Appendix A

Technical Description

And

Operating Instructions

For the

Front Panel Controller

With IEEE-488, RS-232, or RS-422 Interface.

Ophir RF

Rev. -

Appendix A
TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 FRONT PANEL CONTROLLER

1.1 Introduction

The front panel display operates in three distinct modes. The first mode is called the Run Mode. This is the normal operation mode, where the amplifier is controlled either by the front panel or via the GPIB/IEEE-488, the RS-232 or RS-442 interfaces. The second mode is User Configuration. In this mode, the end user can configure the system to more closely support their needs. The final mode is the System Calibration mode. *This mode that is designed to be used only by an authorized technician.* Within the System Calibration mode, all aspects of the amplifier configuration and calibration can be adjusted.

1.2 Controls and Display

The layout of the controls and display on the front panel is depicted in Figure 1. A description of each of the controls and the display is contained in Table 1. General comments on the operation of the controller are contained in Table 2.

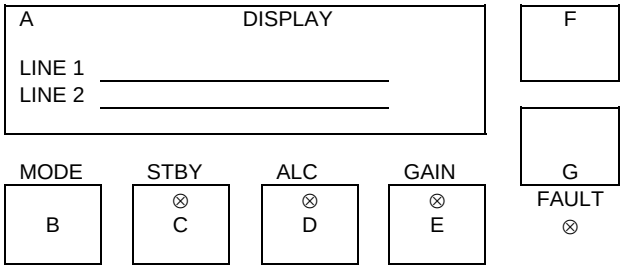

Figure 1. Front Panel Display and Controls

1.3 Run Mode

When the unit first powers up, a self-test operation is conducted. If any portion of the system is un-calibrated, or an error reading the calibration data or settings is encountered, an appropriate message will appear on the display, and the unit will not power up. If the unit passes self-test, it will place itself in the power up mode specified by the user in the User Configuration, or if no mode has been specified, in STANDBY with 0% Gain (Voltage Variable Amplifier, or VVA) amplification.

1.4 User Interface

There are six buttons used to control the amplifier. The first two buttons are the UP and DOWN buttons, which are used to set values used by the amplifier. The values that can be changed include the amplifier output level (either specified in Gain % or dBm), and the VSWR alarm point. The next button is the GAIN button. If pressed, this button places the unit into the VVA mode. It also changes the display so that the VVA level can be changed – "Set VVA: xxx.x%". The next button is the ALC button. If pressed, this button places the unit into the ALC mode – "Set ALC: xx.x dBm". It also changes the display so that the ALC level can be changed. The next button is the STANDBY button. This button does double-duty. If there is a fault that has not been acknowledged, the fault is acknowledged when this button is pushed. For more information on faults and clearing

them, please see the fault section of this document. The STANDBY button also places the unit into and removes it from standby mode. The final button is the MODE button. When pressed, this button cycles through the system status displays. For more information on these displays, please see the display section of this document.

1.5 Display

The display is used in conjunction with the mode button to display the current amplifier status. Pressing the MODE button cycles through all of the status displays. See the tables later in this document for summaries of the displays in the different operational modes.

Table 1. Run-Mode Controls and Display Descriptions

Item	Description	Comments
A	Display	Displays information on command from the microprocessor based on queries from the front panel control switches, IEEE interface, or from fault detection circuitry.
B	Mode Switch	Allows toggling thorough all of the following: o Gain Control (Adj. Output power) o Forward and Reflected power o Max Power (FWD, REV) o VSWR Cut off (Fwd - Rev in dB) o Gain (VVA) Voltage in % o Monitors (8 inputs, If Applicable), o IEEE-488 (GPIB) interface address o Firmware revision
C	Standby Switch	Places the amplifier in minimum gain mode (Gain/VVA @ 0% voltage). The standby condition is indicated via the LED on Standby button.
D	ALC Switch	Turns ALC (Automatic Level Control) mode ON and VVA (Variable Voltage Attenuator) control mode (also known as the GAIN mode) OFF. The ALC mode is on when the LED on ALC button is illuminated. This button is used in conjunction with the UP/DOWN buttons to change the ALC setting in 0.1 dB steps.
E	Gain Switch	Turns VVA control mode ON and ALC mode OFF. ON is indicated when the LED on GAIN button is illuminated. This button is used in conjunction with the UP/DOWN buttons to change the Gain of the amplifier through 0.1% steps. Note that the percentage of gain is a relative function and is not linear.
F & G	Up and Down Switches	Controls gain of the amplifier when in the Gain mode and the output level when in the ALC mode. These buttons manipulate various parameters depending on the operating mode of the amplifier.

Table 2. General Notes on Operation

Item	Description	Comments
1	Default Power-Up Setting	Standby ON (VVA @ 0% voltage), ALC OFF and GAIN ON. UP/DOWN arrow keys adjust Gain of the amplifier in 0.1% steps. After adjusting to desired power output, press Standby key once. Amplifier will display actual power output and relative VVA voltage in percentage. Press Standby key again and amplifier will again be in Standby mode.
2	Fault Conditions	If fault occurs during normal operation, the information is shown on the display and the red fault LED on the front panel illuminates. It also reports the fault information via the IEEE-488 bus, RS-232 port and RS-422 ports, if queried. To clear a fault, after fault condition is repaired, push the STBY button. o High Temperature – Turns OFF bias voltage, illuminates red fault LED and sends fault status condition to IEEE-488 bus, RS-232 port , RS-422 port, and Ethernet Port if queried. A normal operating condition will be only restored once the fault has been removed and Standby has been pressed (to acknowledge fault). MESSAGE: “Temp”. o High power – The amplifiers are programmed to automatically reduce the drive level if the forward, reverse or input power levels exceed factory-set values. Message: “Fwd Pwr”, “Rev Pwr”, or “Input Pwr”. o High VSWR – The amplifiers are programmed to reduce output power to a factory-set maximum reverse-power level under high load VSWR conditions. As with all other faults, the controller will illuminate the fault LED Message: “VSWR”. o Monitors – Occurs when DC input(s) exceeds or falls below configured levels. If configured for amplifier shutdown, the controller turns OFF the bias voltage and illuminates the fault LED. A normal operating condition will be only restored once the fault has been removed and Standby has been pressed (to acknowledge fault). If configured for Notification Fault, the controller will only display the fault without affecting the current control status of the amplifier. Message: “Mon X”, where “X” is the number of the monitor that tripped. o Uncalibrated - If EEPROM is damaged or has lost its' stored data, front panel will indicate “Error – Calibrate” and the controller will not be useable. Complete re-calibration will be required Message: “Error – Calibrate”
3	Basic Operating Instructions	1. Drive the amplifier with a nominal level indicated by the specifications included with the specific model of amplifier. 2. Adjust the desired output level or the gain using the Set ALC or Set VVA level function, respectively.

1.6 Faults

There are two levels of faults in the system. The first and more severe fault level is a *shutdown fault*. Shutdown faults are VSWR faults (when the forward power minus the reverse power is greater than the VSWR Alarm Set point), over-temperature faults, and some voltage or current monitor faults. The second and more minor fault is a *notification fault*. Notification faults can include voltage or current faults as configured via the calibration menu.

When a temperature fault occurs, the unit will go into the protective mode, completely shutting-down the amplifier.

When a shutdown fault occurs, the unit shutdowns immediately, and the fault LED illuminates. The nature of the fault is shown on the display. If applicable, multiple faults will be displayed, in-line. If more faults exist than can be displayed in 16 characters, the up and down buttons can be used to horizontally scroll the display. To change the display mode from the fault screen to other screens to help determine the nature of the fault, press the MODE button to cycle through screen. When the fault condition has been removed (i.e. the temperature has returned to a safe operating range) and the STANDBY button is pressed, the system will restart. If the fault has not been removed, the system will not respond to the STANDBY button.

When a notification fault occurs, the unit continues to operate as before the fault occurred, and the fault LED illuminates. The nature of the fault is still displayed, as described above for shutdown faults. To acknowledge the fault, press the STANDBY button once. This places the display into normal operation. The fault LED will remain illuminated until the fault condition goes away, but the unit will operate normally. To see what faults are still occurring, use the MODE button to step through the displays to the Fault Display. This will display any notification faults the system may have tripped.

1.7 Run Mode Status Displays

Table 3 explains the operation of the run-mode menus. The following general considerations apply:

- These display items are available following successful power-up of the amplifier.
- If any portion of the system requires calibration, the unit will not power up, and the front panel will display an error message and automatically go to the calibration menu.
- Many specific aspects of the display in Run Mode are dictated by settings made in the configuration menu.
- Cycle through the front panel menu items by pressing the MODE key.

Table 3. Run Mode Status Displays

Menu Item	Options	Comments

`Output Level Set`	`Fwd Pwr: XX.X dBm`
	`Set VVA: XXX.X %`
	or
	`Fwd Pwr: XXX.X W`
	`Set VVA: XXX.X %`
	
	(if amplifier is in VVA mode, i.e. 'GAIN' LED is illuminated).
		Change Output Level using the ↑ and ↓ keys on the front panel.

	`Fwd Pwr: XX.X dBm`
	`Set ALC: XX.X dBm`
	or
	`Fwd Pwr: XXXX.X W`
	`Set ALC: XXXX.X W`
	
	(if amplifier is in ALC mode, i.e. 'ALC' LED is illuminated). Units are in dBm or Watts depending on Startup Options setting selected in User Configuration Mode (see next section).
		Change Output Level using the ↑ and ↓ keys on the front panel.

`Output Power`
(Read Only in Run Mode)
	`Fwd Pwr: XX.X dBm`
	`Rev Pwr: XX.X dBm`
	or
	`Fwd Pwr: XXXX.X W`
	`Rev Pwr: XXXX.X W`
	
	Units are in dBm or Watts depending on Startup Options setting selected in User Configuration Mode (see next section).
		The forward and reverse power levels are displayed.

`Input Power` (if option installed and configured)	`In Pwr: XX.X dBm` `Max Pwr: XX.X dBm`	

`Maximum Forward and Reverse Power Settings`	`Max Fwd: XX.X dBm`
	`Max Rev: XX.X dBm`
	or
	`Max Fwd: XXXX.X W`
	`Max Rev: XXXX.X W`
		These values are set via the configuration menu. If either setting is exceeded, a shutdown fault is generated.

Menu Item	Options	Comments
VSWR Alarm (Read Only in Run Mode)	VSWR Alarm: XX.X dB	The VSWR Alarm Threshold represents the difference between the **forward power** and the **reflected power** (in dBm). A higher value here represents a configuration that is more sensitive to VSWR.
Gain (VVA) Level (Read Only in Run Mode)	Gain: XXX.X%	When the unit is in ALC mode this value will change dynamically as the input signal changes. When the unit is in VVA mode this value should mirror the value set in the Output Level Set display. User can change either VVA or ALC level by using the ↑ and ↓ keys on the panel after first pushing the 'ALC' or 'GAIN' buttons.
Monitors (Read Only in Run Mode)	I1: X.X I2: X.X I3: X.X I4: X.X or V1: X.X V2: X.X V3: X.X V4: X.X Any combination of V and I monitors are possible.	Displays the voltage and/or current monitors. They are displayed four at a time; pressing the mode button advances to the next set of four. After all of the monitors are displayed, pressing the mode button advances it to the next display. If no monitors are configured, this mode is skipped.
GPIB Address (Read Only in Run Mode)	Address = XX Where XX = 1 to 31 Default is 5	Displays the GPIB / IEEE-488 device address of the Amplifier. Valid address values are from 1 to 31. This menu item will not appear if the GPIB Interface has been disabled in the System Calibration Options.
Version	X.YY Where X = Revision number, and YY = Version number	Displays the Revision and Version number of the Front Panel Controller firmware.
Fault Display	Temp and/or Fwd Pwr and/or Rev Pwr and/or In Pwr and/or VSWR and/or Mon x and/or ALC Range	Displays any acknowledged notification faults. If no minor faults have occurred, these items will not displayed and this menu item is skipped.

1.8 User Configuration Options

Table 4 explains the operation of the run-mode menus. The following general considerations apply:

- These menu options are available to the user to select the default system settings.
- Enter the User Configuration Menu by pressing and holding down then 'GAIN' and 'ALC' buttons on the front panel simultaneously *during power-up*. Release when top display line reads `Configuration`.
- Cycle through menu items using the ↑ and ↓ keys on the front panel. Make selection by pressing the 'MODE' key. Selections result in context-sensitive prompts for sub-items.

Table 4. User Configuration Mode and Status Displays

MENU ITEM	OPTIONS	COMMENTS

`GPIB Address`	`Address = XX`
	Where
	`XX = 1` to `31`
		Allows user to change the GPIB / IEEE-488 device address of the Amplifier.
		Valid address values are from 1 to 31.
		This item will not appear if GPIB Interface has been disabled in the System Calibration Options.

Startup Option: `Power display`	Display `dBm` or Display `Watts`	Sets default units used in displaying power.
Startup Option: `Online/Standby`	`Standby or Gain`	Selects the default power-up mode for the amplifier.
Startup Option: `Gain /ALC`	`Gain` or `ALC`	`ALC: X.X` (in units of dBm or Watts) or `Gain: XX%` (in units of percent)
Startup Option: `ALC Response`	`Filtering: x` Where x = 0 - 9	Allows choosing between fast and slow response for the Automatic Level Control (ALC) function. 0= Minimal filtering, 9= Maximum filtering.
Startup Option: `Initial ALC`	`ALC: XX.X` Where x = ALC min	Allows choosing default initial level for ALC mode at startup.
Startup Option: `Initial Gain`	`Gain: XX.X%` Where x = 00.0 to 100.0	Allows choosing between 0% attenuation to 100% attenuation at startup. Where 0% is maximum, and 100% is minimum.
Startup Option: `RS-232`	`On` or `Off`	Enables or disables the Front Panel Controller's onboard RS-232 serial port.
Startup Option: `*RS-422`	`On` or `Off`	Enables or disables the Front Panel Controller's onboard RS-422 serial port.
Startup Option: `*GPIB Port`	`On` **or** `Off`	Enables or disable the Front Panel Controller's onboard GPIB port.
Startup Option: `*Ethernet Port`	`On` **or** `Off`	Enables or disable the Front Panel Controller's onboard Ethernet port.
`VSWR Alarm:`	`VSWR Alarm: X` Where	The VSWR Alarm Threshold represents the difference between the forward power and the reflected power

	X = 0 to 20	(in dBm). A higher value here represents a configuration that is more sensitive to VSWR.
Restore Defaults	Yes/No	This allows the user to restore ALL settings and calibration parameters to those set at the factory.
Display Brightness	25%, 50%, 75%, 100%	Allows for setting of the brightness of the vacuum-fluorescent display.
Exit	Save? (Y/N)	Exits User Configuration mode and returns the display to Run Mode. The user is given the choice to save options. Other than as mentioned above, choosing "No" will result in all changes being lost, and the previous settings will remain in EEPROM.

***= May not be displayed if Option was not purchased.**

1.8.1 Example: Setting the VSWR Monitor

This item is used to select the difference between the forward and reverse power levels (loosely defined herein as VSWR) that will result in the amplifier automatically setting the gain to zero, then ramping back up toward the previous gain or ALC setting. If the fault condition persists, the output power will continue to cycle until the condition is rectified.

Procedure:

In this example, the unit is set so that the minimum VSWR level is 5 dB.

User: Select "VSWR" from the main System Configuration menu.
Unit: Top line displays: "Using the ↑ and ↓ buttons, set the minimum value for the VSWR alarm, and press the MODE button." Second line displays: "Max VSWR: 2.0 dB"
User: Use the ↑ and ↓ buttons to change the VSWR Alarm level until it reads "Max VSWR: 5.0 dB", then press the MODE button.
Unit: Stores the information and returns to the main System Configuration menu.

2 GPIB, RS-232 AND RS-422 COMMAND SUMMARY

Table 5 lists the commands and responses available via the GPIB (IEEE-488), RS-232 and RS-422 interfaces.

Table 5. Amplifier Control Commands

Command	Operation / Response
*IDN?	Identification query. Response is "OPHIRAMP".
MODE?	Requests the current mode of the unit; returns one of the following values: STANDBY, ALC STANDBY, VVA ONLINE, ALC ONLINE, VVA
MODE xxx	Sets the mode of the unit; the only valid values for xxx are ALC and VVA.
STANDBY	Places the unit into STANDBY mode.
ONLINE	Removes the unit from STANDBY mode.
CHANNEL X	Activates the Channel selected, where X = the channel number. If the value given is invalid, no change is made.
CHANNEL?	Returns the selected channel.
FWD_PWR?	Returns the forward power in the form 'xx.x dBm' where xx.x is a floating point number
REV_PWR?	Returns the reverse power in the form 'xx.x dBm' where xx.x is a floating point number
INPUT_PWR?	Returns the input power in the form 'xx.x dBm' where xx.x is a floating-point number. If the input power detector option is not installed, the response is "Not Available".
ALC_LEVEL?	Returns the current ALC set point in the form 'xx.x dBm' where xx.x is a floating-point number.
ALC_LEVEL xx.x	Sets the current ALC set point. Xx.x is a floating-point value, conforming to standard IEEE nomenclature. If the value given is invalid or out of range, no change is made.
VVA_LEVEL?	Returns the current VVA level in the form 'xx.x %' where xx.x is a floating-point number.
VVA_LEVEL xx.x	Sets the current VVA level. Xx.x is a floating-point value, conforming to standard IEEE nomenclature. If the value given is invalid, out of range, or the unit is in ALC mode, no change is made.
ACK_FAULTS	Acknowledge all faults. Note that the faults might immediately occur again.
FAULTS?	Returns any current faults in the system. The reply will consist of a string that contains a single space (if no faults have occurred) or one or more of the following items, concatenated together and separated by commas: VSWR, Fwd Pwr, Rev Pwr, Input Pwr, Temp, Mon 1, 2…
VSWR_ALARM?	Returns the current set point for the VSWR alarm in the form 'xx.x dB', where xx.x is a floating-point number.
VSWR_ALARM xx.x	Sets the set point for the VSWR alarm. Xx.x is a floating-point value, conforming to standard IEEE nomenclature. If the value given is invalid, out of range, no change is made
MONITORS?	Returns the current levels of all current and voltage monitors in the system. The reply will consist of a string that contains a single space (if no monitors have been defined), or all of the monitors, concatenated together and separated by commas.

REV?	Returns the current Revision in the form X.XX.
NAME?	Returns Name of the Amplifier.
NAME xxxxxxx	Sets the Name of the Amplifier (Up to 31 Characters).
MODEL?	Returns the Model Number of the Amplifier (Needs to be set first for a return response).
MODEL xxxx	Sets the Model Number of the Amplifier (Up to 31 Characters).
SERIAL?	Returns the Serial Number of the Amplifier (Needs to be set first for a return response).
SERIAL xxxx	Sets the Serial Number of the Amplifier (Up to 31 Characters).
COMPANY?	Returns the Company Name of the Amplifier (Needs to be set first for a return response).

Note that the above commands are only available during normal operation (i.e., they are not available when either the Configuration or Calibration menus are active).

2.1 Serial Communication Parameters

For both the RS-232 and RS-422 ports, the following settings must be used:

- Data Rate: 9600 Baud
- Data Bits: 8
- Start bits: 0
- Stop Bits: 1
- Parity: None
- Flow control/handshaking: None

2.2 GPIB Parameters

2.2.1 Message Terminator

For both incoming and outgoing messages, EOI is the used/required terminator.

2.2.2 Commands

Table 6 lists the supported GPIB commands. These GPIB-specific commands are in addition to those listed in Table 5. For more information on the status registers, refer to Figure 2.

Table 6. GPIB Commands

Command	Operation / Response
*IDN?	Identification query. Response is “OPHIRAMP”.
*CLS	Clears all status bits and all faults.
*ESE	Sets bits in the Event Status Enable register. Valid parameters are 0-255 (e.g., *ESE 255).
*ESE?	Reads the contents of the Event Status Enable register.
*ESR?	Reads the contents of the Event Status Register.
*IDN?	Identification query. Response is always OPHIRAMP. This command is also available via the serial interfaces.

*OPC	Operation Complete. This command is accepted, but is not processed.
*OPC?	Operation Complete query. The response is always the character “1”.
*RST	Reset Command. Clears the Event Status Register only.
*SRE	Sets bits in the Service Request Enable register. Valid parameters are 0-255 (e.g., *SRE 255).
*SRE?	Reads the contents of the Service Request Enable register.
*STB?	Reads the Status Byte.
*TST?	Reads self-test results. The response is always the character “1”.
*WAI	Wait to Continue. This command is accepted, but is not processed.

Note that the above commands are only available during normal operation (i.e., they are not available when either the Configuration or Calibration menus are active).

2.2.3 Status Reporting

Status reporting, i.e., the setting of the Service Request (SRQ) line and status bits in the Event Status Register and Status Byte register (STB), are handled per tailored requirements of IEEE-488.2. The reporting structure is presented in Figure 2. This figure shows which status bits are used and which are always a logic zero.

Important Considerations:

1. The ESE and SRE registers have default values of all zeros. If status reporting is desired, these registers must be initialized whenever power to the amplifier is cycled.
2. Once the SRQ is asserted, then a serial poll command will un-assert the SRQ. However, the STB and ESR registers will not clear until an *CLS command is received.

The recommended/expected response to a service request is as follows:

1. The GPIB controller conducts a serial poll to determine which instrument made the request (asserted the SRQ flag). If serial polling is not used, then the controller could read the Status Byte, via the *STB? query to determine if a specific instrument made the request.
2. Issue the standard clear serial poll command if serial polling is used.
3. Read the Event Status Register, via the *ESR? Query to determine the reason for the service request.
4. If the User Request bit in the ESR is set, a fault condition occurred in the amplifier. Read the status of the amplifier’s monitors via the Monitors? query.
5. Clear the ESR and monitor status registers via the *CLS command. Note that the *CLS clears both the GPIB registers (ESR and STB) and acknowledges faults (i.e., has the effect of issuing the ack_faults command). If a serial poll command was not used, the SRQ line is un-asserted via the *CLS command.

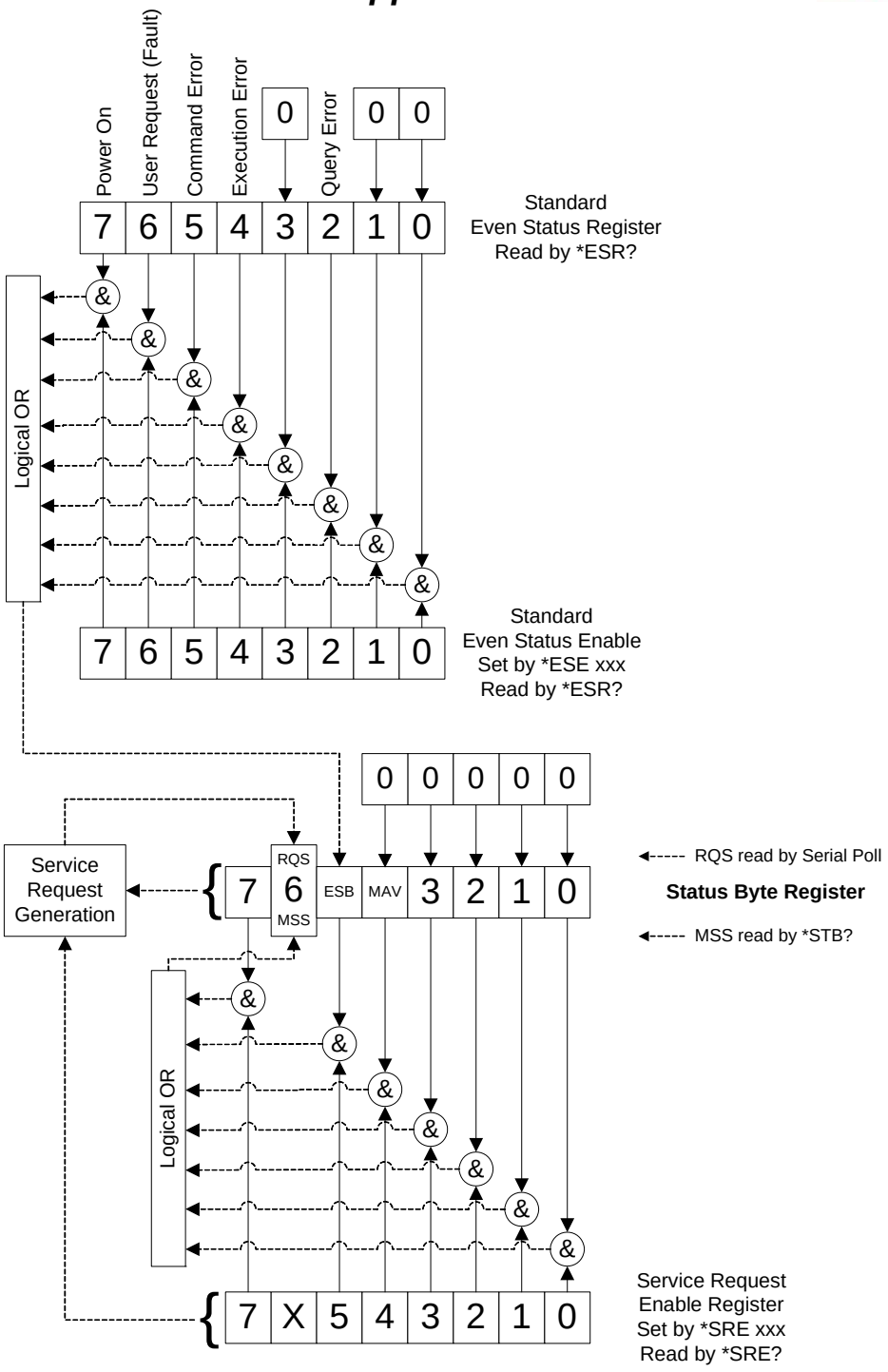

Figure 2. GPIB Status Reporting Structure

3 CALIBRATION

The information in the following section relates to specific technical aspects of the Front Panel Controller and its integration into the RF Power Amplifier that is beyond the scope of normal end-user operation. The information is provided for the purpose of completeness of documentation and is for reference only. Refer to Table 7 during the discussions contained in this section.

All necessary system configuration and calibration is performed at the factory prior to shipment. Specialized skills and equipment are required to perform System Configuration and Calibration, and Ophir RF, Inc., recommends returning the unit to their facility for the performance of any such functions.

Table 7. Calibration Mode Displays

MENU ITEM	OPTIONS	COMMENTS
`Forward Power`	None	Calibrate forward power detector as described in the section below.
`Reverse Power`	None	Calibrate reverse power detector as described in the section below.
`Gain (VVA)`	None	Calibrate Gain adjustment as described in the section below.

View `Peak Values`	`Forward Power`
	`Reverse Power`
	`Input Power`
	`Temperature`
	`Monitors`
		Allows the maximum and minimum (if applicable) values reached to be viewed.

`Monitors`	Multiple as described in the section below.	
`System Info.`	None	Displays system information entered by the factory.
`Exit`	Save or not save settings.	

3.1 System Calibration and Configuration

The options in System Configuration also allow for various features to be enabled or disabled on the system. To enter the system configuration mode press and hold down both the ↑ and ↓ buttons while the unit is powered up. When the display reads "Calibration", release the two buttons. The unit now displays the main system configuration menu. Using the ↑ and ↓ buttons, select the option to configure, and press the 'MODE' button to configure that option. A detailed explanation of all of the options is described below.

3.1.1 Forward Power (CH1 and CH2)

This option calibrates the dBm scale used by the display. Before this step can be completed, the VVA levels must be calibrated. To perform the Forward Power calibration, the amplifier must be attached to an external RF power meter via a load, with a continuous wave input source to the amplifier. Also, the directional coupler must be configured for forward power calibration.

Example:

Unit: Top line displays: "Using the 'UP' and 'DOWN' buttons, adjust the output power to match the level below, and press the 'MODE' button."
Second line displays: "Fwd Pwr=27.0 dBm"

User: Use the ↑ and ↓ buttons to adjust the output power so that the power level read on the RF power meter is 27.0 dBm. Then press the 'MODE' button.

Unit: Top line displays: "Using the ↑ and ↓ buttons, adjust the output power to match the level below, and press the 'MODE' button."
Second line displays: "Fwd Pwr=28.0 dBm"

User: Use the ↑ and ↓ buttons to adjust the output power so that the power level read on the RF power meter is 28.0 dBm. Then press the 'MODE' button.

The user can back-up (e.g., go from 32.0 dBm to 31.0 dBm) by pressing the ALC button.

This process continues until all of the calibration points have been taken. After all of the forward power levels have been calibrated, press the GAIN button, then the unit returns to the main System Configuration menu.

3.1.2 Reverse Power (CH1 and CH2)

This option calibrates the dBm scale used by the display. Before this step can be completed, the VVA levels must be calibrated. To perform the Reverse Power calibration, the amplifier must be attached to an external RF power meter via a load, with a continuous wave input source to the amplifier. Also, the directional coupler must be configured for reverse power calibration.

Example:

Unit: Top line displays: "Using the 'UP' and 'DOWN' buttons, adjust the output power to match the level below, and press the 'MODE' button."
Second line displays: "Rev Pwr=27.0 dBm"

User: Use the ↑ and ↓ buttons to adjust the output power so that the power level read on the RF power meter is 27.0 dBm. Then press the 'MODE' button.

Unit: Top line displays: "Using the ↑ and ↓ buttons, adjust the output power to match the level below, and press the 'MODE' button."
Second line displays: "Rev Pwr=28.0 dBm"

User: Use the ↑ and ↓ buttons to adjust the output power so that the power level read on the RF power meter is 28.0 dBm. Then press the 'MODE' button.

The user can back-up (e.g., go from 32.0 dBm to 31.0 dBm) by pressing the ALC button.

This process continues until all of the calibration points have been taken. After all of the reverse power levels have been calibrated, press the GAIN button, then the unit returns to the main System Configuration menu.

3.1.3 Gain/VVA Levels (CH1 and CH2)

This should be the first item configured on any system. This option configures the VVA control voltage.

Example:
In the following example, the unit will be calibrated so that the VVA control voltage will be 0 volts when the input is to undergo maximum attenuation, and the VVA control voltage will be 3.75 to 5.00 volts when the input is to undergo minimum attenuation (actual voltage varies by amplifier model).

User: Selects 'Gain' from the main System Configuration menu.
Unit: Top line displays: "Using the 'UP' and 'DOWN' buttons, adjust the VVA control voltage to the level specified below, and press the 'MODE' button."
Second line displays: "VVA Level: 100.0%"
User: Connect a voltmeter to Pin 3 of J3, and use the 'UP' and 'DOWN' buttons to adjust the voltage to the specified value (typically 4.75 to 7.0 volts, depending on amplifier model). Then press the 'MODE' button.
Unit: Stores the information and returns to the main System Configuration menu.

3.1.4 Monitor Options

This is a series of menus to configure all of the voltage and current monitors, as well as cutoff points for voltage and current faults.

Example:
In this example, physical monitor 2 will be configured as a current monitor that has a display range of 0.00 to 9.99 amps, with a shutdown fault if the monitor ever exceeds 8 amps.

User: Select 'Monitors' from the main System Configuration menu.
Top line displays: "Using the ↑ and ↓ buttons, select which monitor port you wish to configure, then press the MODE button."
Second line displays: "Monitor 1".
Unit: Use the ↑ and ↓ buttons to select the monitor to edit until the lower line of the display reads "Monitor 2", then press the MODE button.
Unit: Top line displays: "Using the ↑ and ↓ buttons, select what type of monitor this port is, then press the MODE button."

Second line displays: "Monitor OFF".

User: Use the ↑ and ↓ buttons to change the monitor mode until the lower line of the display reads "Current", then press the MODE button.

Unit: Top line displays "Monitor Label:" and the second line displays "I2". In this example, I2 is the next available current monitor (i.e., I1 is already in use, and the label I2 is not in use).

Unit: Top line displays: "Using the ↑ and ↓ buttons, select the display format, then press the MODE button."
Second line displays: "Format: 123"

User: Use the ↑ and ↓ buttons to change the display format until the lower line of the display reads "Format: 1.23", then press the MODE button.

Unit: Top line displays: "Using the ↑ and ↓ buttons, select the reading that corresponds to 0 volts on the input, and press the 'MODE' button."
Second line displays: "I2: 0V –> 0.00"

User: Press the 'MODE' button (no adjustment is required).

Unit: Top line displays: "Using the 'UP' and 'DOWN' buttons, select the reading that corresponds to 5 volts on the input, and press the 'MODE' button."
Second line displays: "I2: 5V –> 0.00"

User: Use the ↑ and ↓ buttons to change the upper voltage range until the lower line of the display reads "5V –> 10.00", then press the 'MODE' button.

Unit: Top line displays: "Using the ↑ and ↓ buttons, select the fault mode, and press the MODE button."
Second line displays: "No Fault Check"

User: Use the ↑ and ↓ buttons to change the monitor fault mode until the lower line of the display reads "Shutdown Fault", then press the MODE button.

If "No Fault Check" was selected, then the configuration of this monitor is completed. If either "Shutdown Fault" or "Notify Fault", then the following choices relating to monitor limits are displayed.

Unit: Top line displays: "Using the ↑ and ↓ buttons, select the upper fault value for the input, and press the 'MODE' button."
Second line displays: "Upper I2= 0.00"

User: Use the 'UP' and 'DOWN' buttons to change the upper fault point until the lower line of the display reads "Upper I2= 8.00", then press the 'MODE' button.

Unit: Top line displays: "Using the ↑ and ↓ buttons, select the lower fault value for the input, and press the MODE button."
Second line displays: "Lower I2= 0.00"

User: Press the 'MODE' button (no adjustment is required).

Configuration for Monitor 2 has been completed at this time. If the other monitors were to be configured, they could be selected at this time. For this example, the user is going to just exit after editing Monitor 2.

Unit: Top line displays: "Using the ↑ and ↓ buttons to scroll through options, then press the MODE button."
Second line displays: "Monitors".

User: Press MODE to configure another monitor, or edit an existing monitor or use the ↑ and ↓ buttons to scroll to "Exit ", then press the MODE button.
Unit: Top line displays "Save Changes?" and the bottom line displays "Yes= ↑ No= ↓ ".
User: Press ↑ , thus saving the changes.

4 INTERFACE PIN ASSIGNMENTS

All connectors are dual row headers, unless otherwise noted and are numbered as follows:

1 2
3 4
5 6
7 8

N-1 N

4.1 Connector J1: Power

This is a 0.156-inch single row header located on the left upper edge of the board. Pin 1 is in the upper right corner. The pin assignments are:

1 - +5V
2 - +12V
3 - GND

4.2 Connector J2: Amplifier Monitor

J2 is located on the upper left edge of the board (when viewed from the front of the panel), pin at the top. The pin assignments are:

1 - Forward Power (analog in)
2 - GND
3 - Reverse Power (analog in)
4 - GND
5 - Temperature
6 - GND
7 - Input Power (analog in)
8 - GND
9 - Spare Analog Input 1
10 - GND
11 - Spare Analog Input 2
12 - GND
13 - Spare Analog Input
14 - GND
15 - Monitor Voltage 1
16 - GND
17 - Monitor Voltage 2
18 - GND
19 - Monitor Voltage 3
20 - GND
21 - Monitor Voltage 4
22 - GND
23 - Monitor Voltage 5
24 - GND
25 - Monitor Voltage 6
26 - GND
27 - Monitor Voltage 7
28 - GND
29 - Monitor Voltage 8
30 - Spare Analog Input 3

4.3 Connector J3: Amplifier Control

J3 is located on the lower right edge of the board, (when viewed from the front of the panel), pin 1 at the top. The pin assignments are:

1 – AMP-BIAS (open collector output to control amplifier power)
2 - GND
3 – VVA-LEVEL (analog output for VVA control, CH1)
4 - GND
5 – VVA-LEVEL (analog output for VVA control, CH2)
6 - GND
7 - Spare Analog OUT
8 - GND
9 - Spare Analog OUT
10 - GND

4.4 Connector J5: GPIB (IEEE-488) Connector

J5 is located on upper left edge of the board, pin 1 in lower right corner. This should work directly with an IDC GPIB-4882 connector. The pin assignments are:

1 - DIO1
2 - DIO5
3 - DIO2
4 - DIO6
5 - DIO3
6 - DIO7
7 - DIO4
8 - DIO8
9 - EOI
10 - REN
11 - DAV
12 - GND
13 - RFD
14 - GND
15 - DAC
16 - GND
17 - IFC
18 - GND
19 - SRQ
20 - GND
21 - ATN
22 - GND
23 - GND
24 - GND

4.5 Connector J6: Digital Inputs and Outputs

J6 is located on lower left edge of the board, pin 1 in lower right corner. The pin assignments are:

1 Digital Input 0
2 - GND
3 - Digital Input 1
4 - GND
5 - Digital Input 2
6 - Digital Input 3
7 - Digital Input 4
8 - GND
9 - Digital Input 5
10 - GND
11 - Digital Input 6
12 - Digital Input 7
13 - Digital Output 0
14 - Digital Output 1
15 - Digital Output 2
16 - Digital Output 3
17 - Digital Output 4
18 - Digital Output 5
19 - Digital Output 6
20 - Digital Output 7

4.6 Connector J7: LAN Status

J7 is a single-row, four-pin header located on lower center edge of the board, pin 1 to the far right. The pin assignments are:

1 – Activity LED
2 – Link LED
3 - LED 1 bias
4 - LED 2 bias

4.7 Connector J8: Unassigned I/O (for future use)

J8 is a dual-row, ten-pin header located on lower center edge of the board, pin 1 to the far upper right. None of the pins are currently assigned.

4.8 Connector J9: RS-232 Serial I/O

P1 is a ten-pin, dual-row header located on the lower left edge of the board (when viewed from the front of the panel), pin 1 on the right. This should work directly with an IDC D-9 connector. The pin assignments are:

1 - GND
2 - N/C
3 - TX
4 - N/C
5 - RX
6 - N/C
7 - N/C
8 - N/C
9 - GND

4.9 Connector J10: RS-422 Serial I/O

P10 is a ten-pin, dual-row header located on the lower left edge of the board (when viewed from the front of the panel), to the immediate right of P1, pin 1 on the right. The pin assignments are:

1 - N/C	6 – RX-
2 - N/C	7 - GND
3 - GND	8 - GND
4 - GND	9 – TX+
5 – RX+	10- TX-

4.10 Connector J11: Test

J11 is a four-pin, single-row header located on the bottom left of the module, just below P10 (4-pin, 0.1**”** single row header). The pin assignments are:

1 - Factory	3 – Spare
2 - GND	4 - GND