in the same file a line such as "**HOSTNAME= localhost.localdomain**" exists in this file. You can substitute a new hostname for the "**localhost.localdomain**". You must also edit the file /etc/hosts and add to this a line that first lists the IP address of your ETH0, then lists your hostname exactly as it appears in the /etc/sysconfig/network file.

After making any changes to default routes and/or hostnames, you must reboot your computer before they will take effect.

Hosts and DNS

In the out of the box configuration, the RVP8/RCP8 can communicate with other computers on the network, but only by using IP Addresses. If you want to communicate with other computers using Hostnames, you must configure either a hosts table or DNS. Generally, a small network of only a few computers uses a hosts table, while large networks generally use DNS. It is up to you to decide which method is appropriate and again, your network administrator can provide advice.

To configure hostnames using a host table, this is done by editing the /etc/hosts files and adding lines that default the IP address of a host and its hostname. For example, a line such as:

met_server

would allow you to communicate with the host "**met_server**" using its hostname rather than its IP address.

For DNS, you do not need to enter individual hostnames into a local host file, but it is assumed that all of the hostnames and IP addresses are stored on a central DNS server. All you need to do is to install a pointer to this server computer and then you can communicate using hostnames to any of the computers in the list on the DNS server. To enable DNS, edit the file /etc/resolv.conf and add a line such as:

nameserver 192.168.76.99

Of course substitute the IP address of your DNS server for the "**192.168.76.99**" listed above, and again, your network administrator can provide you with the appropriate information.

Time Zones Configuration

By default, the system clock and time zone of your RVP8/RCP8 are set to UTC (Universal Time – also called Greenwich time). If you wish to change your time to be reported as local time rather than UTC, you can use the "**timeconfig**" utility to do this. When using timeconfig, you need to select your local time zone from the list provided. And also you need to select if the BIOS stores time in UTC. SIGMET recommends using BIOS time in UTC because this is more standard. But you are free to choose any timezone (or UTC) from the list provided. You should reboot your computer after making any change using "**timeconfig**".

Time Synchronization using NTP

Because the data generated by the RVP8/RCP8 is time stamped, it is often useful to have an automated way of keeping the system clock accurate. Using the Network Time Protocol (NTP) is an effective and easy way of doing this.

To use NTP, you must have an NTP server on your network. Often this is a single system where your network administrator oversees keeping the clock accurate so other computers can sync their clocks to it. There are also automatic NTP servers that sync their clock to GPS (satellite based time) and then other computers can sync to this.

Assuming you have such an NTP server available on your network, to setup NTP on the RVP8/RCP8, you must first execute the command "**chkconfig –service ntp on**". Next you must edit the file /etc/ntp.conf and find add the line "**server 192.168.76.98**". Of

course substitute the IP address of your NTP server for 192.168.76.98 in this example. There are many other lines in the /etc/ntp.conf file, but these are not used for normal configuration and must be left with a comment symbol "**#**" prefixing them. Generally, you should only have one line without a comment symbol, and that is the "**server ...**" line defined above. Next you should edit "or create" the file /etc/ntp/step–tickers. In this file put only the IP address of your NTP server. There should be nothing before or after the IP address, and it should be the only line in the file. The /etc/ntp/step–tickers file causes your computer to sync its time abruptly to the NTP servers time while your computer is booting, and the /etc/ntp.conf file causes your computer to periodically compare its time to the NTP server and make small adjustments as needed. Once again, you must reboot your computer before the above changes take effect.

Adding Network Services

If more network services are required (such as telnet, rlogin, ftp, ...) these can be optionally enabled. Before enabling such network services, it is advisable to review these decisions with your network administrator to make sure that the network safety of the RVP8/RCP8 is not compromised. The easiest way to enable these services is by using the "**ntsysv**" utility. When running this utility, you are presented with a list of many system services (not only network services). Services that are currently enabled have a star "*****" in front of them. You can either enable or disable a service by scrolling to it and then pressing the space bar. This will toggle the star and thus if the service is enabled.

Again, it is recommended that you discuss with your system administrator before making any changes because such changes could have a profound effect on the security of your system. After making any changes, you should reboot your computer before they will take effect.

One such services that you might want to consider enabling is telnet. Telnet allows your to login to your RVP8/RCP8 from another computer on the network and is often convenient. Telnet uses a user name and password for security authentication.

B. RVP8/RCP8 Packaging

A standard RVP8/RCP8 processor consists of three separate units:

- **Main Chassis**   **Section B.1   RVP8 and RCP8**

- **Connector Panel**   **Section B.2   RVP8 and RCP8**

- **IFD (IF Digitizer)**   **Section B.3   RVP8 Only**

Because of the similarity of the packaging for the RVP8 and RCP8, both units are described here.

The main chassis and connector panel are located in a rack within 100m of the IFD. Typically the main chassis interfaces to a host computer via 100 BaseT Ethernet. For the RVP8, the IFD receiver module resides in the radar cabinet.

This section describes the general features of the packaging and the electrical specifications and cabling of these units. Please read *CAREFULLY* the following warnings before you apply power to your system.

⚠   **WARNING: The Main Chassis power supply modules are NOT auto ranging. These must be set by a switch on each module for either 115/230 VAC 60/50 Hz. Verify these before applying power to the system. See Section B.1.3.**

⚠   **WARNING: Turn off power to the main chassis before installing or removing any PCI boards. For safety, the line cord should be disconnected before opening either the IFD module or main chassis.**

Ⓘ   **Important: The circuit boards contain many static sensitive components. Do not handle the boards or open the IFD module unless a properly grounded wrist strap is worn.**

B.1 Main Chassis General Description

SIGMET's standard main chassis is a 4U rackmount/table top enclosure (43.2 wide x 43.2 long x 17.8 cm high) or (17 wide x 17 long x 7.00 inch high) which fits a standard 19-inch EIA rack. The system comes standard with hot–swap redundant power supplies. The chassis may be equipped with either a mother board or a single-board computer depending on how the unit was purchased. The chassis is shown in the following figures.

- Front View   **Figure B–1**

- Rear View   **Figure B–2**

- Side view   **Figure B–3**

- Internal Wiring   **Figure B–4**

The front of the unit has a plasma matrix display that is used for status information. There is also a CDRW drive (for software installation and backup) and in most cases, a floppy drive as well (for configuration backup).

Two fans are mounted behind the door on the front of the enclosure. These draw ambient air in to the unit. The air flows through the unit and exits the rear. Do not block the slots or the exhaust grills on the fans. Check airflow now and then, and also check the board and fan screen for dust accumulation. If necessary, excessive dust accumulations on the board can be cleaned at a properly equipped static-free workstation with "canned air" or Chemtronics TF-Plus solvent, which can be purchased through electronics distributors.

The boards should be left in the chassis whenever the unit is shipped. This minimizes handling and static risk. Save the original packing provided for shipment.

Important: Prior to shipment, contact support@sigmet.com to obtain a returned materials authorization (RMA) and to coordinate the shipping.

A table top unit can be converted for rack mount by simply installing rack mount ears. The rack ears are installed with #8-32 flat head screws. It is strongly recommended that the rack mount slide brackets supplied with the unit should be installed in the rack for additional structural support.

The internal cabling diagram in **Figure B–4** shows how the various disk drives, power supplies, etc. are connected within the standard Main Chassis. A mother board example is shown. Use this as a guide if you have to replace internal components.

The remainder of this section describes the front and rear panel of the Main Chassis.

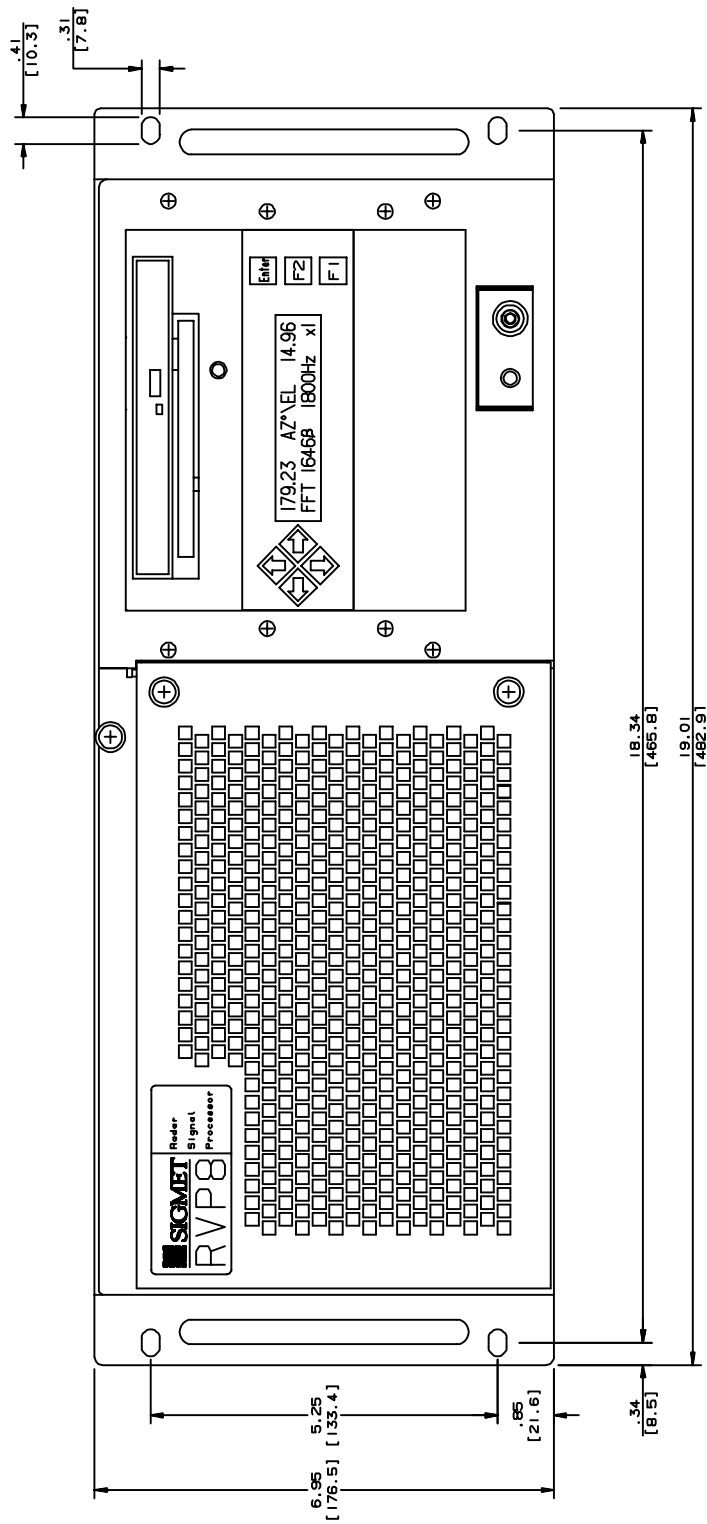## Figure B–1: Main Chassis- Front Panel
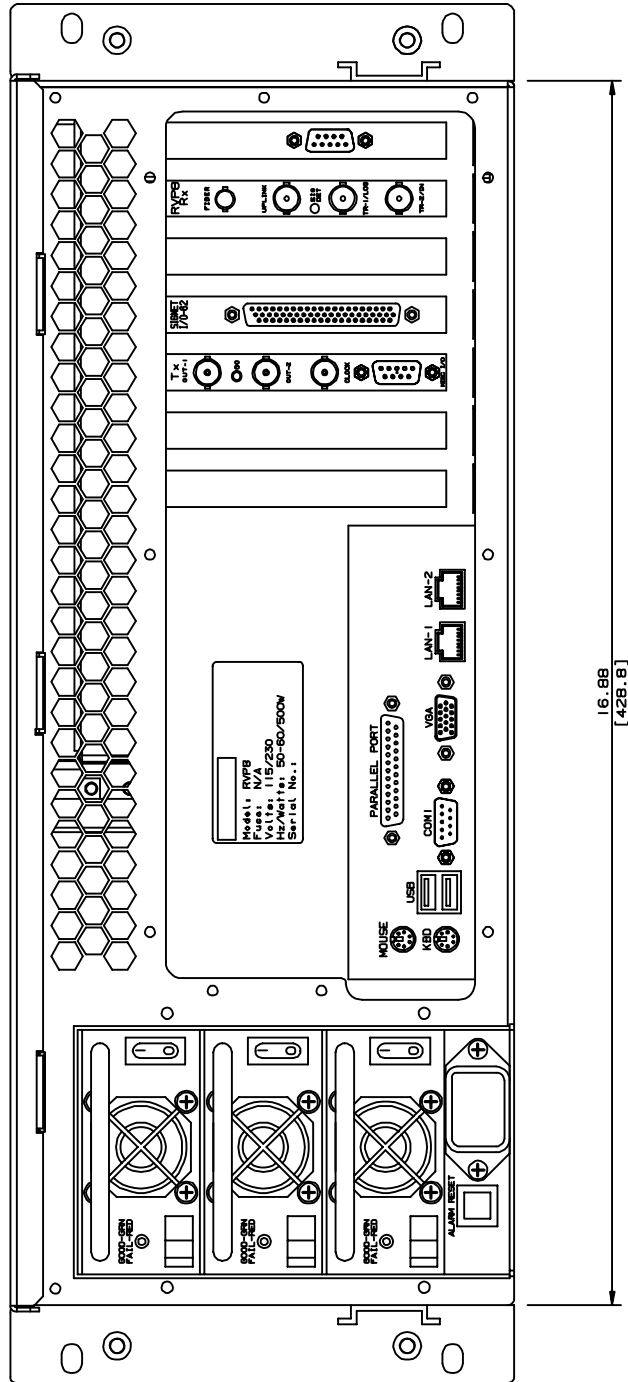
Figure B–2: Main Chassis- Back Panel

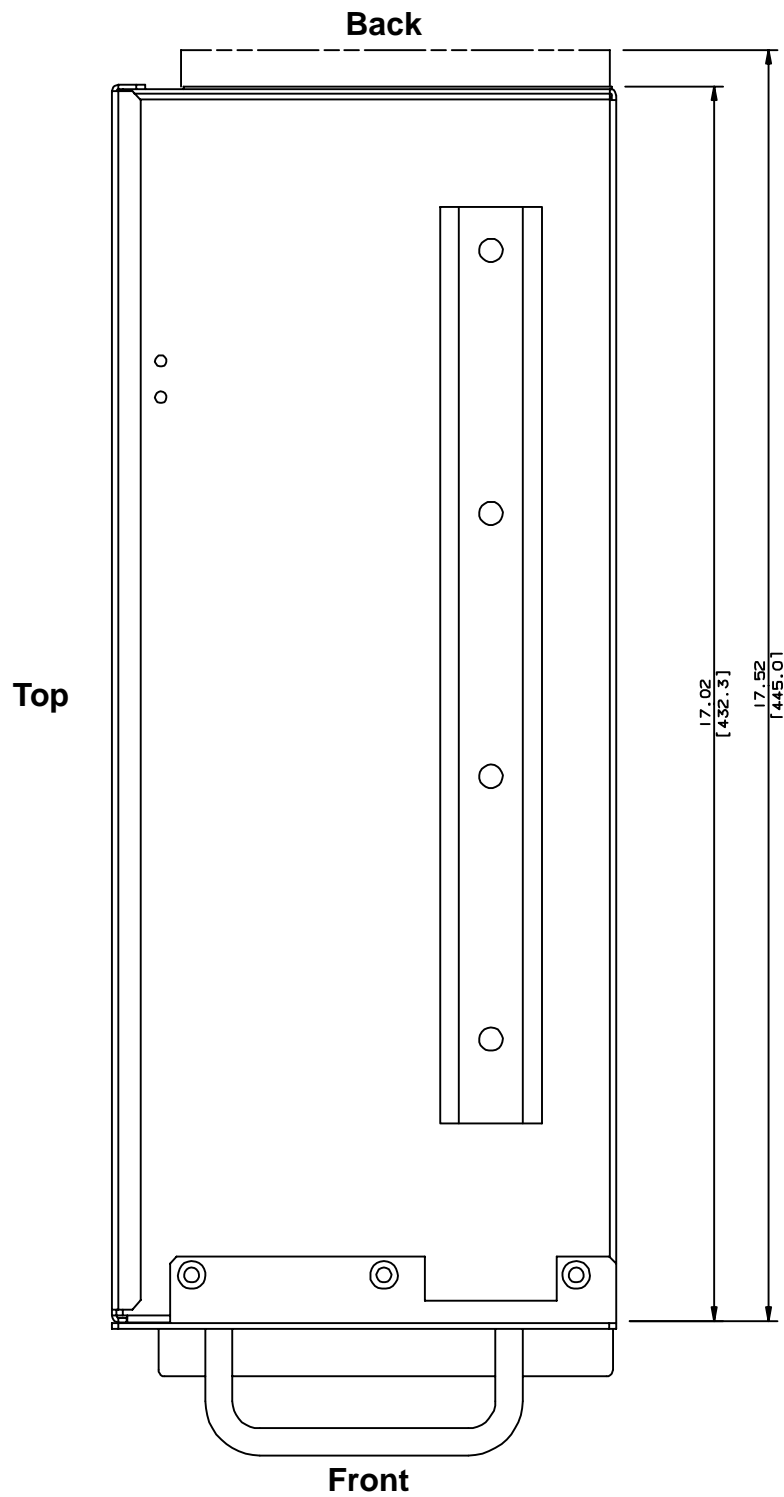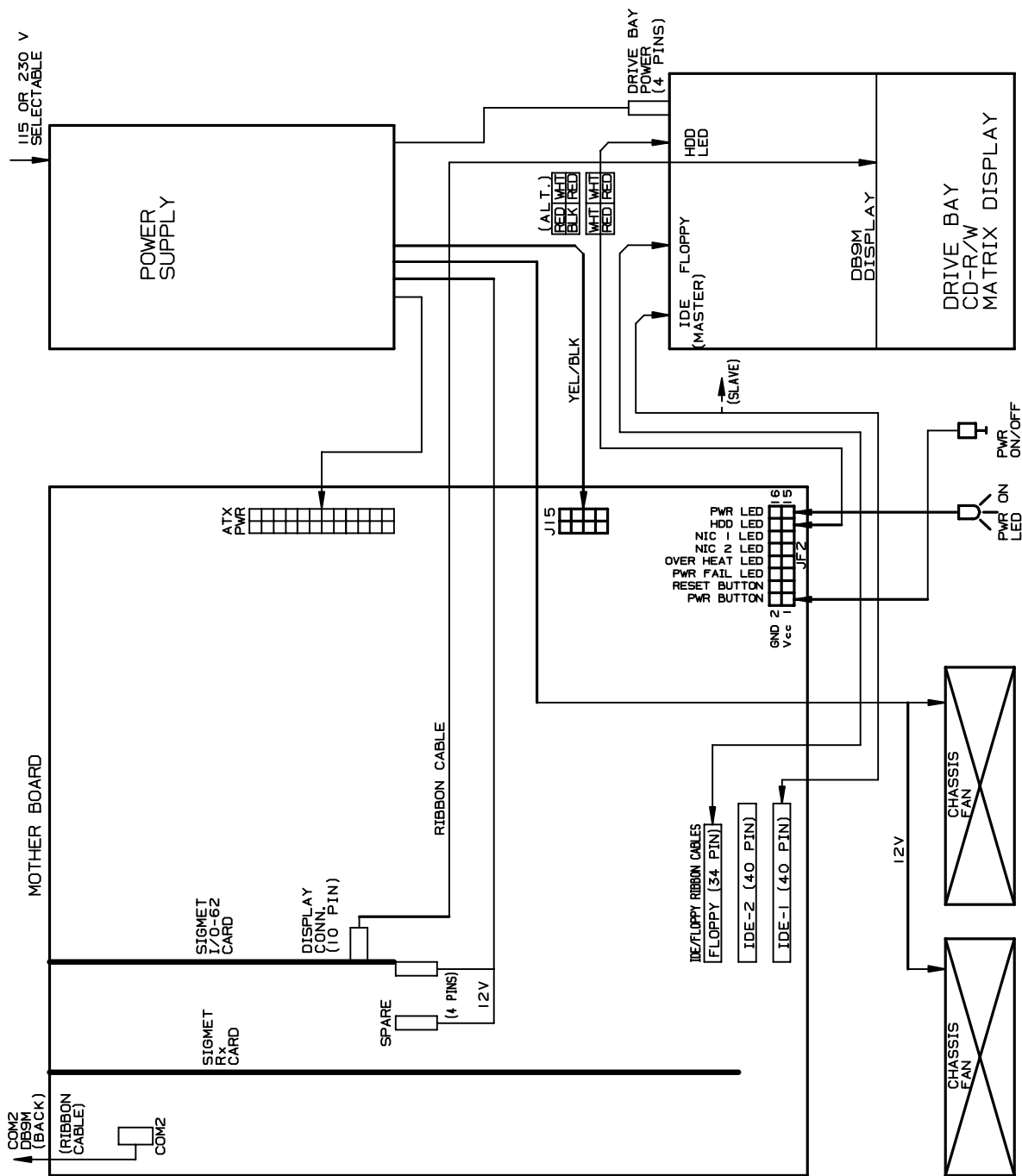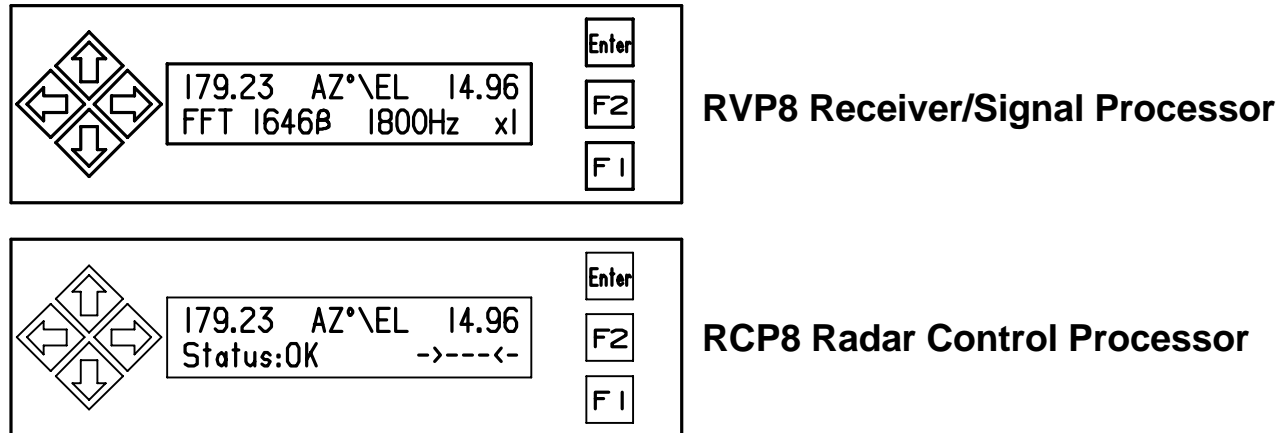**Figure B–3: Main Chassis- Right Side View**

Figure B–4: Main Chassis Internal Cabling

B.1.1 Main Chassis Front Panel

The front panel is shown in **Figure B–1**. The front panel matrix plasma display is typically connected internally by a ribbon cable to either an I/O-62 card or an RVP8/Rx card. The display is used to show status and power-up test results. Power–up features are described in detail in **Section 2.3.5**. The function keys beside the display are not currently used.

179.23 AZ°\EL 14.96 FFT 1646β 1800Hz x1 Enter F2 F1	**RVP8 Receiver/Signal Processor**
179.23 AZ°\EL 14.96 Status:OK ->---<- Enter F2 F1	**RCP8 Radar Control Processor**

In addition, the CDRW and the floppy drive are located on the front panel. The various activity lights are for the CDRW (yellow), floppy drive (small green) and the hard disk drive (large red). The cabling diagram shows how to connect the activity lights. At the lower right of the unit is a power on/off switch and a green LED to indicate that power is on.

B.1.2 Main Chassis Back Panel

Figure B–2 shows an example of the main chassis back panel for the case of a motherboard system. There are three main sections to the Main Chassis back panel:

- **Power section**- on the left (looking from the rear) with the power entry module, alarm reset and three redundant hot-swap power supplies.

- **PC I/O section**- in the lower center with connectors for keyboard, mouse, monitor, network, etc. This is for a mother board example.

- **PCI card section**- on the right (looking from the rear) with standard PCI slots for the RVP8/RCP8 circuit cards as well as other standard commercial PCI cards that may be used (e.g., a four port serial card).

Note that depending on whether your system is using a mother board or single-board computer (SBC), the appearance of these sections may be different, but the functions are the same. These sections are described in detail in the sections below.

B.1.3 Main Chassis Back Panel Power Section

⚠ **WARNING: The Main Chassis power supply modules are NOT auto ranging. These must be set by a switch on each module for either 115/230 VAC 60/50 Hz. Verify these per the procedure below, before applying power to the system.**

The Main Chassis back panel is equipped with a modular AC power entry device. There are three hot-swap redundant power supply modules in the system. The procedure for setting/verifying the voltage on each one is as follows:

- The unit should be powered-off. This can be assured by simply not connecting the power input cord.

- Remove the top power supply module by shifting the black release button to the right.

- Use the handle to pull the module out.

- Check the red power selector switch on the right side (rear) of the module and set it as appropriate to your line voltage (115/230).

- Re–insert the module and push the chrome handle down. This switches the module in the on "1" position.

- Repeat this procedure for the middle and lower modules (the order is not critical)).

When the system is switched–on, the LED on each module shows green to indicate that it is functioning properly. A red light indicates a failure. There is an audio "buzzer" alarm in the event that a power module is turned-off, removed or fails.

ⓘ **Note: The red button next to the power entry module will reset the "buzzer" alarm.**

The system will function if there is failure of any one power module, but is not rated to function with only one module, i.e., if two modules fail. Each power module is equipped with internal protection for over-temperature and over-current. In the event that the protection is triggered, the module LED will show red. It can be reset by removing the module for a minute and then inserting the module back into the system. It is best to do this with power–off to the module.

ⓘ **Note: If a power module is switched on, but the LED indicator is red, then it is not functioning. The reset procedure is to turn the power off on the failed module, remove it for one minute and then re-insert it and power it back on.**

B.1.4 Main Chassis Back Panel PC I/O Section

P4DP8-G2/P4DPE-G2/P4DPi-G2/P4DP6
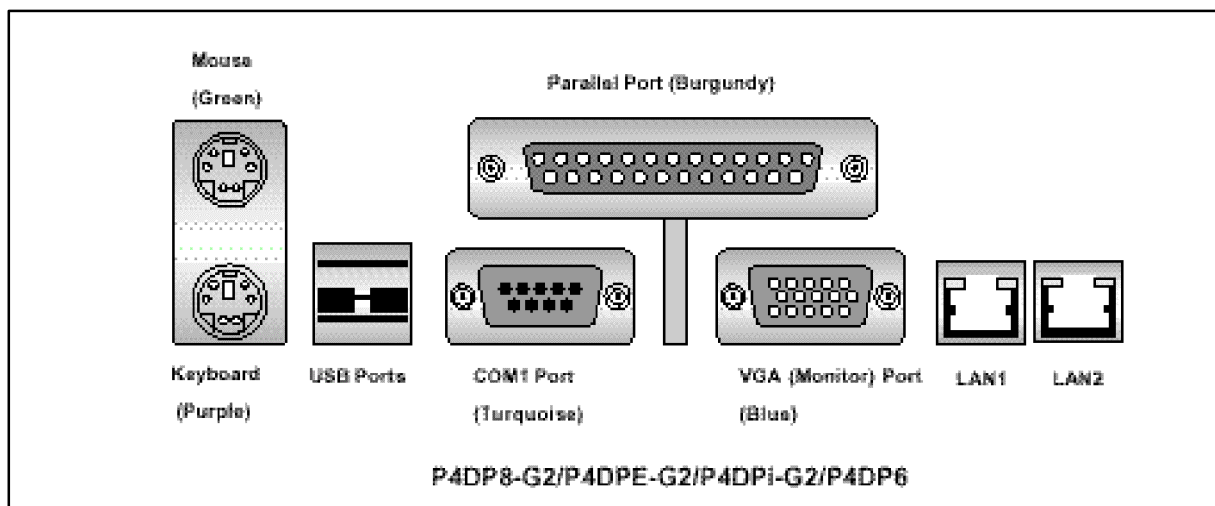
The PC I/O section shown above is where you make all of your standard PC connections. Note pins (male) are indicated by filled black circles while sockets (female) are indicated by open circles.

A standard keyboard and mouse are provided with the unit. VGA monitor is supplied by the customer or ordered as an option from SIGMET.

Note that LAN 1 and LAN 2 are standard RJ45 connectors. For the –G2 style mother boards the LAN port speed is 100/1000 BaseT. For the –Q they are 10/100 BaseT.

The keyboard and mouse are standard PS/2. You can use an adapter to plug a USB mouse into the circular mouse connector.

COM1 is the DBM9 connector. COM2 is typically installed as a separate DBM9 connector in the PCI section.

B.1.5 Main Chassis Back Panel PCI Card Section
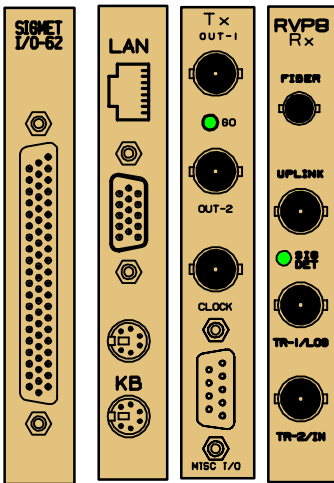
The PCI cards are installed vertically on the right of the chassis (looking from the back). Since there are many different RVP8/RCP8 configuration options that can be ordered, there is quite a bit of variability in what PCI cards are installed. For the RCP8, however, there is typically only an I/O-62 PCI Card.

Note that COM2 is typically installed as a connector in the PCI section.

PCI Card	Used on	Vendor	Functions
I/O –62	RVP8 RCP8	SIGMET	I/O to radar system control and monitoring
RVP8/Rx	RVP8 only	SIGMET	Uplink/Downlink IFD connections. Two triggers.
RVP8/Tx	RVP8 only	SIGMET	Two waveform outputs, clock output/input, 4 RS422 lines
HPIB	RVP8 RCP8	Market	HPIB control for signal generator or other test equipment
COM2	RVP8 RCP8	Market	RS232C used for COM2.

Please see **Section 2.3.3** of the *RVP8 User's Manual* for a description of the connectors on the RVP8 PCI cards. The I/O-62 is used on both the RVP8 and RCP8. It is described in the next sections, along with the standard connector panels for the RVP8 and RCP8.

B.2 I/O-62 and Connector Panel

Figures B–5 and **B–6** show the I/0-62 Connector Panel for the RVP8 and RCP8. This is typically mounted on the same rack as the Main Chassis. A 1:1 62–position cable (standard 1.8 m/6 foot) connects the connector panel to the I/O-62. As shown in the figures, the cable can be connected to either the front or the back of the panel so that the cable run can be optimized. In most cases, it is recommended to connect the cable to the back of the panel to minimize the risk of physical damage to the cable.

The panel is electrically the same for both the RVP8 and RCP8.Indeed the circuit board is identical. However, the panel labelling and the softplane configurations are different.

The pin assignments to the various connectors are described in **Tables B–1** to **B–14** located at the end of this section. The tables show the basic electrical properties of each pin and the default signal assignment (if any) that is made in the factory softplane.conf file. The softplane approach provides a great deal of flexibility in assigning the I/O to the panel.

The I/O–62 PCI card provides forty multi–protocol digital interface lines at its 62–pin faceplate connector. These lines are grouped into five independent and identical blocks, each of which contains eight lines. Moreover, each of these blocks of eight lines can be further divided into four line pairs.

Each block of I/O lines can operate in one of the following modes:

- As eight TTL/CMOS single–ended outputs

- As eight TTL/CMOS single–ended inputs

- As N RS–422 differential transmitters or receivers, and (8–2N) TTL/CMOS single–ended inputs.

The assignment of electrical levels and signal directions are all made in the 'softplane.conf' file. Users do not have to worry about how to configure each block of lines because inconsistent signal assignments will be checked and reported when the file is loaded.

All forty I/O–62 digital lines are individually protected against both overvoltage and electrostatic discharge (ESD). You may safely apply voltages between –27V and +27V to any line regardless of whether it is configured for an input or output. Likewise, external ESD pulses of 15KV (Human body model) will be safely shunted to ground at the 62–pin connector point of entry.

This wide voltage tolerance effectively makes the TTL/CMOS inputs function as wide range comparators with a 2.5V logic threshold. These inputs could be connected directly to a 24V panel bulb, for example, in order to monitor its On/Off status. Note that the line protection circuitry has a side effect of raising the output impedance of the TTL/CMOS drivers to approximately 120–Ohms. This should not cause any trouble unless the signal is heavily terminated at the receiving end. The RS–422 drivers are not affected by the line protection, and have the standard very low output impedance.

The I/O–62 provides a variety of terminations for its digital I/O lines. The TTL/CMOS signals can optionally be pulled either to GND or to +5V through a 2.2K–Ohm resistor. Similarly, the RS–422 linepairs can optionally be terminated with a 100–Ohm resistor across each pair.

There are a few additional constraints that should be kept in mind when assigning electrical signals to a block of eight I/O–62 lines. These are:

- When TTL/CMOS pull-up/pull-down resistors are enabled, they are applied to the entire group of eight lines. This is somewhat inconsistent with using some of those same lines as RS–422.

- Similarly, when RS–422 terminators are enabled, they are applied to all four line pairs. This is completely inconsistent with using some of those same lines as TTL/CMOS.

Thus, if line termination is required, it is usually necessary to split the TTL/CMOS and RS–422 functions so that both do not appear within the same block of eight lines.
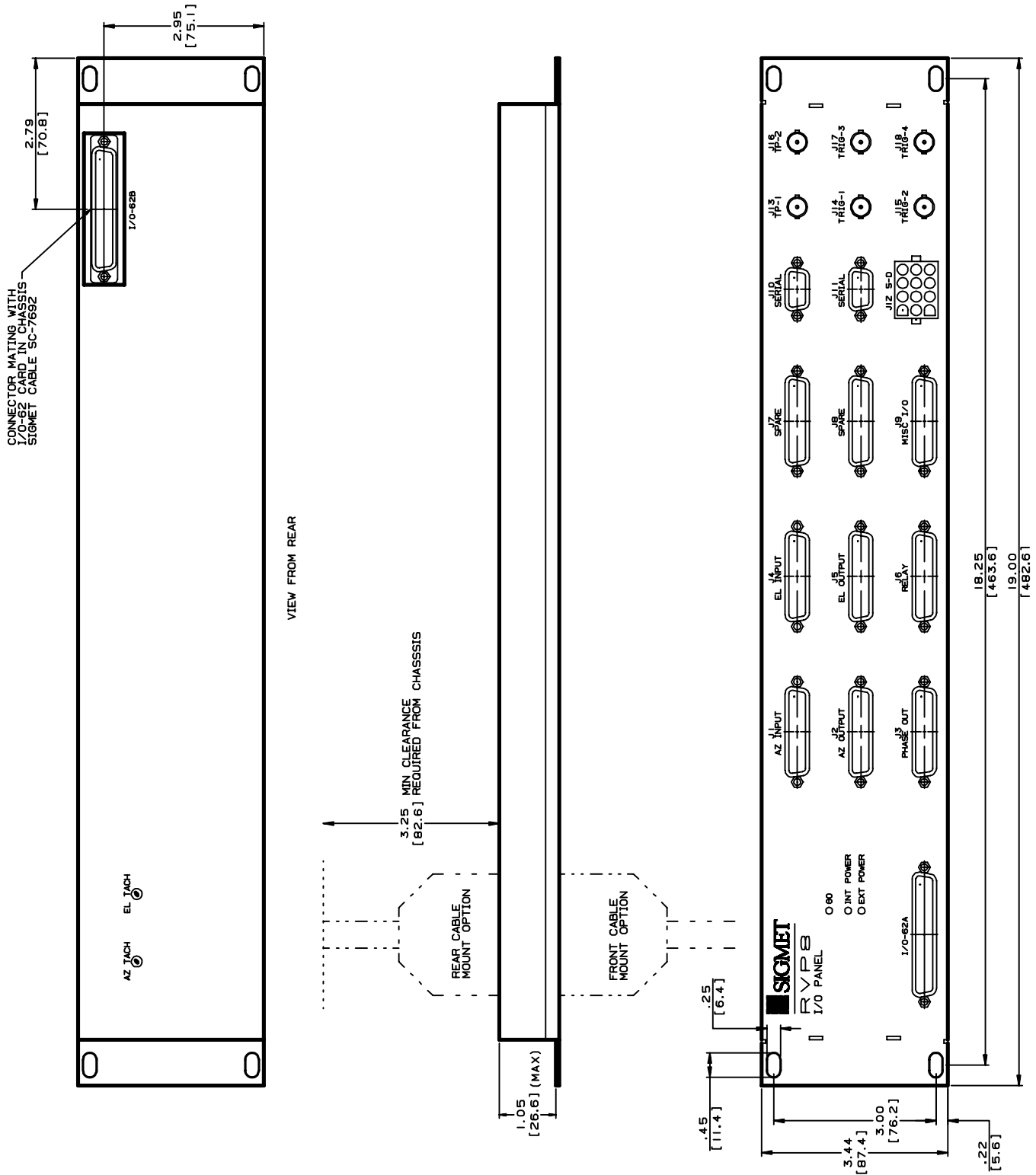
Figure B–5: RVP8 I/O-62 Connector Panel

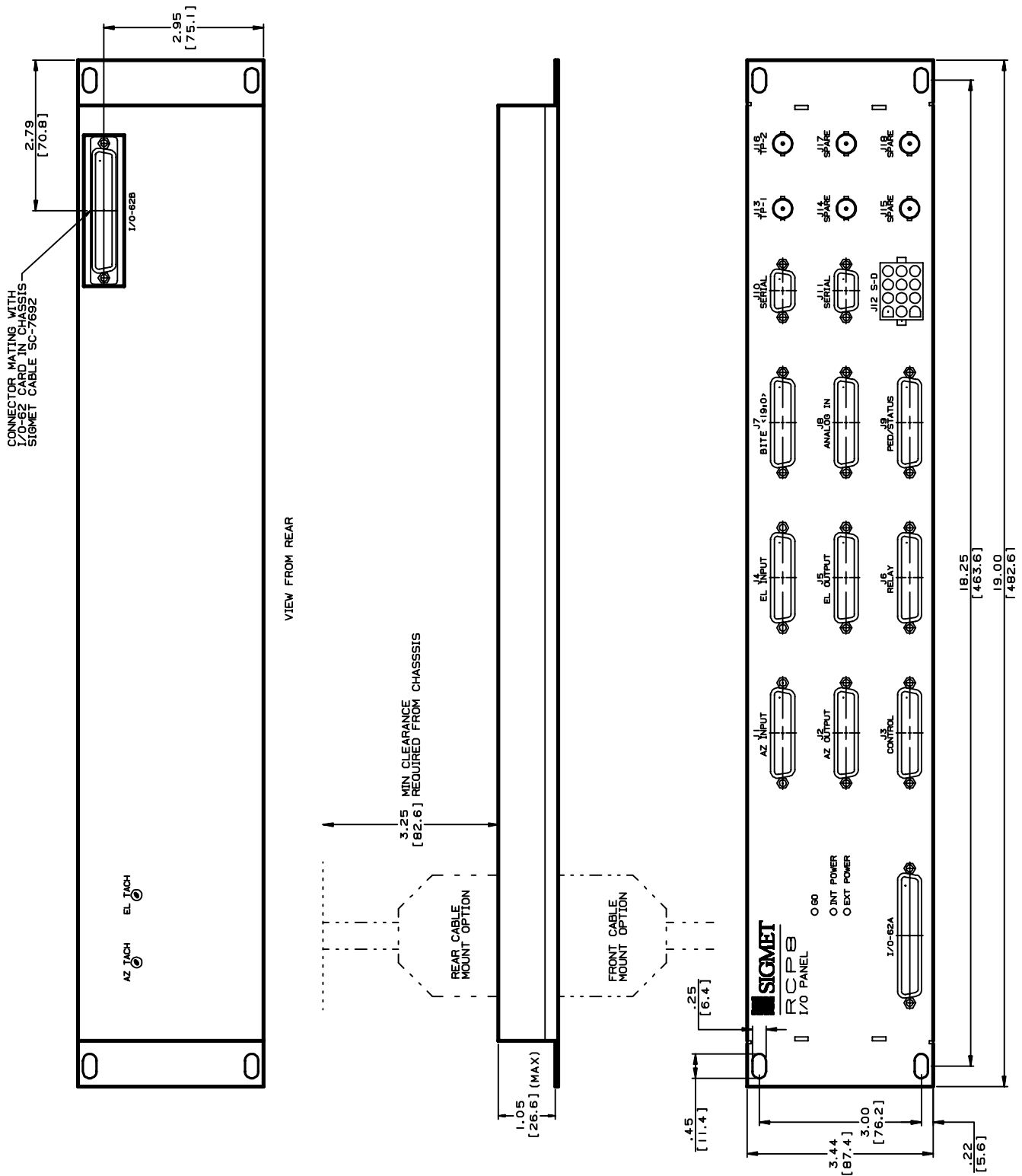**Figure B–6: RCP8 I/O-62 Connector Panel**

Table B–1: J1 "AZ INPUT"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	TTL	sPedAZ[0]	sPedAZ[0]
2	TTL	sPedAZ[1]	sPedAZ[1]
3	TTL	sPedAZ[2]	sPedAZ[2]
4	TTL	sPedAZ[3]	sPedAZ[3]
5	TTL	sPedAZ[4]	sPedAZ[4]
6	TTL	sPedAZ[5]	sPedAZ[5]
7	TTL	sPedAZ[6]	sPedAZ[6]
8	TTL	sPedAZ[7]	sPedAZ[7]
9	TTL	sPedAZ[8]	sPedAZ[8]
10	TTL	sPedAZ[9]	sPedAZ[9]
11	TTL	sPedAZ[10]	sPedAZ[10]
12	TTL	sPedAZ[11]	sPedAZ[11]
13	TTL	sPedAZ[12]	sPedAZ[12]
14	TTL	sPedAZ[13]	sPedAZ[13]
15	TTL	sPedAZ[14]	sPedAZ[14]
16	TTL	sPedAZ[15]	sPedAZ[15]
17	TTL		
18	TTL		
19	TTL		
20	TTL		
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

Table B–2: J2 "AZ OUTPUT"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	TTL	cPedAZ[0]	cPedAZ[0]
2	TTL	cPedAZ[1]	cPedAZ[1]
3	TTL	cPedAZ[2]	cPedAZ[2]
4	TTL	cPedAZ[3]	cPedAZ[3]
5	TTL	cPedAZ[4]	cPedAZ[4]
6	TTL	cPedAZ[5]	cPedAZ[5]
7	TTL	cPedAZ[6]	cPedAZ[6]
8	TTL	cPedAZ[7]	cPedAZ[7]
9	TTL	cPedAZ[8]	cPedAZ[8]
10	TTL	cPedAZ[9]	cPedAZ[9]
11	TTL	cPedAZ[10]	cPedAZ[10]
12	TTL	cPedAZ[11]	cPedAZ[11]
13	TTL	cPedAZ[12]	cPedAZ[12]
14	TTL	cPedAZ[13]	cPedAZ[13]
15	TTL	cPedAZ[14]	cPedAZ[14]
16	TTL	cPedAZ[15]	cPedAZ[15]
17	TTL		
18	TTL		
19	TTL		
20	TTL		
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

Table B–3: J3 RVP8: "PHASE OUT"; RCP8 "CONTROL"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1			
2	Configurable		
3	I/O–62		
4	Digital		
5	Lines		
6			
7			
8			
9	RS422+	RS422+[0]	
10	RS422+	RS422+[1]	
11	GND		
12	GND		
13	GND		
14			
15	Configurable		
16	I/O–62		
17	Digital		
18	Lines		
19			
20			
21			
22	RS422–	RS422–[0]	
23	RS422–	RS422–[1]	
24	GND		
25	GND		

Table B–4: J4 "EL INPUT"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	TTL	sPedEL[0]	sPedEL[0]
2	TTL	sPedEL[1]	sPedEL[1]
3	TTL	sPedEL[2]	sPedEL[2]
4	TTL	sPedEL[3]	sPedEL[3]
5	TTL	sPedEL[4]	sPedEL[4]
6	TTL	sPedEL[5]	sPedEL[5]
7	TTL	sPedEL[6]	sPedEL[6]
8	TTL	sPedEL[7]	sPedEL[7]
9	TTL	sPedEL[8]	sPedEL[8]
10	TTL	sPedEL[9]	sPedEL[9]
11	TTL	sPedEL[10]	sPedEL[10]
12	TTL	sPedEL[11]	sPedEL[11]
13	TTL	sPedEL[12]	sPedEL[12]
14	TTL	sPedEL[13]	sPedEL[13]
15	TTL	sPedEL[14]	sPedEL[14]
16	TTL	sPedEL[15]	sPedEL[15]
17	TTL		
18	TTL		
19	TTL		
20	TTL		
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

Table B–5: J5 "EL OUTPUT"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	TTL	cPedEL[0]	cPedEL[0]
2	TTL	cPedEL[1]	cPedEL[1]
3	TTL	cPedEL[2]	cPedEL[2]
4	TTL	cPedEL[3]	cPedEL[3]
5	TTL	cPedEL[4]	cPedEL[4]
6	TTL	cPedEL[5]	cPedEL[5]
7	TTL	cPedEL[6]	cPedEL[6]
8	TTL	cPedEL[7]	cPedEL[7]
9	TTL	cPedEL[8]	cPedEL[8]
10	TTL	cPedEL[9]	cPedEL[9]
11	TTL	cPedEL[10]	cPedEL[10]
12	TTL	cPedEL[11]	cPedEL[11]
13	TTL	cPedEL[12]	cPedEL[12]
14	TTL	cPedEL[13]	cPedEL[13]
15	TTL	cPedEL[14]	cPedEL[14]
16	TTL	cPedEL[15]	cPedEL[15]
17	TTL		
18	TTL		
19	TTL		
20	TTL		
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

Table B–6: J6 "RELAY"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	Relay K1: CT	Internal Relay Center Contact	
2	Relay K1: NO	Internal Relay Normally Open	cPWidth[0]
3	Relay K1: NC	Internal Relay Normally Closed	
4	Relay K2: CT	Internal Relay Center Contact	
5	Relay K2: NO	Internal Relay Normally Open	cPWidth[1]
6	Relay K2: NC	Internal Relay Normally Closed	
7	Relay K3: CT	Internal Relay Center Contact	
8	Relay K3: NO	Internal Relay Normally Open	
9	Relay K3: NC	Internal Relay Normally Closed	
10	——		
11	GND		
12	GND		
13	GND		
14	+12VDC	External	
15	+12VDC	Relay	
16	+12VDC	Control	
17	+12VDC	Power	
18	+12V Unreg		
19	Return14	External	
20	+12V Return15	Relay	
21	+12V Return16	Control	
22	+12V Return17	Returns	
23	——		
24	GND		
25	GND		

⚠ **WARNING: To avoid possible damage to the connector panel, all external relays must be equipped with diode protection against the back EMF generated when the external relay coil is opened. Relays can be purchased with a diode installed or a diode can be added to the relay across the coil supply and return.**

Notes: Internal relays K1, K2, K3 on the connector panel are dry contacts:

CT   Center contact
NO   Normally open contact
NC   Normally closed contact

Table B–7: J7: RVP8 "SPARE"; RCP8 "BITE 19:0"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1	TTL		sAux[0]
2	TTL		sAux[1]
3	TTL		sAux[2]
4	TTL		sAux[3]
5	TTL		sAux[4]
6	TTL		sAux[5]
7	TTL		sAux[6]
8	TTL		sAux[7]
9	TTL		sAux[8]
10	TTL		sAux[9]
11	TTL		sAux[10]
12	TTL		sAux[11]
13	TTL		sAux[12]
14	TTL		sAux[13]
15	TTL		sAux[14]
16	TTL		sAux[15]
17	TTL		sAux[16]
18	TTL		sAux[17]
19	TTL		sAux[18]
20	TTL		sAux[19]
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

Table B–8: J8: RVP8 "SPARE"; RCP8 "ANALOG IN"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1		Amux0+	Amux0+
2	±20VDC	Amux1+	Amux1+
3	Differential	Amux2+	Amux2+
4	Analog	Amux3+	Amux3+
5	Inputs	Amux4+	Amux4+
6		Amux5+	Amux5+
7	Positive	Amux6+	Amux6+
8	Side	Amux7+	Amux7+
9		Amux8+	Amux8+
10		Amux9+	Amux9+
11	GND		
12	GND		
13	GND		
14		Amux0–	Amux0–
15	±20VDC	Amux1–	Amux1–
16	Differential	Amux2–	Amux2–
17	Analog	Amux3–	Amux3–
18	Inputs	Amux4–	Amux4–
19		Amux5–	Amux5–
20	Negative	Amux6–	Amux6–
21	Side	Amux7–	Amux7–
22		Amux8–	Amux8–
23		Amux9–	Amux9–
24	GND		
25	GND		

Table B–9: J9 RVP8: "MISC I/O" ; RCP8: "PED/STATUS"

Pin	Electrical Specification	RVP8 Signal Name	RCP8 Signal Name
1			
2	Configurable		
3	I/O–62		
4	Digital		
5	Lines		
6			
7			
8	±6 to ±70 VDC Input		AzTach+
9	±6 to ±70 VDC Input		ElTach+
10	±10 VDC Output		AzDrive
11	GND		
12	GND		
13	GND		
14			
15	Configurable		
16	I/O–62		
17	Digital		
18	Lines		
19			
20			
21	±6 to ±70 VDC Input		AzTach–
22	±6 to ±70 VDC Input		ElTach–
23	±10 VDC Output		ElDrive
24	GND		
25	GND		

Note: Antenna pedestal tachometer inputs are adjusted by a potentiometer on the back of the Connector Panel.

Table B–10: J10 "SERIAL"

Pin	Electrical Specification	Comment
1	GND	
2	RS232C Rx	
3	RS232C Tx	
4	——	
5	GND	
6	——	
7	——	
8	——	
9	——	

Table B–11: J11 "SERIAL"

Pin	Electrical Specification	Comment
1	GND	
2	RS232C Rx	Channel 0
3	RS232C Tx	Channel 0
4	RS232C Rx	Channel 1
5	GND	
6	RS232C Tx	Channel 1
7	–12VDC @ 50mA max regulated	Regulated power supply
8	+12VDC @ 50mA max	Regulated power supply
9	+5VDC @ 50mA max	Regulated power supply

Table B–12: J12 "S–D"

Pin	Electrical Specification	RVP8 Signal Name	RVP8 Signal Name
1		RefEL+	RefEL+
2	Nominal 90V 60Hz	RefEL–	RefEL–
3	Synchro Signals	SyEL1	SyEL1
4		SyEL2	SyEL2
5		SyEL3	SyEL3
6	GND		
7		RefAZ+	RefAZ+
8	Nominal 90V 60Hz	RefAZ–	RefAZ–
9	Synchro Signals	SyAZ1	SyAZ1
10		SyAZ2	SyAZ2
11		SyAZ3	SyAZ3
12	GND		

Table B–13: RVP8 BNC Connector Pin Assignments

Ref Designator	Label	Electrical Specification	Signal Name
J13	TP1	5V 75Ohm	
J14	TRIG–1	12V 75Ohm	Trigger[1]
J15	TRIG–2	12V 75Ohm	Trigger[2]
J16	TP2	5V 75Ohm	
J17	TRIG–3	12V 75Ohm	Trigger[3]
J18	TRIG–4	12V 75Ohm	Trigger[4]

Table B–14: RCP8 BNC Connector Pin Assignments

Ref Designator	Label	Electrical Specification	Signal
J13	TP1	5V 75Ohm	
J14	SPARE		
J15	SPARE		
J16	TP2	5V 75Ohm	
J17	SPARE		
J18	SPARE		

B.3 IFD Module (RVP8 Only)

The IFD module is a small metal box which can be mounted inside the receiver cabinet. The IFD is shown in Figures B–7 and B–8. Cooling of the inside components is accomplished by direct conduction to the case. It is desirable to place the module in an environment that allows external convective cooling.

The IFD is equipped with its own auto ranging power supply (110 to 240 VAC 50/60 Hz) which is mounted on the side of the IFD. On the other side of the IFD are two anti-aliasing filters. These analog filters must be specified for the radar IF frequency. The filters have an 8 MHz bandwidth centered about the IF frequency.

Figure B–7: RVP8/IFD Module
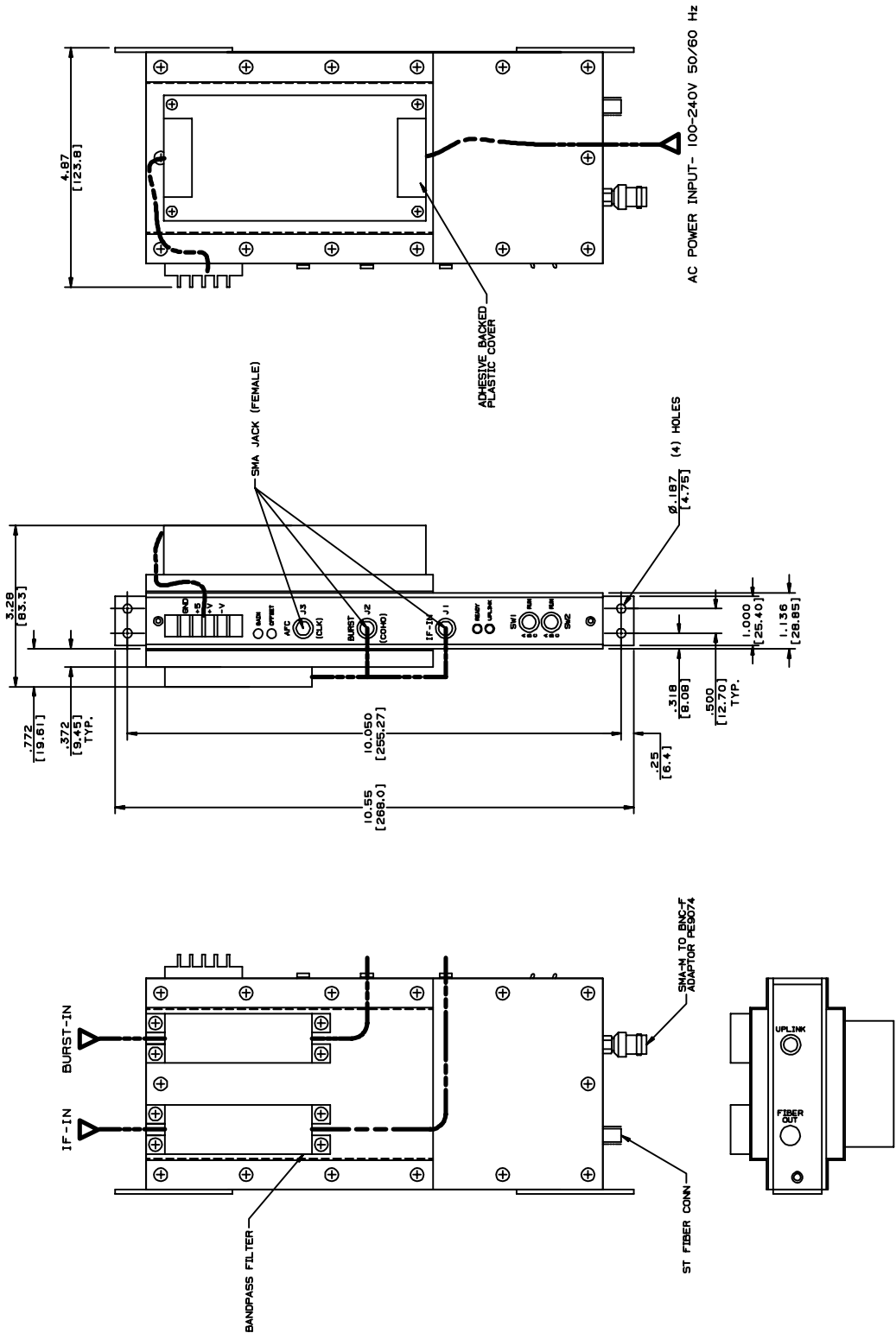
Figure B–8: IFD Front Panel
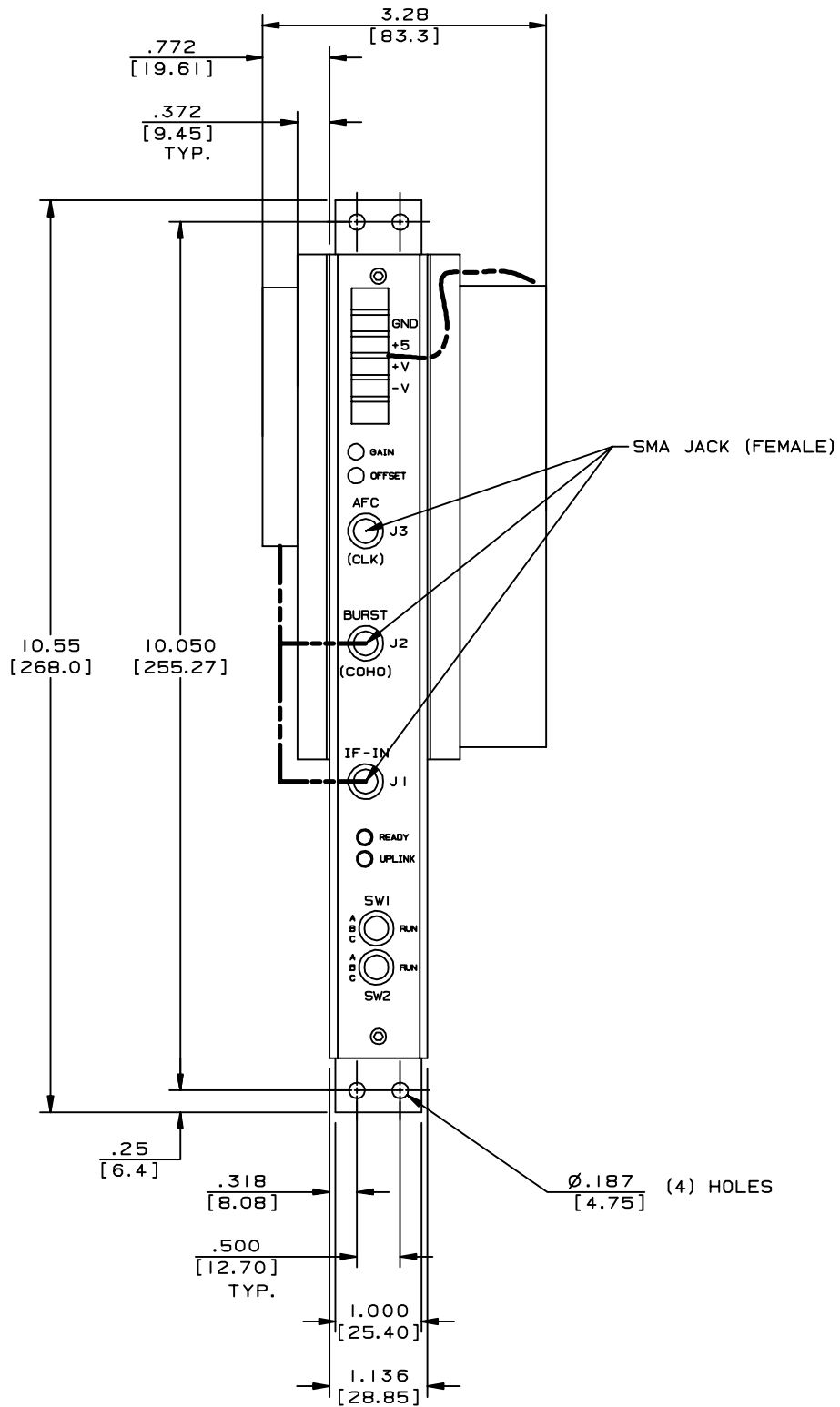
B.4 DAFC Module (RVP8 only)

The Digital AFC (DAFC) module is used on RVP8 for magnetron systems to interface to a digitally controlled STALO. The DAFC "T's" off the coax uplink cable. Power can be provided by running discrete wires from the IFD. Note that +5 VDC is all that is required to run the DAFC. If you want to supply the STALO power over the ribbon cable to the IFD, you can connect the +24 VDC input to an appropriate power supply. Otherwise, you can power the STALO directly.

The DAFC outputs up to 24 TTL lines to the STALO digital control/interface. Since these are TTL, the DAFC should be mounted within 10 to 30cm of the STALO if possible. For details on the DAFC, including pin assignment examples for some commercial STALO's, please refer to **Section 2.4**.

Figure B–9: View of DAFC Module
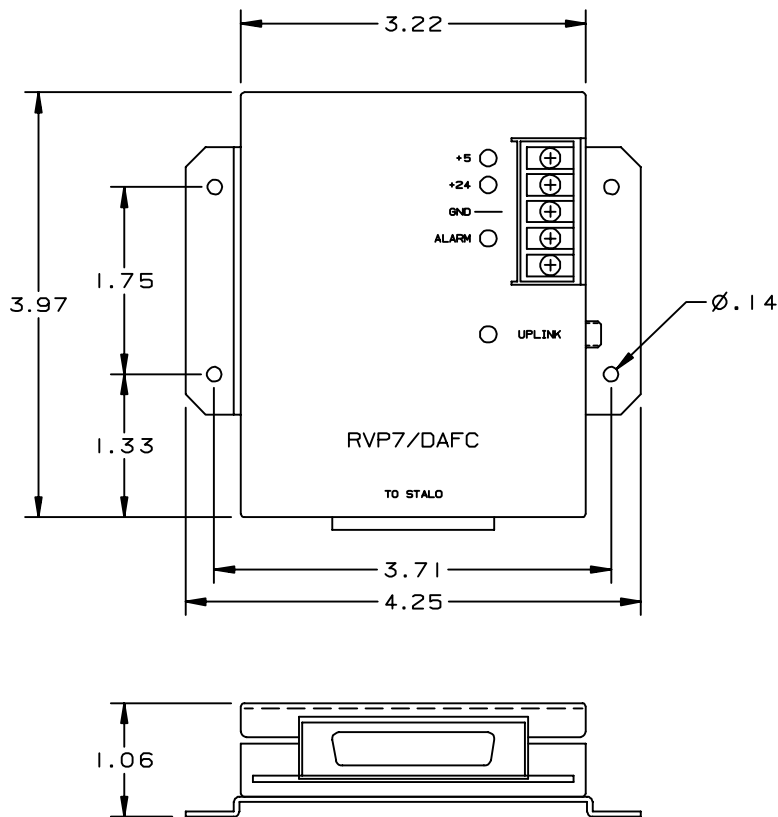
C. Clutter Filter Characteristics (DRAFT)

This draft appendix is based on the legacy RVP7 algorithms. The RVP8 will have some additional features and may not contain some of the legacy features.

The RVP8 is shipped with a preprogrammed set of digital IIR (Infinite Impulse Response) high-pass clutter filters. There are eight filters available. The filters are fourth-order Chebyshev, and provide 40dB and 50dB stop band attenuation in seven different widths ranging from approximately 2% to 14% of the Nyquist interval. Filter #0 is an all-pass filter, so that clutter rejection can effectively be switched off.

The correct choice of filter for observing different weather conditions must be determined by experiment. The filter with the highest rejection is not always the best choice, since the group delay of signals in the transition band is greater for deeper filters. This effect introduces dispersion in the Velocity/Time profile of the incoming signal. In general, try to use the shallowest filter with the shortest impulse response that will do the job for the types of weather and clutter that are typical at the radar site.

The processing algorithm for the IIR clutter filter is described in Chapter 5, as follows:

$$A'_n = B_0 A_n + B_1 A_{n-1} + B_2 A_{n-2} + B_3 A_{n-3} + B_4 A_{n-4}$$
$$- C_1 A'_{n-1} - C_2 A'_{n-2} - C_3 A'_{n-3} - C_4 A'_{n-4}$$

In this algorithm, the input time series A_n is processed to form a filtered output time series A'_n, and the B's and C's are filter coefficients. This appendix shows the magnitude response plots for the set of filters supplied with the RVP8. The Doppler 40dB and 50dB clutter filter coefficients are given in Tables C–1 and C–2.

Table C–1: Doppler 40dB Clutter Filter Coefficients

B_4	$-C_4$	B_3	$-C_3$	B_2	$-C_2$	B_1	$-C_1$	B_0
0.88524580	-0.78366012	-3.53845834	3.32323517	5.30642599	-5.29330203	-3.53845834	3.75363693	0.88524580
0.80657571	-0.65056438	-3.21913964	2.87521021	4.82513582	-4.78811692	-3.21913964	3.56267500	0.80657571
0.71441318	-0.51038627	-2.84208420	2.37084266	4.25538455	-4.17592962	-2.84208420	3.31122076	0.71441318
0.62870255	-0.39526762	-2.48861663	1.92570662	3.71996530	-3.58889047	-2.48861663	3.04473893	0.62870255
0.54606519	-0.29819195	-2.14537980	1.52275259	3.19897838	-3.01019977	-2.14537980	2.75072405	0.54606519
0.45879351	-0.21051814	-1.78052007	1.13050566	2.64427921	-2.39223952	-1.78052007	2.38964305	0.45879351
0.37359302	-0.13969494	-1.42239330	0.78656442	2.09937656	-1.79477930	-1.42239330	1.97031054	0.37359302

Table C–2: Doppler 50dB Clutter Filter Coefficients

B_4	$-C_4$	B_3	$-C_3$	B_2	$-C_2$	B_1	$-C_1$	B_0
0.84542846	-0.71474928	-3.37930255	3.09659463	5.06774905	-5.04399223	-3.37930255	3.66187494	0.84542846
0.74382306	-0.55327276	-2.96868634	2.53400299	4.44973390	-4.38526438	-2.96868634	3.40221256	0.74382306
0.62973136	-0.39656213	-2.50520230	1.93990255	3.75097936	-3.61978794	-2.50520230	3.06459405	0.62973136
0.52882407	-0.27966010	-2.09326396	1.45511086	3.12899512	-2.92516254	-2.09326396	2.71323771	0.52882407
0.43670149	-0.19073865	-1.71571192	1.05300155	2.55830009	-2.28497406	-1.71571192	2.33441266	0.43670149
0.34541284	-0.11946113	-1.34050390	0.69988946	1.99080407	-1.66019496	-1.34050390	1.88309201	0.34541284
0.26278690	-0.06966656	-1.00051743	0.42488088	1.47671031	-1.12951524	-1.00051743	1.37925631	0.26278690

The filter responses are plotted on the following pages. Note that the plots cover only 50% of the width of the full Nyquist interval, so the pass band of the filters actually extends another full plot width off the right edge of the diagrams. In other words, a normalized velocity of 1.0 corresponds to the "fold" velocity of a target. The higher numbered filters are the wider ones on the plots.

Figure C–1: 40 dB IIR Clutter Filter Responses
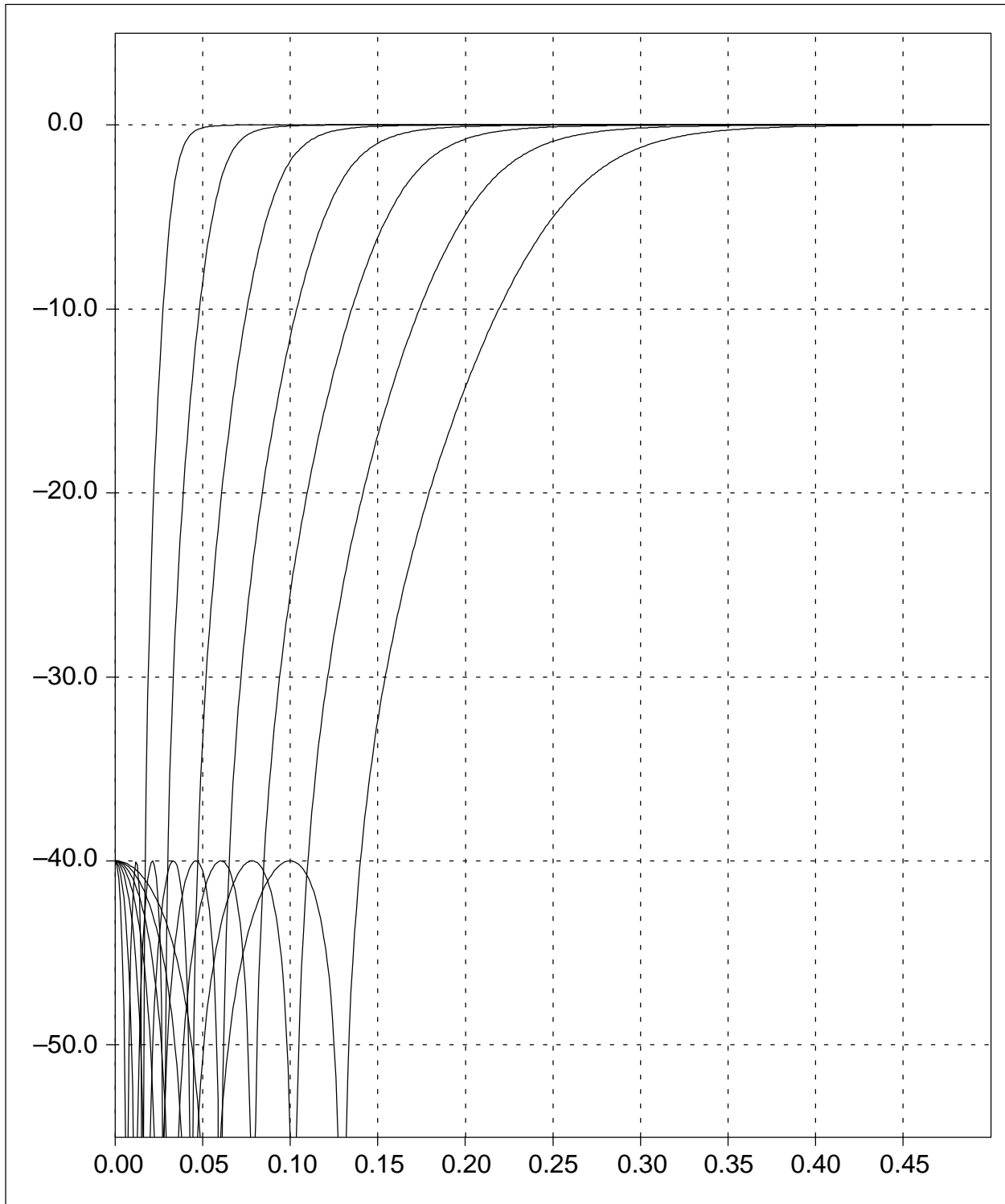
Figure C–2: 50 dB IIR Clutter Filters Responses
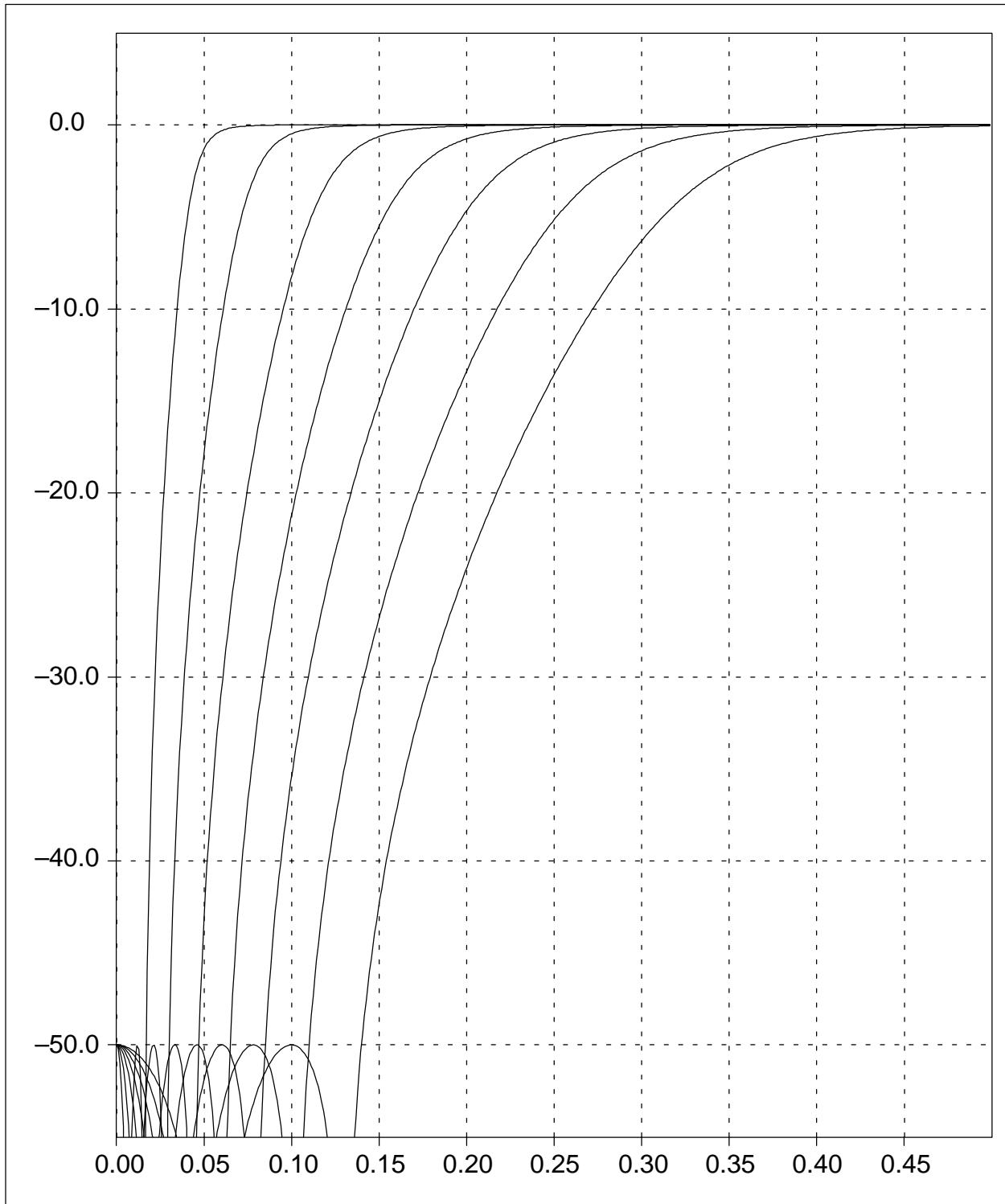
D. References and Credits

1. Tang Dazhang, et.al. (1984). Evaluation of an Alternating–PRF Method for Extending the Range of Unambiguous Doppler Velocity. *Preprints of the Conference on Radar Meteorology, 22nd, 1984* pp.523–527.

2. Joe, Passarelli and Siggia (1995). Second Trip Unfolding by Phase Diversity Techniques. *Preprints of the Conference on Radar Meteorology, 27th, 1995* pp. 770–772.

3. Doviak, R. J., and Zrnic, D. S. (1993). "Doppler Radar and Weather Observerations." Academic Press, San Diego.

4. The JMA internal specification for Interference Filter algorithm for use on Chitose airport Doppler weather radar is the basis for Alg.1 described in Section 5.1.4.

5. Environment Canada – Aldergrove BC, kindly supplied the snapshot of receiver data that is plotted in Figure 4–6.

E. Installation and Test Procedure (DRAFT)

Customer: _____

Serial No.   Main: _____

                AUX: _____

Delivery Date: _____

Radar Mfg./Type: _____

                             _____

Customer Engineer: _____

SIGMET Engineer: _____

Overview

This installation and test procedure is designed to assist SIGMET field engineers and customers with the installation and testing of the RVP8 on a radar system. Because the tests also function as an installation procedure, they must be completed in order. Failure to perform one step may effect later tests.

A copy of the test results should be kept either on file or with the *RVP8 User's Manual.* Do not write in the manual since it will be replaced with an upgrade, instead make a copy and mark that. For IRIS systems, it is recommended that the RVP8 TTY nonvolatile setups be put into a file on your system in the ${IRIS_LISTINGS} directory. The file should be called something like RVP8.26feb2000. The UNIX script command can be used to to create this file

Each test should be performed and signed off when it is completed. If a test does not pass, then the problem should be remedied and the test repeated. If the test still does not pass, then an additional sheet should be added to the test explaining the variance. A supplementary test sheet is at the end of the test procedure.

After you have successfully completed the installation steps and tests in this procedure, your RVP8 will be ready for connection to your application software such as SIGMET's IRIS system. There will be additional configuration and calibration to use the RVP8 with your application software.

The following page is a convenient summary check list for the tests. Use this as a check list for completing the installation and test procedure. We hope that you enjoy your new RVP8. Please contact us if you have any problems or comments regarding this product or procedure at support@sigmet.com.

Test Summary:

❏ E.1 Installation Check

❏ E.2 Power-up Check

❏ E.3 Setup Terminal

❏ E.4 Setup "V" Command (Internal Status)

❏ E.5 Setup "M" Command (Board Configuration)

❏ E.6 Setup "Mp" Command (Processing Options)

❏ E.7 Setup "Mf" Command (Clutter Filters)

❏ E.8 Setup "Mt" Command (General Trigger Setup)

❏ E.9 Initial Setup of Information for Each Pulse Width

❏ E.10 Setup "Mb" Command (Burst Pulse and AFC)

❏ NO TAG Setup "M*" Command (Stand alone Settings)

❏ E.11 Setup "M+" Command (Debug Options)

❏ E.12 Setup "Mz" Command (Transmitter Phase Control)

❏ E.13 Display Scope Check

❏ E.14 Burst Pulse Alignment

❏ E.15 Bandwidth Filter Adjustment

❏ E.16 Digital AFC Voltage Alignment

❏ E.17 Analog AFC Voltage Alignment

❏ E.18 MFC Functional Test

❏ E.19 AFC Functional Test

❏ E.20 Input IF Signal Level Check

❏ E.21 Dynamic Range Check

❏ E.22 Receiver Bandwidth Check

❏ E.23 Receiver Phase Noise Check

❏ E.24 Hardcopy of Final Setups

All Tests Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.1 Installation Check

Test Goal

Verify that the RVP8 is properly connected to the radar system and document some of the basic radar characteristics. There are differences for TWT/Klystron vs magnetron radar systems.

Test Procedure

❏ IF Digitizer (IFD) mounted in the radar receiver cabinet or other convenient location.

❏ IF Digitizer Power Supply properly connect to AC Line voltage _____VAC.

❏ IFD IF input connection. IF Frequency _____MHz.

❏ RVP8 Chassis installed in (circle one)   Rack   Tabletop

   Distance between IFD and RVP8 Chassis _____

❏ Fiber optic connection from IFD to RVP8 Chassis.

❏ Uplink connection from IFD to RVP8 Chassis.

❏ Trigger connections. List triggers in section E.8.

For magnetron systems only verify the following:

❏ IFD burst pulse connected.

   Is RVP8 AFC output used for STALO tuning (circle one) ?   Yes   No

❏ AFC connected to IFD.

For Klystron or TWT systems only verify the following:

❏ IFD COHO connected to Burst Input.

   Is RVP8 Phase Shift Control used and connected to chassis (circle one) ?   Yes   No

   If yes, then specify the phase shifts that correspond to the RVP8 Phase Control Output Bits (attach a separate sheet).

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.2 Power-Up Check

Test Goal

Verify that the IFD and RVP8 properly power–up.

Reference: *RVP8 User's Manual,* Tables 2–4 and section 2.3.5 .

Test Procedure

The RVP8 runs numerous power-up tests. The overall results of the tests are indicated by red and green LED's on the IFD and text on the RVP8 Display. In addition, the main board and auxiliary board (optional) have red and green LED's to signal test results.

Apply power to the RVP8 and the IFD. Verify the following:

For the IFD with RVP8 Main Chassis power on:

❏   When power is applied to the IFD, the red and green lights blink and then go to on.

❏   When the uplink is disconnected, the red light blinks and the green light is off.

❏   When the fiber cable is disconnected, the red light is on and the green light is off.

For the RVP8 with the IFD power on

❏   The front panel display shows the correct text.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.3 Setup Terminal

Test Goal

Verify that the TTY Setups can be accessed and function properly.

Special Test Equipment

Either the IRIS **dspx** utility or a terminal or PC with terminal emulator (e.g., Procom or minicom). This is to be supplied by the customer. SIGMET provides an adapter and cable to convert the RJ11 connector on the RVP8 main board to a DN25–M connector. Note that a null modem may be required.

Reference: *RVP8 User's Manual*, Section 3.1

Option 1: Access to Terminal Setups via **dspx** chat mode at workstation.

This requires that the IRIS Utilities be installed and that the RVP8 is connected to the workstation via a SCSI interface. Refer to the sample chat mode session in the **dspx** chapter of the *IRIS Utilities Manual*. At your workstation, login as operator and type "dspx" in a terminal window to enter the Doppler signal processor examiner utility. Now repeat the procedure in section one of this test (i.e., press ESC, etc...).

Option 2: Access via a terminal or PC:

Connect the setup terminal. Configure the setup terminal for 9600 baud. Note, some terminals or PC's may require a null modem. Details of the TTY connection are provided in section 3.1. Verify the following:

Test Procedure

❏ Press the ESC key and verify that the RVP8 banner appears (see section 3.1.1).

❏ Type "Help" or "?" and verify that the list of commands is displayed.

❏ Issue the reset command "*" and verify that the front panel lights flash.

❏ Type "q" or "quit" to exit the menus.

   Record the type of hardware/software used for the connection:

   _____

   Null modem (circle one)   required   not required

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.4 Setup "V" Command (Internal Status)

Test Goal

Verify that the TTY setups for the Internal Status section are properly reported.

Special Test Equipment: Setup terminal.

Reference: *RVP8 User's Manual* Section 3.1.4

Test Procedure

Enter the TTY setups and issue the "V" command to display the internal status. Note that we will record the final values of all the settings at the end of the installation.

❑   Status information is consistent with the board jumper settings.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.5 Setup "Mc" Command (Board Configuration)

Test Goal

Verify that the TTY setups for the Board Configuration section are properly configured for the customer application.

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.1

Test Procedure

Enter the TTY setups and type the "Mc" command. Set all the values as required.

❏   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.6 Setup "Mp" Command (Processing Options)

Test Goal

Verify that the TTY setups for the Processing Options section are properly configured for the customer application.

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.2

Test Procedure

Enter the TTY setups and type the "Mp" command. Set all the values as required.

❏   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.7 Setup "Mf" Command (Clutter Filters)

Test Goal

Verify that the TTY setups for the Clutter Filters section are properly configured for the customer application.

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.3

Test Procedure

Enter the TTY setups and type the "Mf" command. Set all the values as required.

❏   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.8 Setup "Mt" Command (General Trigger Setup)

Test Goal

Verify that the TTY setups for the General Trigger Setup section are properly configured for the customer application.

Background

The RVP8 can output up to 6 different triggers. These can be delayed by different amounts, and have different pulse widths. For example trigger 0 may go to fire the transmitter, while a slightly delayed trigger 1 may be used for triggering an oscilloscope. The timing can be different for each transmitter pulsewidth. The final timing adjustments will be done later in Section E.14. Enter in the table below the purpose of each trigger, as well as the nominal start time and pulse width. Note that start times are relative to range zero (middle of the burst pulse). We recommend a nominal pulsewidth of 3 microseconds. This chart will be used in the next section.

Magnetron radars using an analog COHO system often have a trigger generator circuit which produces a trigger for the COHO latching and also for the transmitter pulse. This circuit should be bypassed in an upgrade.

#	Purpose	Start Time	Width
0	_____	_____usec	_____usec
1	_____	_____usec	_____usec
2	_____	_____usec	_____usec
3	_____	_____usec	_____usec
4	_____	_____usec	_____usec
5	_____	_____usec	_____usec

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.4

Test Procedure

Enter the TTY setups and type the "Mt" command. Set all the values as required. Note that the PRF and pulse width set here are the current values, and values used at power-up.

❏   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.9 Initial Setup of Information for Each Pulse Width

Test Goal

Enter the initial values for the TTY Setups for each of the pulse widths. Note that the final values of trigger timing, FIR filter impulse response length and bandwidth will be adjusted later.

Background

The duty cycle of the transmitter is the product of the PRF and the pulse width in seconds. For example, a PRF of 1000 Hz and 1 microsecond pulse width is a duty cycle of 0.001. Thus a transmitter with a 0.001 duty cycle limit could function at 1000 Hz and 1 microsecond pulse width, or 500 Hz and 2 microsecond pulse widths.

The duty cycle limits of your radar should be obtained from your system documentation or radar manufacturer. The RVP8 supports up to four pulse widths (coded 0 to 3), although most transmitters typically support only two pulse widths. Record below the pulse width in microseconds and the maximum PRF that is allowed for each pulse width.

#	Pulse Width	Max PRF
0	_____ microseconds	_____ Hz
1	_____ microseconds	_____ Hz
2	_____ microseconds	_____ Hz
3	_____ microseconds	_____ Hz

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.5

Test Procedure

Enter the TTY setups and type the "Mt #" command, once for each pulsewidth. Enter the start time and widths for each trigger as documented on the previous page. For all unused triggers, set the width to zero. Next enter the Maximum PRF from the table above. Set the initial impulse response length to 1.5 times the pulsewidth, and the initial pass bandwidth to the inverse of the pulsewidth.

❑   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.10 Setup "Mb" Command (Burst Pulse and AFC)

Test Goal

Verify that the TTY setups for the Burst Pulse and AFC Configuration section are properly configured for the customer application.

Background: Magnetron vs Klystron Systems

Magnetron Systems: For magnetron systems, the phase and frequency of the burst pulse from the transmitter is measured at IF. The phase measurement is used for digital phase locking and 2nd trip echo filtering and recovery. The frequency measurement is used to implement an analog (+−10V) AFC output to control the STALO frequency. Note that an external AFC can be used rather than the RVP8 AFC, but is not recommended.

Klystron or TWT–based Systems: The COHO is measured instead of the burst pulse. Note that Klystron systems that use a phase shifter should input the phase shifted COHO into the IFD so that the RVP8 can digitally lock to the actual transmitted phase. For Klystron systems the AFC feedback loop is not used.

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual,* Section 3.3.6

Test Procedure

Enter the TTY setups and type the "Mb" command. Set all the values as required.

❑   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.11 Setup "M+" Command (Debug Options)

Test Goal

Verify that the TTY setups for the Debug Options section are properly configured for the customer application.

Special Test Equipment: Setup Terminal

Background

The RVP8 supports several test features that are configured in this section. For operational systems, the simulation features should be turned off. SIGMET recommends that the LED's be set to "1:Go/Proc" so that the front panel red LED will flash during each processing cycle.

Reference: *RVP8 User's Manual,* Section 3.3.7

Test Procedure

Enter the TTY setups and type the "M+" command. Set all the values as required.

❏   Parameters set.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.12 Setup "Mz" Command (Transmitter Phase Control)

Test Goal

Verify that the TTY setups for the Transmitter Phase Control section are properly configured for the customer application. This feature is not used for magnetron systems since these have inherent random phase that is measured, but not controlled.

Special Test Equipment: Setup Terminal

Reference: *RVP8 User's Manual*, Section 3.3.8

Test Procedure

Enter the TTY setups and type the "M+" command. Set all the values as required.

❏　　Parameters set.

Test Passed

For Customer　　　＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ Date ＿＿＿＿＿＿＿＿

For SIGMET　　　　＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ Date ＿＿＿＿＿＿＿＿

E.13 Display Scope Test

Test Goal

Verify that the display scope output functions properly.

Background

The RVP8 can use a standard oscilloscope as a display device for local configuration and testing. This is a common item at radar sites and most technicians are familiar with its use. The oscilloscope is provided by the customer or purchased as an option from SIGMET. When using the **dspx** utility, the scope plot is drawn on the computer screen and an oscilloscope is not required.

Reference: *RVP8 User's Manual,* Section 4.1

Special Test Equipment:
Setup terminal
Analog oscilloscope (Optional)

Dspx Test Procedure

❏ Enter the TTY setups and issue the "P+" command.

❏ Verify that the test pattern is displayed OK.

Optional Scope Test Procedure

❏ Connect the BNC cable from the Q output on the back of the RVP8 chassis to a vertical input channel on the scope. Be sure to terminate the cable

❏ Configure the scope per Section 4.1.

❏ Enter the TTY setups and issue the "P+" command.

❏ Adjust the scope time base, vertical gain, horizontal and vertical offsets so that the test pattern appears as illustrated in Figure 4–1 of the Manual. If there is a problem doing this, you can adjust the scope plots numbers using the "Mc", see Section 3.3.1.

❏ Verify that the test pattern is displayed OK.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.14 Burst Pulse Alignment

Test Goal

Verify that the burst pulse is present and that its amplitude is sufficient. This test also aligns the burst pulse in the burst pulse sample window.

Special Test Equipment: Setup terminal and display scope

Reference: *RVP8 User's Manual,* Section 4.4

Test Procedure

❏ Use the Mt command to select pulse width 0 and a safe PRF.

❏ Set the transmitter on to radiate.

❏ Issue the Pb command to obtain the burst pulse display. Use the L/R commands to find the burst pulse. Use the l/r commands to fine tune the position of the burst pulse in the burst pulse window.

❏ Adjust the width of the burst pulse window using the I/i command to be slightly larger than the burst pulse (e.g., ~50%).

❏ Verify that the burst pulse power is in the range +1 to –12 dBm per the tabular display on the setup terminal.

Record the burst pulse power

Pulsewidth #0: _____ dBm
Pulsewidth #1: _____ dBm
Pulsewidth #2: _____ dBm
Pulsewidth #3: _____ dBm

❏ Repeat the above procedure for each pulse width.

In the event that the burst pulse is not found, try to detect the burst pulse on an oscilloscope connected directly to the IF burst line (ahead of the IFD). On a magnetron radar, if the AFC is not working it is possible the IF frequency is outside the IFD anti-aliasing filter bandwidth. It may be necessary to go to manual frequency control to get this to work. If no burst pulse is detected, then the radar should be serviced by an experienced technician. If the burst pulse is power is too small or large, check the status of any attenuators or amps in the burst pulse signal path. It might be necessary to adjust the gain buy installing a fixed attenuator or amplifier.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.15 Bandwidth Filter Adjustment

Test Goal

Set the band width filter for each pulse width.

Reference: *RVP8 User's Manual,* Section 4.5

Special Test Equipment: Setup Terminal and display scope

Test Procedure

❑ Enter the Ps command mode and view the results on the display scope. Toggle the space bar to show both the spectrum of the burst pulse and the spectrum of the bandwidth filter response. Use the Z/z command to zoom the burst spectrum plot to approximately match the height of the bandwidth filter response (which will have a smoother shape than the burst pulse).

❑ Use the Ww/Nn commands to adjust the width of the bandwidth filter plot to be slightly narrower than the burst pulse. Then use the w/n commands to fine tune the filter width such that the "DC–Gain:" is either "ZERO" or less than –64 dB.

❑ Repeat for each pulse width that is used (use mt to change pulse width) and record:

	FIR Length	Bandwidth	DC Gain
Pulsewidth 0	_____usec	_____MHz	_____ dB
Pulsewidth 1	_____usec	_____MHz	_____ dB
Pulsewidth 2	_____usec	_____MHz	_____ dB
Pulsewidth 3	_____usec	_____MHz	_____ dB

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.16 Digital AFC Voltage Alignment (Optional)

Test Goal

Verify that the RVP8 AFC output controls the STALO over the correct span.

Special Test Equipment: Setup TTY and display scope

Background

The RVP8 implements an AFC based on the measurement of the burst pulse frequency. The control output is available in 8 bits on the phase control signals of the RVP8 J13 connector, or on the RxNet7 J16, or in 16+ bits on the DAFC. A frequency control span of approximately +− 7 MHz is expected. If your STALO requires more control lines, jumper the higher lines.

Check the specification of the STALO and document the following. To calculate the digital span take the desired frequency minus the base frequency divided by the frequency step.

STALO base frequency after jumpering high bits: _____ MHz
STALO frequency step _____ MHz
Desired frequency span: _____ to _____ MHz
Desired digital span: _____ to _____

Test Procedure

❏ Verify that JP23 and JP24 are set to AB to enable all 8 bits of digital AFC.

❏ Use the setup terminal to set the Digital AFC span as required in the Mb section.

❏ Use the setup terminal and display scope in the Pb (plot burst) mode to verify that the burst pulse is properly centered. Any pulsewidth can be used.

❏ Set to MFC using the "=" command, and adjust the control to the lowest setting using the "D" command. Record the results below.

❏ Raise the control using "U" to within 0.1 MHz of the IF frequency. Record the results.

❏ Raise the control using "U" to the highest setting. Record the results.

❏ Verify that sufficient span is covered, and the the power at the end points is sufficiently high to run the AFC loop.

	voltage	frequency
Midpoint:	_____A/D	_____ MHz.
Lower limit:	_____A/D	_____ MHz.
Upper limit:	_____A/D	_____ MHz.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

E.17 Analog AFC Voltage Alignment (Optional)

Test Goal

Verify that the RVP8 AFC output voltage is properly adjusted to match the STALO input control voltage.

Special Test Equipment
       Calibrated Oscilloscope or Voltmeter.
       Setup TTY and display scope

Background

The RVP8 implements an AFC based on the measurement of the burst pulse frequency. The control output is an SMA labeled "AFC" on the IFD module which connects to the STALO control voltage input. The output signal is an analog voltage in the range +–10V. A frequency control span of approximately +– 7 MHz (for a 30 MHz IF) is expected. Some STALOs contain a nominal frequency adjustment. The alignment procedure is different in that case.

Check the specification of the STALO and verify the following:

       STALO analog control input range   _____V to _____V
       STALO frequency control range   +/– _____ MHz

Test Procedure, initial setup

❏ Connect a scope or digital Voltmeter to the AFC line, either at the IFD or the STALO.

❏ Use the setup terminal and display scope in the Pb (plot burst) mode to verify that the burst pulse is properly centered. Any pulsewidth can be used.

❏ Set the test switches on the IFD to output the Midpoint Voltage
       SW1–A   SW2–B

Test Procedure, STALO without adjustment

❏ Adjust the "Offset" pot by screwdriver on the IFD module until the the IF frequency display on the setup terminal is approximately the desired IF frequency (e.g., 30 MHz). Record the results below.

❏ Set the test switches on the IFD to output the AFC low test voltage.
       SW1–A   SW2–A
The voltage on the monitoring scope or Voltmeter will decrease. The burst pulse frequency may either increase or decrease depending on the nature of the voltage control in the STALO.

❏ Adjust the "Gain" pot by screwdriver on the IFD module until the frequency stops changing or until the burst pulse frequency is 7 MHz off the center frequency (e.g. for 30 MHz IF, either 23 or 37 MHz) whichever occurs at a higher voltage. Record the results.

❏ Set the test switches on the IFD to output the AFC high test voltage.
       SW1–A   SW2–C

❑ Reduce the gain slightly (CCW turn) and verify that the frequency changes such that it becomes closer to the center IF frequency. If it does not change, then continue to reduce the gain until it does. If the frequency is more than 7 MHz from the IF center frequency, then reduce the gain until the frequency is 7 MHz off. Record the results below.

Test Procedure, STALO with adjustment

❑ Adjust the "Offset" pot by screwdriver on the IFD module until the voltage is at the middle of the desired voltage span.

❑ Adjust the "Offset" pot on the STALO until the the IF frequency display on the setup terminal (Pb mode) is approximately the desired IF frequency (e.g., 30 MHz). Record the results below.

❑ Set the test switches on the IFD to output the AFC low test voltage.
SW1–A   SW2–A
The voltage on the monitoring scope or Voltmeter will decrease. The burst pulse frequency may either increase or decrease depending on the nature of the voltage control in the STALO.

❑ Adjust the "Gain" pot by screwdriver on the IFD module until low end of the desired voltage span is reached, or until the burst pulse frequency is 7 MHz off the center frequency (e.g. for 30 MHz IF, either 23 or 37 MHz) whichever occurs at a higher voltage. Record the results below.

❑ Set the test switches on the IFD to output the AFC high test voltage.
SW1–A   SW2–C

❑ Reduce the gain slightly (CCW turn) and verify that the frequency changes such that it becomes closer to the center IF frequency. If it does not change, then continue to reduce the gain until it does. If the frequency is more than 7 MHz from the IF center frequency, then reduce the gain until the frequency is 7 MHz off. Record below.

Test Procedure, final cleanup

❑ Set the switches back to the run position (SW1–B and SW2–B), and disconnect the T for the Voltmeter or scope monitor. This cable can introduce a lot of noise into the system.

	voltage	frequency
Midpoint:	_____Volts	_____ MHz.
Lower limit:	_____Volts	_____ MHz.
Upper limit:	_____Volts	_____ MHz.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.18 MFC Functional Test and Tuning (Optional)

Test Goal

Verify that the Manual Frequency Control (MFC) is functioning properly. Skip this test if you are not using the RVP8's AFC.

Reference: *RVP8 User's Manual,* Section 4.5

Special Test Equipment: Setup Terminal and display scope

Test Procedure

Enter the Ps command (Plot burst spectrum and AFC).

❏ Use the "=" command to enter the MFC (manual frequency control) mode. Verify that the MFC mode is indicated by the "Manual" notation next to the AFC % output indicator on the terminal.

❏ Use the U/u and D/d commands and verify that these commands shift the measured IF frequency (as displayed on the TTY) either up or down. The U command should increase the frequency and the D command should decrease the frequency. If the sense is reversed, then go to the Mb command menu and change the question "Burst frequency increases with increasing AFC voltage".

❏ Using the U/u and D/d commands, verify the limits of the AFC tuning and fill in the table below:

AFC %	Measured Freq (MHz)
–100%	_____
0%	_____
+100%	_____

The 0% AFC value should be within approximately +–0.2 MHz of the center IF frequency (e.g., 30 MHz) . The values at +– 100% should correspond to approximately +– 7 MHz of the center IF frequency, or at the maximum span that is supported by the STALO, whichever is less.

❏ Toggle the MFC mode to AFC by typing the "=" symbol and and verify that the terminal indicator changes from "Manual" to "AFC". Then exit the Ps menu.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.19 AFC Functional Test (Optional)

Test Goal

Verify that the AFC properly tracks the burst pulse frequency.

Reference: *RVP8 User's Manual,* Section 4.5

Special Test Equipment: Setup Terminal and display scope

Test Procedure

Use the setup terminal to enter the Ps mode and observe the output on a display scope. Verify the following:

- ❏ Verify that the system is in AFC mode by checking that the text on the terminal for the AFC % output says "AFC".

- ❏ Verify that the frequency displayed on the setup terminal is within +– 15KHz of the center IF frequency (the default value for the AFC hysteresis outer limit in the Mb command). For example in the range 29.985 to 30.015 MHz. If it is not in this range then verify that it moves within this range.

- ❏ Turn radiate off for 10 minutes and then turn the radiate back on. Observe that the AFC properly tracks the magnetron frequency as the magnetron warms.

- ❏ Similarly, set the control signal to the maximum and minimum values using MFC, then turn on AFC. Observe that the AFC properly tracks back to the correct frequency.

- ❏ Perform the tests above for each pulse width and verify that the AFC properly tracks the center frequency.

- ❏ For pulsewidth 0.

- ❏ For pulsewidth 1

- ❏ For pulsewidth 2.

- ❏ For pulsewidth 3.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.20 Input IF Signal Level Check

Test Goal

Verify that the input signal level is optimized for the IFD. This is done be observing the power in the noise using the Pr command.

Reference: *RVP8 User's Manual,* Section 4.6

Special Test Equipment: Setup Terminal and display scope

Test Procedure

❏ Set the transmitter to radiate and elevate the antenna to >45 degrees to minimize the effects of weather or clutter echoes (including earth noise). Be sure the antenna azimuth is pointed away from the sun or any known RF interference sources you may have.

ⓘ **Note: This entire procedure may also be performed with the transmitter off since, in theory, it is only measuring properties of the receiver. However, you may notice some noise interaction between the Tx and Rx.**

❏ Use the setup terminal to enter the Pr command and the display scope to view results. Use the Ll/Rr commands to move out in range to a start range of 50 km so that only noise is present.

Record the powers displayed on the setup terminal. You can use the V/v command to increase/decrease averaging of samples to make the noise measurement more stable.
Total: _____ dBm, Filtered: _____ dBm

❏ Now remove the cable connecting the IF signal into the IFD. Again record the powers:
Total: _____ dBm, Filtered: _____ dBm

❏ Add attenuation and/or amplification by an amount such that the Filtered noise power is approximately 7 dB higher when the signal is connected (See Section 2.2.8).

❏ After verifying the above rise in noise level, disconnect the output cable from the LNA and verify that the noise drops to the same level as when the IFD IF-Input was disconnected. This verifies that the dominant noise is indeed coming from the LNA, and not from any of the subsequent IF amplifiers.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

E.21 Dynamic Range Check

Test Goal

Verify the receiver dynamic range is in excess of 80 dB.

🎤 **Important: This test requires the injection of an RF test signal over a 90 dB range. Damage to the LNA could occur. Check the LNA specification to verify the maximum signal that it can accept. The output from the signal generator (accounting for cable and coupler losses) should not be allowed to exceed this value.**

Reference: *RVP8 User's Manual* section 4.6

Special Test Equipment:
        Setup Terminal and display scope
        RF signal generator

Test Procedure

❏ Run the radar and test signal generator for 20 minutes to allow proper warm-up of the system prior to the test. This will allow the AFC to stabilize.

❏ After warm-up is complete, turn the radiate off but leave the receiver on since the test signal generator may be damaged by the transmitter. The antenna should be elevated to 20 degrees and the azimuth should be set to point away from any known microwave sources including the sun.

❏ Use the setup terminal to enter the Mt command to set the pulse width to 0.

❏ Use the Mt 0 command to temporarily configure the FIR impulse response to 2.89 usec (I/i command) and 0.59 MHz bandwidth (N/n and W/w commands). These settings are for the purpose of benchmarking the receiver performance. Do not save this result since it would override your previously configured band width and impulse response.

❏ Connect the test signal generator to inject a signal at RF ahead of the LNA.

❏ Enter the Pr mode and make the following settings:
        Use the space bar to toggle to the power spectrum plot.
        Use the L/l and R/r commands to set the start to 50 usec.
        Use the T/t command to set the plot span to 50 usec
        Use the V/v command to set averaging to 10 samples

❏ Set the signal generator to a value that is approximately 20 dB above noise and observe the scope plot. Adjust the frequency of the test signal generator to make the frequency of the spectrum at the correct IF frequency.

Turn off the signal generator RF output and record the "Filtered" noise power
Siggen power: none   RVP8 Filtered power:_____dBm

Turn on the signal generator RF with about 20 dB of signal above noise. Now reduce the power until you the Filtered power is approximately 1 dB above the noise level measured in the previous step. Verify this by toggling the signal generator RF ON and OFF. The samples will be a little noisy, but getting the signal exactly 1 dB above noise is not required. Record the signal generator setting for the 1 dB above noise power (minimum detectable power).

Siggen power (Pmin):_____dBm   RVP8 Filtered power:_____dBm

❑ Increase the signal generator output power by 10 dB steps until saturation of the Filtered power is observed.

───

Important: Do not increase the signal generator power such Total Power exceeds the Safe Total Power Limit for Pr command display +10 dBm or damage to the RVP8 A/D convertor could result.

───

Back off the siggen power to approximately 10 dB below saturation. Now use 1 dB steps to more carefully define the saturation point to within +– 1 dB (e.g., for a 0.2 dB roll–off). Record the signal generator setting.

Siggen power (Psat):_____dBm   RVP8 Filtered power:_____dBm

The Receiver dynamic range is:

$$\text{_____ dB} = Psat - Pmin$$

❑ Verify that the receiver dynamic range is greater than or equal to 80 dB.

❑ Check that the signal generator frequency has not drifted by looking at the plot. If it is off by more than 0.1 MHz, retune and repeat the test.

❑ Exit Pr and do a "restore" to restore the saved settings.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.22 Receiver Bandwidth Check

Test Goal

Verify the receiver bandwidth is in excess of 14 MHz.

Background

For proper functioning of the high speed A/D convertors, it is necessary that approximately 14 MHz of broadband noise is available at the IFD. This noise does not interfere with the signal to noise ratio because the bandwidth filter is applied afterwards. The bandwidth of the anti-aliasing filter should be the limiting factor. This test uses the same hookup as the previous test (Section E.21). For dual polarization systems, you expect to get a narrower bandwidth.

Reference: *RVP8 User's Manual,* section 4.6

Special Test Equipment:
> **Setup Terminal and display scope**
> **RF signal generator**

Test Procedure

❑ Connect the test signal generator to inject a signal at RF ahead of the LNA.

❑ Enter the Pr mode and make the following settings:
> Use the space bar to toggle to the power spectrum plot.
> Use the L/l and R/r commands to set the start to 50 usec.
> Use the T/t command to set the plot span to 50 usec
> Use the V/v command to set averaging to 1 sample

❑ Set the signal generator power to a value that is approximately 60 dB above noise and observe the scope plot. Adjust the frequency of the test signal generator in 1 MHz steps to cover the whole range of the scope plot. Mark the total power measured on the plot on the next page.

❑ Set the signal generator power to a value that is approximately 60 dB above noise and observe the scope plot. Adjust the frequency of the test signal generator in 1 MHz steps to cover the whole range of the scope plot. Mark the total power measured on the plot below.

❑ Verify that the 3dB point gives approximately 14 MHz of bandwidth.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

Graph of Total Power vs. IF frequency
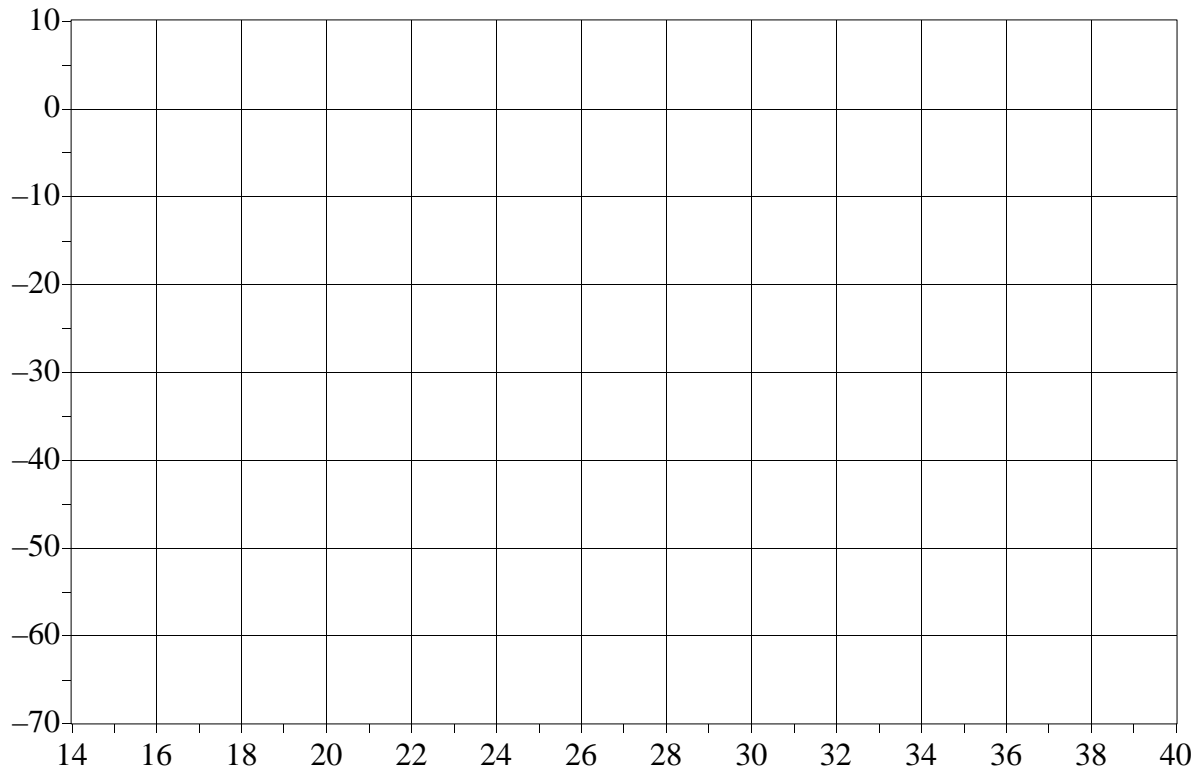
E.23 Receiver Phase Noise Check

Test Goal

Verify the stability of the STALO by looking at the phase noise of a clutter target.

Background

For proper velocity calculations and for ground clutter rejection, it is required that the radar's STALO maintain a stable frequency, and that the transmitted pulse contain no amplitude or phase artifacts.

Special Test Equipment:
IRIS ascope utility, or similar program
Known clutter targets with no weather signal

Test Procedure

❑ Configure the radar for normal operation expect pointing at a known clutter target.

❑ Run the IRIS ascope program, and configure as follows: 16-bit time series, Spectrum not from DSP, spectrum size 256, Rectangular window, short pulse width, high PRF, no clutter filters. Select the maximum range and number of bins to get the maximum resolution over the target. For targets < 24 km, use 201 bins, 25 km. Select the range bin of the target. Record the Az, El, range and phse noise below.

❑ Try minor changes in Az, El, and Range to get the lowest phase noise. The goal is less than 1 degree within 20 km.

Az: _____   El:_____   Range:_____ Phase Noise:_____

Az: _____   El:_____   Range:_____ Phase Noise:_____

Az: _____   El:_____   Range:_____ Phase Noise:_____

Az: _____   El:_____   Range:_____ Phase Noise:_____

Az: _____   El:_____   Range:_____ Phase Noise:_____

Az: _____   El:_____   Range:_____ Phase Noise:_____

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.24 Hardcopy of Final Setups

Test Goal

Make a hardcopy of all the final setups, and attach to the tests.

Special Test Equipment: Setup Terminal

Dspx Chat Mode Test Procedure

❏ Start script logging with commands "cd /usr/sigmet/config/listings", "script RVP8.26feb01".

❏ Enter the TTY setups and type the "??" command to list all the TTY setups.

❏ Exit **dspx**, and exit script logging with "exit".

❏ Print the file.

Terminal Test Procedure

Either use a known screen capture method on your terminal or PC, or make a copy of chapter 3 of the manual, attach to this test, and mark the results in it.

Test Passed

For Customer   _____ Date _____

For SIGMET   _____ Date _____

E.25 IFD Stand-alone SigGen Bench Test

Test Goal

Verify that the IFD analog I/O is working properly in an isolated environment.

Background

These stand-alone production tests are are performed on every IFD prior to shipment.

Special Test Equipment:
IRIS dspx utility, IF Signal Generator, Voltmeter

Test Procedure

❑ Begin by running **dspx** and temporarily reverting to factory settings with 'f'.

❑ Enter the "Mb" menu and choose an IF frequency f_{IF} MHz that matches the center frequency of the IFD's anti-alias bandpass filter.

❑ Enter the "Pr" menu, and type "RRRTTVVVVV" to move the starting plot range to 30km, the plot interval to 20µsec, and the averaging factor to 10. Also type two space characters to switch to the spectral display plot.

❑ Attach an IF SigGen to the input of the anti-alias filter that feeds the "IF-In" IFD input.

❑ Set the SigGen for f_{IF} MHz at 0dBm. Verify that the filtered power is within 0.5dB of –1dBm, and that a single clean spectral line is plotted. Use the "Z" or "z" keys to zoom Up/Down as needed.

❑ Increase the SigGen power in 1dB steps until distortion harmonics are seen on the plot. This should occur at 6–7dBm.

❑ Reduce the SigGen power to –20dBm, and sweep the frequency in 1MHz steps over a 20MHz band centered on f_{IF}. Verify that the bandwidth of the anti-alias filter matches its designed value (14MHz BW for the 30, 57.5 and 60MHz filters, and 4MHz BW for the 16MHz filter).

❑ Switch the SigGen off, and verify that the noise floor filtered power is between –83dBm and –81.0dBm. Note: a very good quality shielded test cable is required here.

❑ Move the SigGen cable to the other IFD filter input, and swap the plots by flipping IFD SW2 to its "A" position. Repeat the above four tests, now on the "Burst-In" SMA port.

❑ Place IFD SW1 in its "A" position, and verify that the AFC output voltage varies in a negative-zero-positive pattern as SW1 is flipped from A-B-C. Use the **offset** pot to set a nominal 0-Volt output, and the **gain** pot to set a ±5V span.

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