5. Close the 4-pack master box and seal the top seam with 2" clear box tape, using three layers to assure strength. Then put 4 pieces of fiberglass strapping tape over the edges. Clearly mark the RA number on the outside of the box before shipping.

Figure 21: Power amplifier segments ready to ship.

RETURN PACKAGING OF THE POWER AMPLIFER SEGMENT

1. Start with an empty power amplifier segment box, shown in Figure19. If you don't have one please inform Comwave customer service when you contact them for a return authorization (RA) number, which you MUST do prior to returning ANY equipment.

2. Place the power amplifier segment into the box, as shown in Figure20. The heatsink should always face up and the connectors on the rear of the power amp segment rest against the soft gray foam for protection.

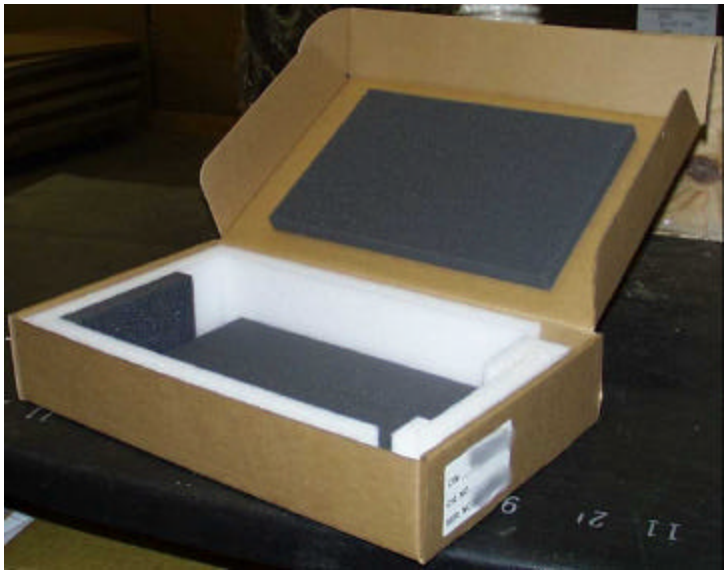


Figure 19: Empty power amplifier segment box.

Figure 20: Boxed power amplifier segment.

3. Fold the edges of the inner box in and close.

4. Place the inner box into the 4-pack master (outer box), being sure to include three empty power amplifier boxes for a secure fit, as shown in Figure21. The power amplifier segments are generally packed 4 per master box and shipped. When returning segment(s) please pack them the same way, ALL boxes will be returned to you. If you need to assemble a master box, use 2" clear box tape over the bottom seam, using three layers to assure strength. Then put 4 pieces of fiberglass strapping tape over the edges.

RETURN PACKAGING

Below is a pictorial view of the following steps.

1) Begin with an empty Thomcast box, if you don't have one please inform customer service when you contact them for a return authorization (RA) number, which you MUST do prior to returning ANY equipment. ***NOTE: A box consists of 4 parts, one cardboard box, one cardboard tube, and two polyethylene endcaps.***
   a) To assemble a flattened box put three[23] layers of 2" clear box tape over the bottom seam, then position four pieces of fiberglass strapping tape over the edges.
2) Put the cardboard tube in the box.
3) Place the polyethylene endcaps against the sides of the equipment. ***NOTE the front panel fits snuggly into a slotted opening in the endcap.***
4) Put the chassis in the box.
5) Close the box and seal the top seam with three layers of 2" clear box tape, then position four pieces of fiberglass strapping tape over the edges.
6) Affix a shipping label to the box see DOC20-0001, preceding this document, for shipping address.
7) **Mark the RA number on the outside of the box before shipping.** If the RA number is not clearly visible Thomcast cannot be held responsible for delays in repair and return time.

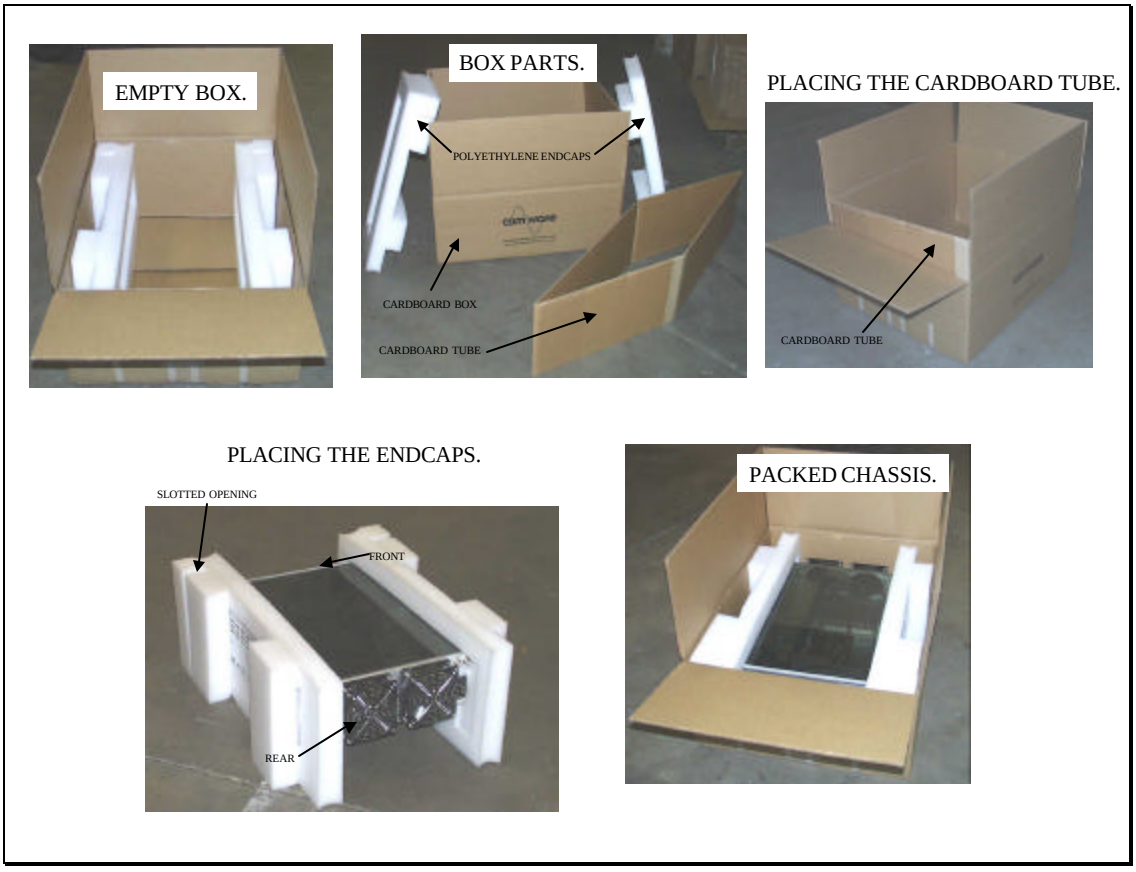


Figure 18: Equipment packing.

[23] Using several layers of tape assures the strength of the box.

CUSTOMER SERVICE

DOC20-0001

CONTACT INFORMATION
DURING BUSINESS HOURS
Inquiries may be directed to Thomcast Communications, Comwave Division during business hours, 8 am to 5 pm Monday through Friday. When the automated attendant answers you will be given the option of dialing your party direct or speaking with the operator.

AFTER BUSINESS HOURS
If you need emergency assistance due to equipment shutdown or malfunction, customer support personnel are available 24 hours a day. Call Thomcast at one of the numbers listed below; when the automated attendant answers press 6, leave your name, company name, phone number, equipment model number(s), and a brief description of the problem you're encountering. When you hang up the system will automatically page the on-call technician who will then return your call in a timely manner. You can listen to the message prompt for other options as well, however, for emergency assistance you MUST use option 6.

Thomcast Communications, Comwave Division **Crestwood Industrial Park, 395 Oakhill Road** **Mountaintop, PA 18707**	
1-800-266-9283	USA & Canada
1-570-474-6751	International[21] & USA
(Please note, as of 12/98, our area code changed from 717 to 570)	
1-570-474-5469	FAX
(Please note, as of 12/98, our area code changed from 717 to 570)	

COMMENTS/SUGGESTIONS
Please forward comments regarding documentation content and/or layout, or suggestions to improve Thomcast publications to ksimeone@thomcastcom.com

EQUIPMENT RETURNS
If the equipment requires return for factory service, please follow the guidelines listed. Thomcast cannot be held responsible for damaged equipment received due to improper packing; contact Thomcast with any questions or concerns.

1. ***Contact Thomcast:*** Call Thomcast to report the problem and to **obtain a "Return Authorization" number[22] (RA).** This enables accurate tracking and identity of returned equipment for prompt and efficient service.

2. ***Obtain packaging materials:*** Use original boxes and packing materials when returning any equipment. This will safeguard against most in-transit damages. If original boxes and packing materials are not available, contact Thomcast to obtain replacement materials prior to shipping, they are provided at a nominal cost.

4. ***Pack equipment:*** Use original packing materials and directions provided. Most equipment is packed in a box within another box; this varies with each product. Double boxing provides maximum protection.

Caution: Do not pack equipment using "PEANUTS" as filler it does NOT provide sufficient protection during shipping. Rough handling by the carrier may cause permanent damage to the equipment. Thomcast cannot be held responsible for damaged equipment received due to improper packing.

[21] International calls must dial the country code before the phone number, i.e. 001-570-474-6751.
[22] If you do not obtain an RA number **prior** to returning equipment Thomcast cannot be held responsible for delays in repair and return time.

POWER AMPLIFIER SEGMENT SPECIFICATIONS

Table 3: DOC19-0014, REV D.

PARAMETER	*SPECIFICATION*
Primary Voltage	48 VDC
Primary Current	4.9 A
Secondary Voltage	10 ±0.5 VDC
Secondary Current	400 mA
Communication Port	RS-232 and RS-485
Input Power Digital Analog	 12.0 dBm 17.5 dBm (@ POut1dB)
Output Power Digital Analog	 41.5 dBm 47.0 dBm (@ POut1dB)
DC Connector	Floating Molex p/n 15-06-0141
Impedance / RF Connector	50 O / Blindmate
Operating Temperature	0° to 50° C
Dimensions	10.3" H x 2.1" W x 17.1" D 26.16 cm H x 5.33 cm W x 43.43 cm D
Approximate Weight[20]	10 lbs (4 Kg)

[20] Weight doesn't include shipping material.

POWER AMPLIFIER SEGMENT THEORY OF OPERATION

DOC14-0008

The power amplifier segments of the high power single channel transmitter series or broadband booster series use the latest technology in power FET's. The transistors provide high output power, as well as more linearity and higher efficiency. Mechanically, the power amplifier segments have a plug-in architecture that allows hot replacement. In addition to hot replacement, the architecture of the amplifier enables flexibility to tailor the system to higher output power levels and can be easily upgraded.

The power amplifier segment consists of a microwave amplifier[2], control board[1], DC to DC converter[3], and a front panel. A microcontroller system, located on the control board, supervises and controls the power amplifier segment in each of its functions. The DC to DC converter reduces 48 V_{DC} front-end power supply input to the nominal amplifier voltage of 10.5 V. The front panel displays the status of the amplifier segment and interfaces the control board to a computer by means of a serial RS-232 port[4]. See Figure48 for numerical references.

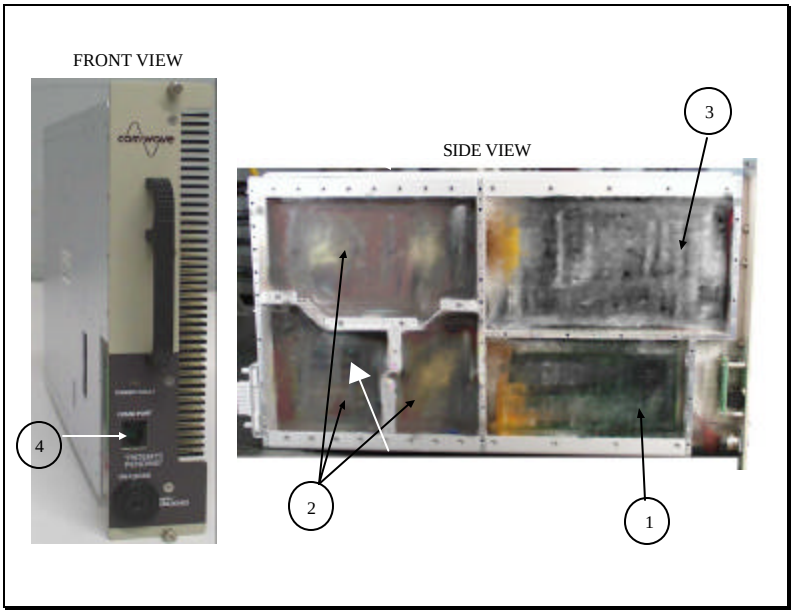


Figure 16: Power amplifier segment.

OPERATION

The amplifier segment is equipped with a key lock switch on the front panel to retain it in place. When pushing-in or pulling-out the Segment, turn the key lock switch to the OFF position. After plugging the amplifier segment into the sub-rack and tightening the front panel thumbscrews, turn the key-lock switch to the ON position. The 10 V_{DC} secondary power supply will start up the control board, which applies a negative voltage to the gates of the FET's and turns the DC to DC converter on. It also adjusts the transistor's current and releases the input signal to the microwave amplifier. The airflow passes through the heatsink from the front to the rear of the sub-rack. The airflow loss to the other power amplifier segments during hot replacement is negligible.

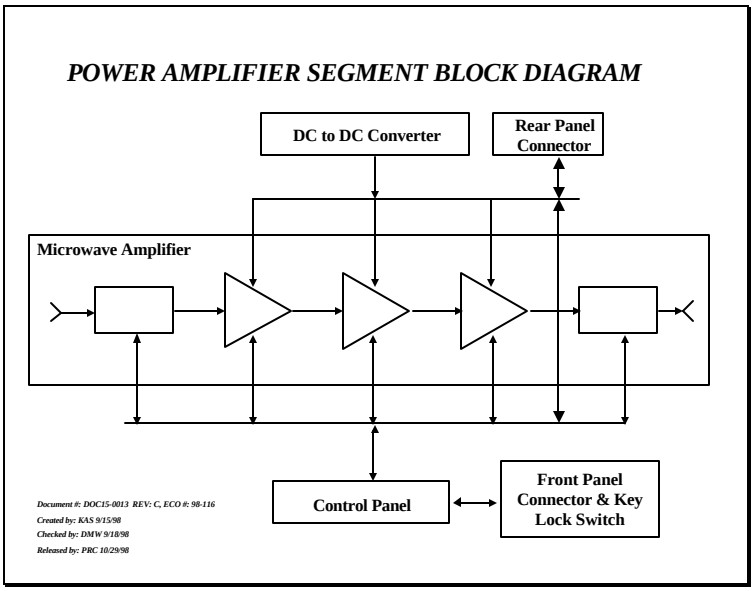


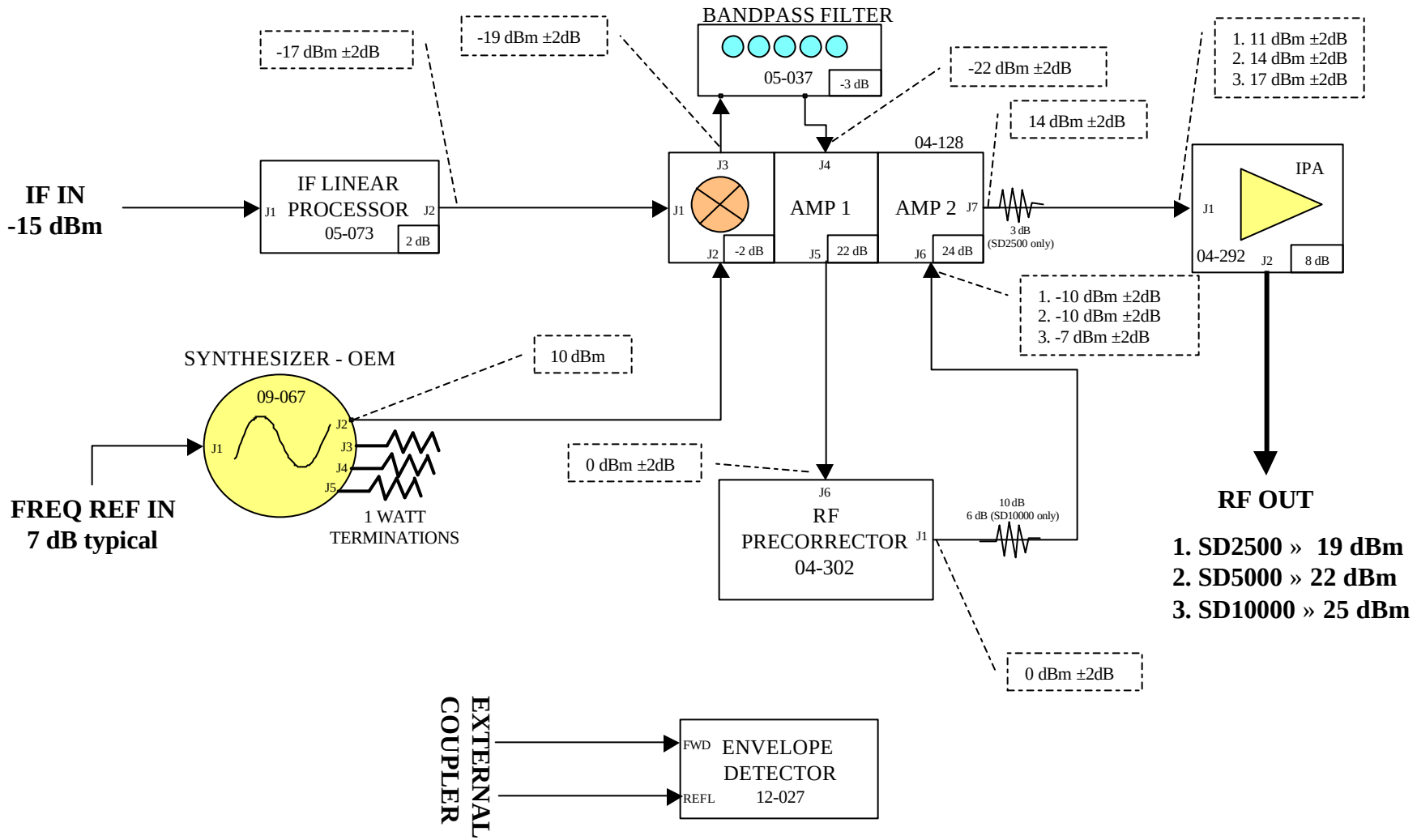
Figure 17 : DOC15-0013 power amplifier segment block diagram.

SD-SERIES FREQUENCY FIXED DIGITAL DRIVER (2RU) SPECIFICATIONS[18]

DOC19-0008

Parameter	*Specification*	*Notes / Test Conditions*
Average Output Power	1.25 Watts @ maximum drive level	2^{23}-1 PN data sequence (at transmitter output)
IF Input Frequency	44 MHz	Other frequency options available
Impedance/Connector Input Output	 75 Ω/BNC-female 50 Ω/N-female	
Average Input Power	-15 dBm ± 0.5 dB	2^{23}-1 PN data sequence (at transmitter output)
Output Frequency	2000 - 2700 MHz	In select bands
Frequency Stability	≤ ±500 Hz ≤ ±1 Hz (Optional GPS)	
SSB Phase Noise Direct measurement of microwave LO	= -80 dBc/Hz @ 10 KHz offset = -110 dBc/Hz @ 10 KHz offset	Optional Standard (recommended for digital transmission)
Power Requirement	117/230 V_{AC} ±10%; 50/60 Hz (=150 VA)	
Operating Temperature	0°C to +50°C	Frequency stability and equipment functionality guaranteed
Specified Temperature Range	13° to +33°C	All Specified parameters guaranteed
Relative Humidity	95% non-condensing	
Hum and Noise	=-60 dBc	
Dimensions	3.5" H x 19" W x 17" D 8.89cm H x 48.26cm W x 43.18cm D	
Approximate Shipping Weight[19]	17.5 lb (7.93kg)	

[18] All factory test measurements made at approximately 23° C.
[19] Shipping weight includes the transmitter and shipping material only. Digital modulators are typically shipped directly from the manufacturer.



THOMCAST COMMUNICATIONS Inc.
COMWAVE DIVISION

TITLE:
Block Diagram, SD Series Driver

REV	Description	ECO # NAME/DATE

DRAWN: KAS / 12-6-99
CHECKED: DMW / 12-7-99
RELEASED: PRC / 12-7-99

DWG. NUMBER: DOC15-0067
Scale: none
Sheet 1of 1
REV: A

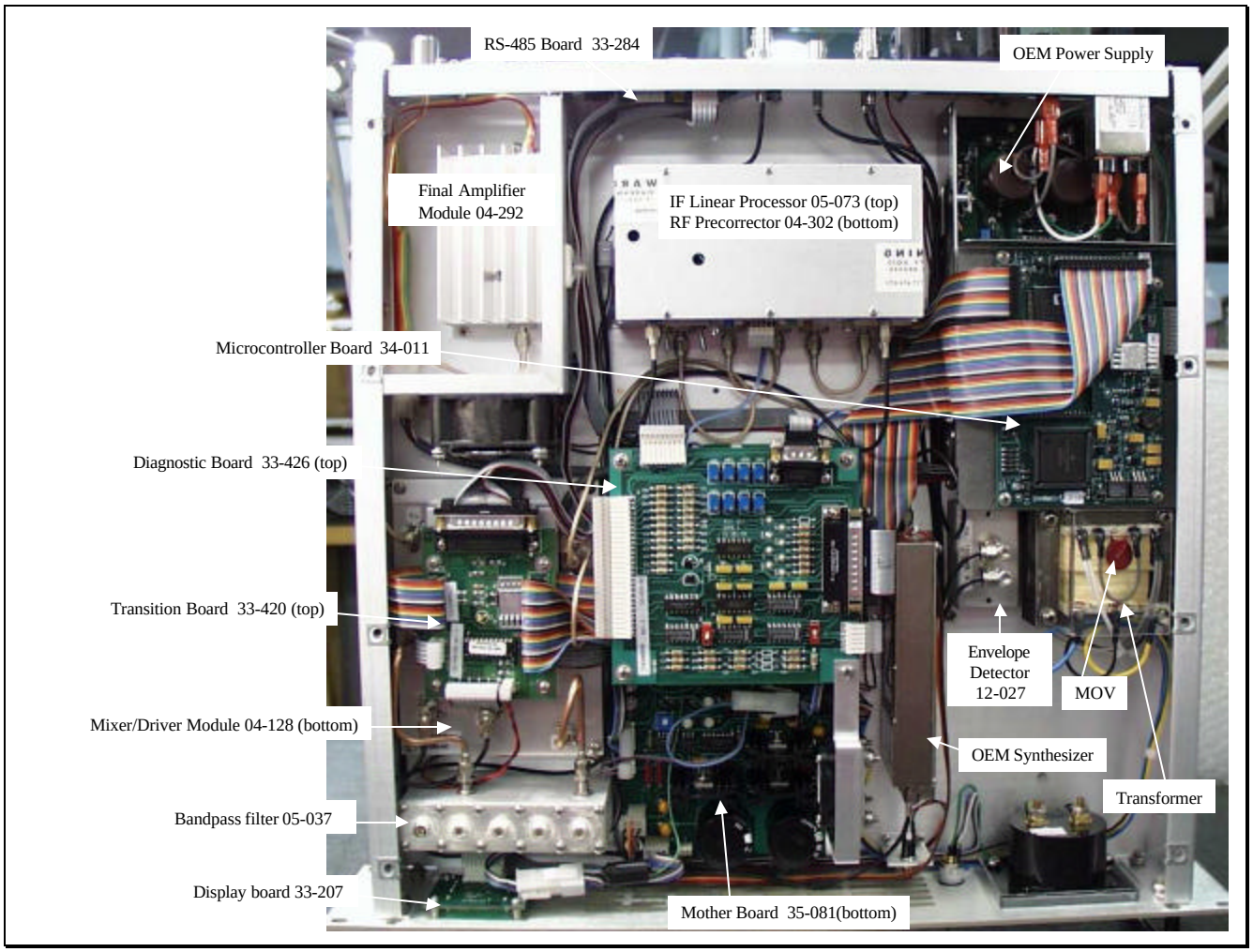


Figure 15: Driver layout.

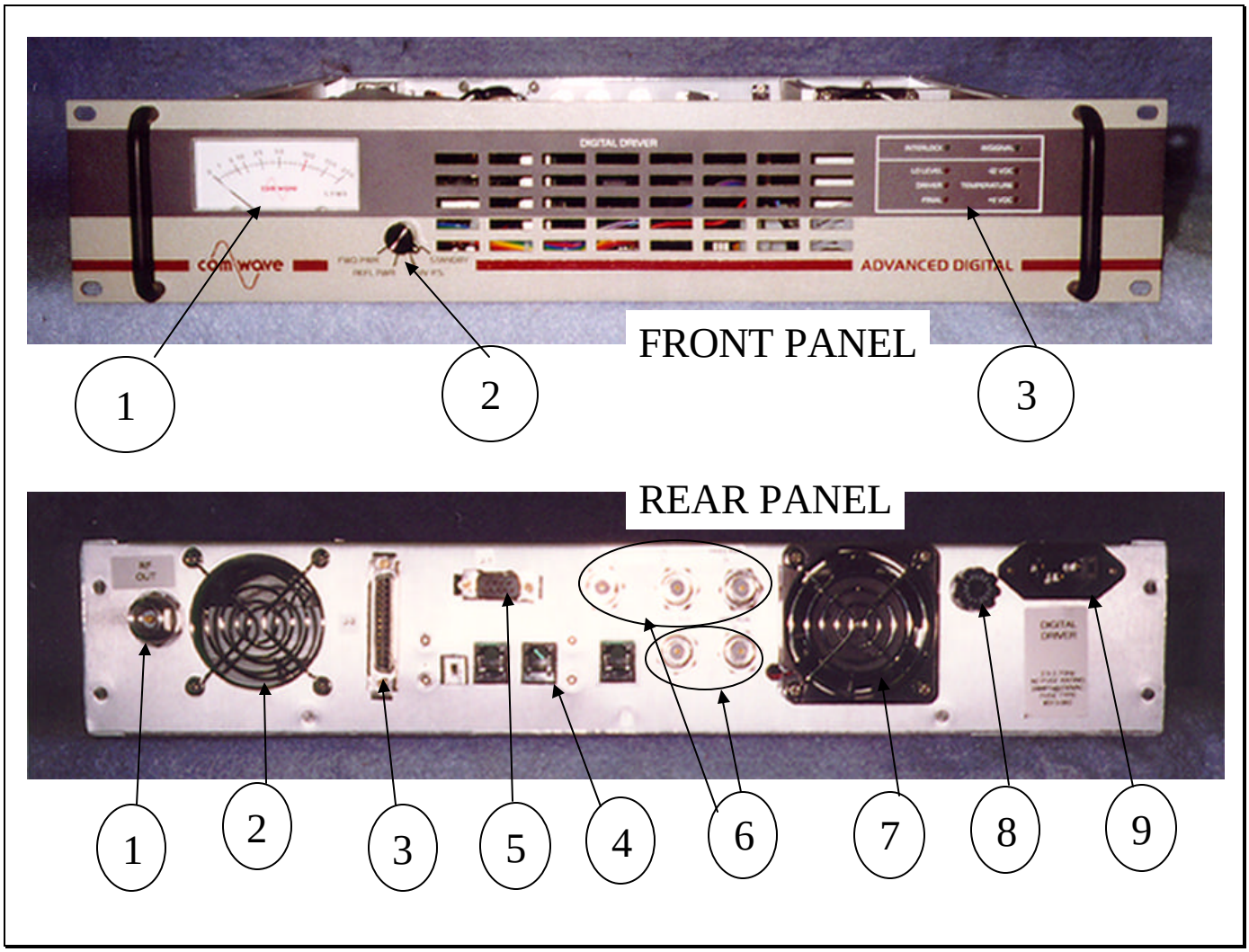


Figure 14: Driver front and rear panels.

The following status monitoring RED LED's remain OFF during normal operation. When a failure is detected, the appropriate LED will illuminate RED. Controlled automatic transmitter shut down is a function of failure severity. Presence of a RED status LED with normal meter readings and/or normal transmitter operation indicates an out of tolerance condition with that circuit.

TEMPERATURE: Illuminates RED when internal chassis temperature exceeds 140° Fahrenheit (60° Celsius). Transmitter shut down occurs. Allow transmitter to cool. Transmitter reset can be attempted by rotating the front panel function switch to STANDBY.

LO LEVEL: Illuminates RED when the local oscillator loses phase lock. Transmitter shut down occurs.

DRIVER: Illuminates RED to indicate a failure or an out of tolerance condition with the driver module. Transmitter usually operates at reduced output power.

FINAL: Illuminates RED to indicate a failure or an out of tolerance condition with the intermediate power module. Transmitter usually operates at reduced output power.

+11 V_{DC}: Illuminates RED when a failure in the + 11 volt DC main switching power supply or an out of tolerance condition has been detected by the diagnostic and monitoring circuitry.

-12 V_{DC}: Illuminates RED when a failure in the -12 V_{DC} gate bias/interlock has been detected.

REAR PANEL

1. ***RF OUT:*** RF output connector (Female N type).
2. ***GRILL:*** Air outlet vent for cooling.
3. ***J2:*** Female 25 pin D-Sub connector for diagnostics monitoring.
4. ***ACCESS HOLES:*** For three phone jack connectors and a termination switch from the RS 485 Board used for communication to ComView Network.
5. ***J1:*** Female nine pin D-Sub connector for system monitoring and control.
6. ***INPUT CONNECTORS (FEMALE BNC'S):***

   IF IN: Input signal from modulator.

   LO IN: Input signal provided by an external source. (ONLY USED IN AGILE TRANSMITTER)

   FREQ REF: Input signal from an external frequency reference source.

   FWD PWR IN: RF sample from an external coupler.

   REFL PWR IN: RF sample from an external coupler.
7. ***FAN:*** A rear mounted DC Fan provides switching power supply cooling.
8. ***FUSE:*** Main line fuse location (2 amperes).
9. ***AC INPUT:*** AC Line input power cord connector.

DIGITAL DRIVER THEORY OF OPERATION

DOC14-0035

The digital driver transmitter receives a digitized intermediate frequency signal typically at -15 dBm, which is upconverted to an S-band frequency. The transmitter is capable of providing an output of 1.25 W average power. Refer to the block diagram for the RF signal path.

The IF signal being received is sent to an IF linear processor pre-correcting for frequency response, group delay, and detection of IF presence. The IF linear processor output is applied to a mixer/amplifier module where it is mixed with a microwave local oscillator. A bandpass filter follows the mixer to prevent out-of-band products from being amplified and transmitted. The filtered mixer/amplifier output drives the first intermediate power amplifier. Then a microwave precorrector module introduces precorrection to reduce amplitude distortions of the power amplifier. It contains an ALC circuit for maintaining 100% output power over a ±2 dB gain variation. Both precorrection and ALC can be separately turned off by individual switch controls located on the module exterior. Two more stages of amplification assure the correct level for the final intermediate power amplifier.

The intermediate power amplifier is a broad band, fixed gain linear amplifier that does not require any tuning. An external coupler provides a metering sample to an envelope detector for forward and reflected powers through 3 dB isolation attenuators. The average output power is dependent on the drive level needed by the power amplifier array to achieve rated power.

FRONT AND REAR PANEL DESCRIPTIONS
Refer to the Figure below for numerical references.

FRONT PANEL

1. ***METER:*** Provides a visual indication of transmitter status and performance of +11 V_{DC} switching power supply, peak forward power, or reflected power. The meter is calibrated to display relative measurements. The four-position rotary selector switch controls meter function.

2. ***FUNCTION SWITCH:*** A four position, user selectable, rotary switch that controls front panel meter monitoring. The following parameters are selectable for monitoring by the function switch.

   STANDBY: Disables transmitting. Power remains applied to all circuits, except the microwave amplifier modules. Meter will read approximately 0 %.

   + 11 V PS: Provides status of main switching power supply. Meter reads 100 % indicating proper switching power supply voltage.

   REFL PWR: Relative reflected power measurement. Readings of less than 10 % are typical.

   FWD PWR: Relative forward output power measurement. 100 % meter reading confirms correct output power.

3. ***LED's:*** Status monitoring LED's which provide visual indication of operating parameters and internal diagnostics. The following status monitoring LED's illuminate GREEN during normal operation. Absence of an LED indicates missing signal or parameter that results in a controlled automatic transmitter shut down.

   IN SIGNAL: Illuminates GREEN when IF is present or when the bypass switch on the motherboard is in bypass.

   INTERLOCK: Illuminates GREEN when Interlock Logic conditions are satisfied. Interlock Logic conditions are satisfied when all Microwave Amplifier Modules have -12 V gate bias.

MONTHLY MAINTENANCE RECORD[17]

DOC18-0006

Date	*Channel*	*Analog Metering*			*Failure LED's*	*Comments*
		FWD	*REFL*	*+11V PS*		

[17] You are encouraged to make copies of this document for future use. Recording the meter readings on a monthly basis assists Thomcast personnel when problems arise.

Figure 12: Power amplifier segment heatsink.

POWER AMPLIFIER SEGMENTS:
Pull each power amplifier segment one at a time from the front of the rack and vacuum the heatsinks. Due to the hot replacement feature, if one segment is removed at a time, the transmitter does not need to be turned off. Plug the segment back in after cleaning.

NOTE: Be sure not to bend or damage the fins of the heatsinks during cleaning.

POWER SUPPLY:
Remove the blanking panel from the rear of the rack and clean any debris found on the power supply located behind the driver. Replace the blanking panel after cleaning.

EXHAUST FANS:
Clean the exhaust fans attached to the rear door of the rack, removing the fan guards if necessary. The RF connection will need to be removed before the door can be opened. Note: The number of fans is dependent upon the transmitter configuration.

Figure 13: Blanking panel & exhaust fans.

MAINTENANCE

DOC18-0012

COMWAVE products have been carefully designed to be maintenance free. Only periodic inspection and cleaning is necessary.

INSPECTIONS

1. Periodically inspect cooling fans on the rear door of the rack and the heatsinks of the power amplifier segments for heavy accumulations of dirt and/or insects. Heavy accumulation of foreign debris impedes cooling effectiveness and could lead to premature failure. Should any debris be detected, shut down the transmitter and follow the cleaning instructions to remove debris from transmitter.

   NOTE: The agile transmitter will automatically recover the channel of the transmitter that is being cleaned.

2. Record analog meter readings of each driver on a monthly basis. This establishes a performance historical database. These entries can identify degraded performance before it becomes a hard failure.

3. After performing routine maintenance, be sure to check the tightness of all cable connections and especially the integrity of crimp type connectors.

CLEANING

DRIVER:
Pull the driver from the front of the rack and remove the top cover. Clean the fan on the rear panel of the driver and remove any internal accumulation of foreign debris concentrating on the areas highlighted in the diagram below.

NOTE: The faceplates and covers may be cleaned using a mixture of a mild detergent and water.

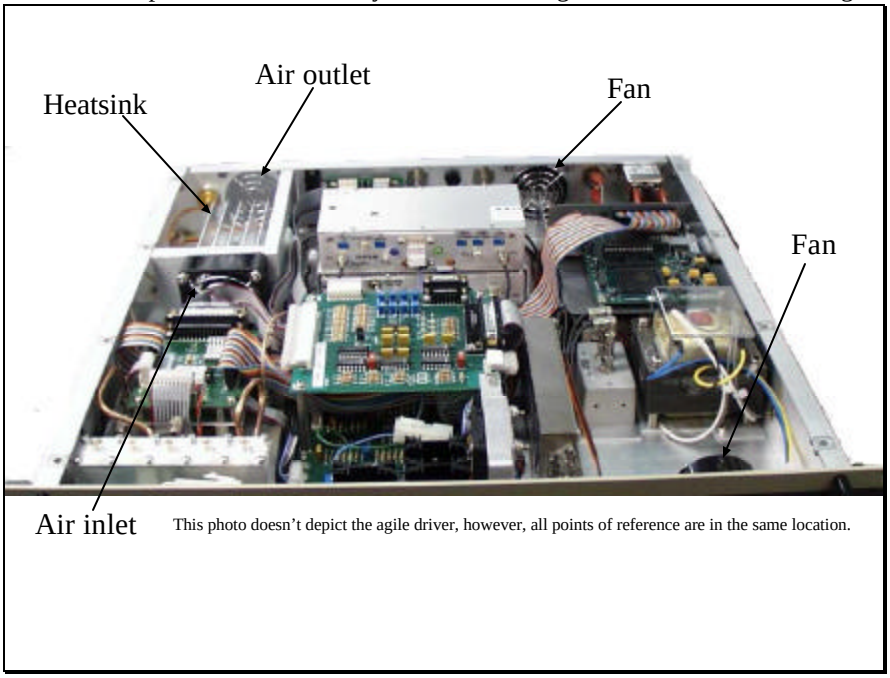


Figure 11: Internal view of driver.

EQUIPMENT FUSING AND PROTECTION

DOC18-0009

Resettable and replaceable fuses[16] are found in the driver and power amplifier segment. Refer to the tables below for fuse locations and values.

Table 1: Driver fuse locations.

LOCATION	*REFERENCE*	*VALUE*
Motherboard	F1	10 amperes
Microcontroller board	F1, F2	.75 amperes resettable
Microcontroller board	F3	.30 amperes resettable
Microcontroller board	F4	.35 amperes resettable
Rear Panel AC	Input	4 amperes slow blow @ 117 V_{AC} or 2 amperes slow blow @ 230 V_{AC}
100 watt Power Supply (OEM)		AC line fused internally

Table 2: Power amplifier segment fuse locations.

LOCATION	*REFERENCE*	*VALUE*
Microcontroller board	F1, F2	.75 amperes resettable
Microcontroller board	F3	.30 amperes resettable
Microcontroller board	F4	.35 amperes resettable
DC - DC converter board	F1	10 amperes

Thermal Protection: The AC line input is supplied with voltage suppressers to protect the equipment from moderate power surges. Thermal protection is accomplished using thermostats that close when the internal temperature exceeds 140° Fahrenheit (60° Celsius). When thermal shut down occurs, logic control removes power from the finals until the unit is sufficiently cooled.

Interlocks: Interlocks are designed for transistor bias protection for both the FET gate and drain power supply voltages. Refer to the motherboard description for more information.

Surge Suppression: Thomcast transmitters employ a metal oxide varistor (MOV) voltage suppressor across the AC line input for protection from moderate power surges. The surge suppressor value is dependent upon the AC line input voltage. 117 V_{AC} employs a 150 V_{AC} MOV and 230 V_{AC} uses a 275 V_{AC} MOV.

This system can be configured to operate at either 117 V_{AC} or 230 $V_{AC,}$ when leaving the factory it is typically configured to operate at 230 V_{AC}. The power supply drawer operates ONLY from 230 V_{AC}.

Figure 10: Circuit breaker.

A three-phase 15-Ampere circuit breaker is provided with each transmitter for system protection. In a phase-to-phase system the circuit breaker is 25-Ampere. It is located on the rear of the rack above the fans. When the current exceeds its rating the circuit breaker trips and the transmitter, including AC to DC front end converter, driver drawer, ultra low phase noise drawer *(Agile applications only)*, power amplifier segments and fans are shut down. A plastic cover is provided to protect the circuit breaker from accidental shut down.

[16] Replace only with the same type and rating.

TROUBLESHOOTING WORKSHEET

DOC18-0011

This troubleshooting worksheet identifies each interface pin, the associated internal test point, nominal value, and the expected voltage range. Please fill in all blank spaces completely.

J2: Rear Panel Diagnostic Pin	*Function Checked*	*Low Limit "V_{DC}"*	*Nominal Voltage "V_{DC}"*	*High Limit "V_{DC}"*	*Measured Voltage*
1	Ground	0.00	0.00	0.00	
2	+12 V_{DC} PS	+11.88	+12.00	+12.12	
3	-12 V_{DC} PS	-12.12	-12.00	-11.88	
4	+11 V_{DC} PS	+8.84	+11.00	+12.51	
5	+5 V_{DC} PS	+4.50	+5.00	+5.50	
6	Mixer	0.98	1.95	2.86	
7	AMP 1	1.24	2.75	3.78	
8	AMP 2	0.88	1.08	1.46	
9	Final Q2	1.49	2.20	2.98	
10	N/A	N/A	N/A	N/A	
11	N/A	N/A	N/A	N/A	
12	N/A	N/A	N/A	N/A	
13	System Reset	3.40	5.00	5.50	
14	ALC	1.00	1.40	2.00	
15	PA Standby	3.40	5.00	5.50	
16	PA Fault	3.40	5.00	5.50	
17	Driver Standby	3.40	5.00	5.50	
18	Reset 1	3.40	5.00	5.50	
19	Reset 2	3.40	+5.00	5.50	
20	N/A	N/A	N/A	N/A	
21	LO	0.00	.30	1.02	
22	Temp	0.00	0.70	2.50	
23	FWD Power	0.74	1.40	2.32	
24	N/A	N/A	N/A	N/A	
25	REFL Power	0.00	0.10	0.32	

FILL IN ALL THE ABOVE BLANK SPACES COMPLETELY

COMPANY NAME: _____ CUSTOMER'S NAME: _____
PHONE NUMBER: _____ FAX NUMBER: _____
MODEL: _____ CHANNEL: _____ SERIAL NUMBER (REAR PANEL): _____

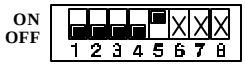
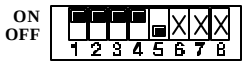
SEND RESULTS TO: **THOMCAST COMMUNICATIONS, COMWAVE DIVISION**
ATTENTION TECHNICAL SUPPORT

TOLL FREE PHONE (U.S.A. & Canada): 1-800-COMWAVE (1-800-266-9283)
International and U.S.A. 1-570-474-6751[15]
FAX 1-570-474-5469

15 International calls must dial the country code before the phone number, i.e. 001-570-474-6751.

NODE ADDRESSES

1 to 16 Channels

MODULE POSITION	*NODE ADDRESS*	*NODE SWITCH SETTING*
1	**2**	
2	**3**	
3	**4**	
4	**5**	
5	**6**	
6	**7**	
7	**8**	
8	**9**	
9	**10**	
10	**11**	
11	**12**	
12	**13**	
13	**14**	
14	**15**	
15	**16**	
16	**17**	

NOTE: Do not change node switch Settings 6, 7, and 8. They should remain as set by the factory.

Figure 9: DOC22-0019 node addresses.

REFL PWR *(Reflected power is greater than 10%)*	
CAUSES:	***REMEDY:***
Loose RF cable connection(s)	Check integrity of all RF cable connections
RF cable kinked	Check cabling for kinks or severe bends
Wave guide leak/depressurized	Check wave guide pressure
Reflected metering out of adjustment	Calibrate reflected metering per calibration documentation in section 3 of the manual
	Measure voltages at 25-pin diagnostic interface

FWD PWR *(Meter does not indicate 100% forward power)*	
CAUSES:	***REMEDY:***
Driver Module	Confirm output power
Final Module(s)	Troubleshoot per front panel LED diagnostic display
Switching Power Supply	Check for defective module
Forward metering out of adjustment	Calibrate forward power metering per calibration documentation in section 3 of the manual
	Measure voltages at 25-pin diagnostic interface, J2

POWER AMPLIFIER SEGMENT

Hot replacement of the power amplifier segment may be required if a failure occurs. To remove a segment, turn the key-lock switch to the OFF position, loosen the thumbscrews on the segment's front panel and slide the failed segment out of the sub-rack. Before the replacement segment can be installed, the node address must be set, refer to document # DOC22-0019. A set of DIP switches is accessible through the cover of each segment directly behind the key-lock switch. Set the DIP switches of the replacement segment to the same positions as the failed segment's DIP switches. Refer to the installation procedure in this manual to replace power amplifier segments.

-12 V_{DC} *(Low or missing -12 V_{DC})*	
CAUSES:	***REMEDY:***
Defective -12 V_{DC} source	Check -12 V_{DC} source
Disconnected module	Check module connectors
Shorted module	Measure voltages at 25-pin diagnostic interface, J2

TEMPERATURE *(Internal chassis temperature exceeded +140 degrees Fahrenheit (+60 degrees Celsius)*	
CAUSES:	***REMEDY:***
Fans inoperative	Check fan operation
Heavy accumulation of debris on fans or heatsinks	Check site air conditioning
Module(s) overheating	Allow transmitter to cool, check latched failure logic by rotating function switch momentarily to "STANDBY"
Site air conditioning	Measure voltages at 25-pin diagnostic interface, J2

+11 V_{DC} *(Switching power supply voltage has deviated beyond a set operating window {high or low}*	
CAUSES:	***REMEDY:***
Defective main input line fuse	Check switching power supply output voltage
Switching power supply module	Check for defective fuses(s)
Open switching power supply fuse, F1	Measure voltages at 25-pin diagnostic interface, J2
Shorted amplifier module	Measure voltages at 25-pin diagnostic interface, J2
Open motherboard fuse, F1	

A 25-pin computer type diagnostic interface connector, labeled J2, is located on the rear of the chassis to assist in troubleshooting. Critical power supply, module, and motherboard voltage test points can be accessed/monitored at this location. Should a failure occur, the combination of meter readings, diagnostic LED status lights, and the diagnostic interface voltage test points help identify the failure.

ANALOG METER

The analog meter provides a visual indication of the +11 V_{DC} switching power supply, peak relative forward or reflected power. The +11 V_{DC} switching power supply and forward power should indicate 100%. Reflected power meter readings less than 10% are typical.

+11 V PS *(Meter does not indicate 100%)*	
CAUSES:	***REMEDY:***
Defective switching power supply	Check for defective fuse(s)
Shorted module	Check switching power supply output voltage
Open switching power supply fuse, F1	Troubleshoot per front panel LED diagnostic display
Switching power supply out of adjustment	Adjust switching power supply output voltage per calibration documentation is section 3 of the manual
Metering out of adjustment	Calibrate meter per calibration documentation in section 3 of the manual
	Measure voltages at 25-pin diagnostic interface, J2

SD/SDA SERIES TROUBLESHOOTING

DOC18-0010

DRIVER

The driver is equipped with comprehensive diagnostic circuitry that monitors the status of power amplifier modules and critical circuits so failures can be readily detected. Observing the front panel LED diagnostic display, analog panel meter and diagnostic interface will inform you of the complete operational status. The following lists explain various failure mode displays and possible solutions.

NOTE: Due to internal transmitter design, there are no user serviceable modules, parts, or components. Repair of these modules is not recommended or advised. Contact COMWAVE customer support should a failure occur.

The LED's listed below continuously operate GREEN during normal operation. Absence of a green LED indicates a missing signal or parameter that results in a controlled automatic shutdown

IN SIGNAL *(Missing IF input signal)*	
CAUSES:	***REMEDY:***
Defective cabling to modulator baseband IF INPUT	Check Cabling
Modulator Failure	Verify IF source signal
Missing IF source signal	Replace modulator
	Measure voltages at 25-pin diagnostic interface, J2

INTERLOCK *(Missing system Interlock signal)*	
CAUSES:	***REMEDY:***
RF module unplugged or shorted	Check driver for disconnected module(s)
	Measure voltages at 25-pin diagnostic interface, J2

The following LED's continuously illuminate RED when a failure is detected. Controlled automatic transmitter shut down is a function of the failure and severity. Presence of a RED status LED with normal meter readings and/or normal transmitter operation indicates an out of tolerance condition with that circuit.

LO LEVEL *(Local Oscillator failure)*	
CAUSES:	***REMEDY:***
Oscillator failure	Check external cabling
10 MHz reference missing or low level	Measure voltages at 25-pin diagnostic interface, J2

DRIVER *(Defective driver module)*	
CAUSES:	***REMEDY:***
Driver module current	Measure voltages at 25-pin diagnostic interface, J2
Power supply failure	

FINAL *(Power Amplifier) (Defective final module.)*	
CAUSES:	***REMEDY:***
Final module current	Measure voltages at 25-pin diagnostic interface, J2
Power supply failure	

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Document #: DOC33-0040 REV: DEC.09.99

TURN-ON PROCEDURE

DOC26-0003

- Before initial equipment turn-on, verify that all appropriate wiring interconnections have been accomplished and the installation procedures have been followed precisely. Ensure proper AC power distribution to the exhaust fans and cabling of the driver chassis and the ultra low phase noise drawer (Agile applications only).

INITIAL OPERATION PROCEDURE

Driver

1. Position the front panel rotary function switch to "STANDBY".
2. Place the circuit breaker on the rear of the rack in the "ON" position.
3. The following GREEN LED's continuously illuminate verifying successful initial operation:
   - IN SIGNAL (Modulator operation is required if an input signal is applied)
   - INTERLOCK (Motherboard IF presence switch, SW1, in by-pass, will cause false indication of IF presence)

Power Amplifier Segment

No initial operation procedure is needed for the power amplifier segments. Proceed to the normal operation procedures.

NORMAL OPERATION PROCEDURE

Driver

Rotating the function switch from "STANDBY" to any other position enables driver operation. Once the function switch is rotated, the following GREEN LED's continuously illuminate confirming normal operation:

- IN SIGNAL
- INTERLOCK

Absence of a green LED indicates a missing signal or parameter. Continuous illumination of any red status LED indicates a failure has been detected by the diagnostic circuitry. Refer to troubleshooting guide.

To verify other transmitter parameters using the front panel meter, rotate the function switch. +11 V_{DC} PS and FWD PWR should have meter readings of 100%. REFL PWR is a function of combiners, the transmission line, and antenna. Reflected power readings less than 10% are typical.

Power Amplifier Segment

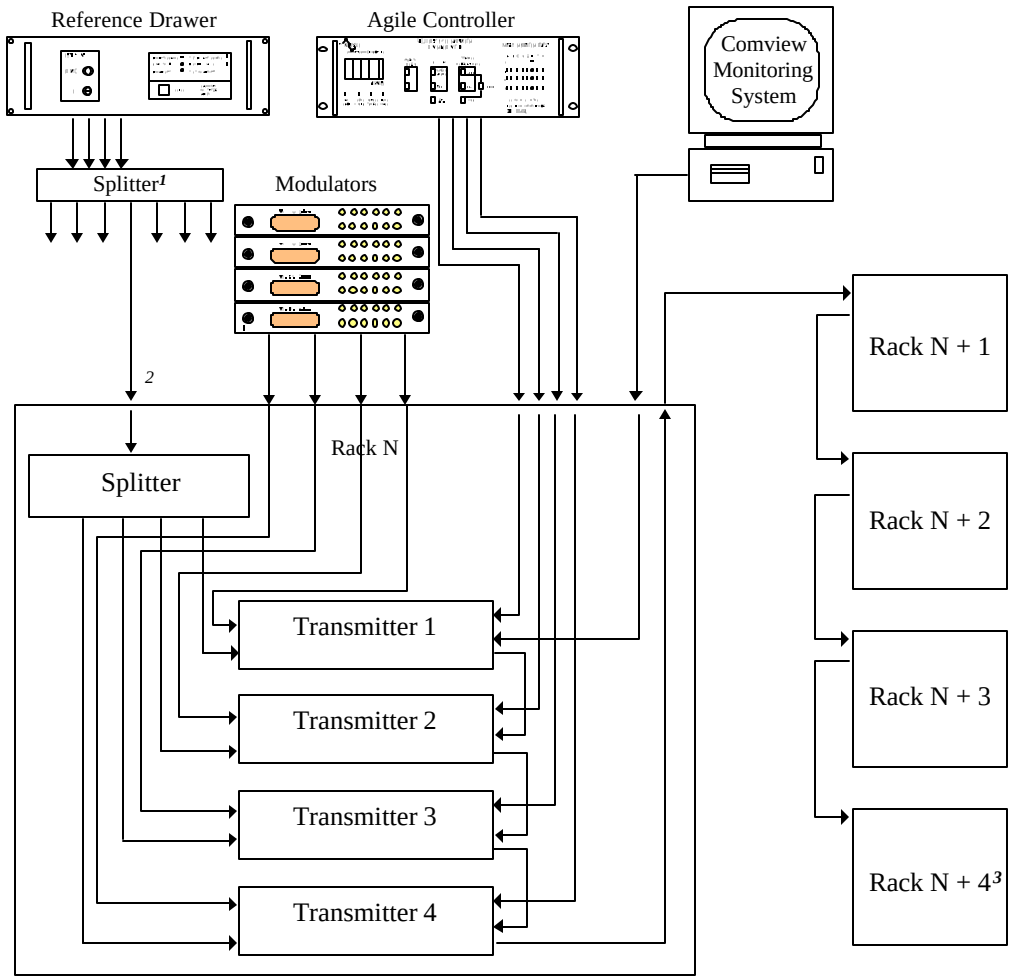
Power Amplifier Segment operation is accomplished by turning the key-lock switch to the "ON/LOCKED" position.

- Note: The locks are an added safety feature; however, the keys are interchangeable.

The POWER/FAULT LED should continuously illuminate GREEN. If the LED flashes RED, the power amplifier segment has faulted. After three faults, a failure will occur and the segment will shut down. Turning the key-lock switch to the "OFF/UNLOCKED" position and then back to the "ON/LOCKED" position will reset it. Should failure occur again, hot replacement is necessary. Turn the key-lock switch to the "OFF/UNLOCKED" position and pull the failed segment out of the rack by the handle. Slide a new power amplifier segment into the vacant space, set the correct node address, and turn the key-lock switch to the "ON/LOCKED" position. Refer to installation guide.

SD/SDA SERIES SYSTEM INTERCONNECTION

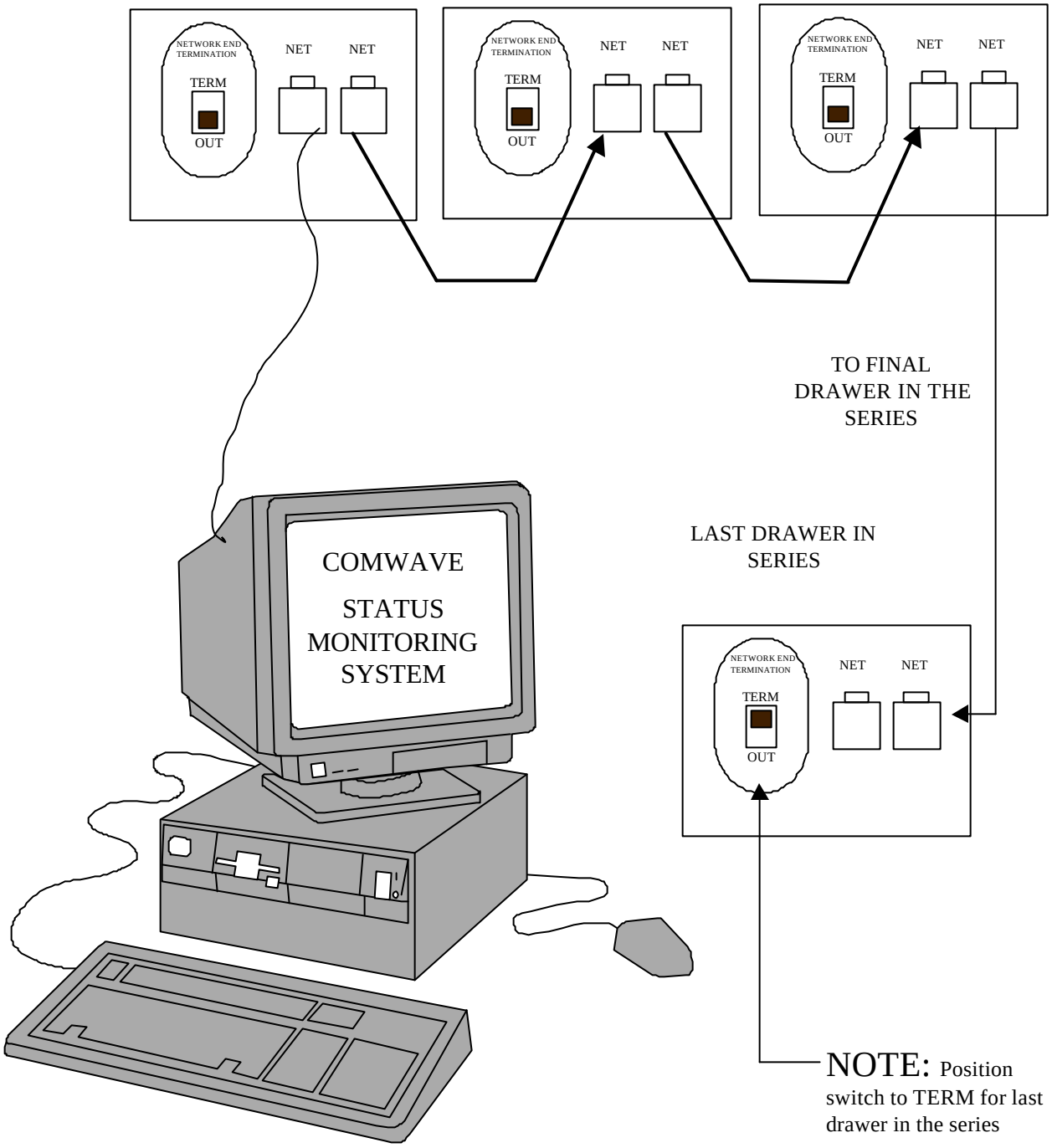
The following diagram is applicable to reference distribution, IF distribution, agile controller and ComView monitoring system installation



1. The type of splitter used is dependent upon the configuration of the transmitter.
2. A certain level must be obtained at this input, refer to the cabling document in section 2 of the manual.
3. The network end termination switch located on the rear panel of the driver must be set to TERM on the last transmitter in the system (all other are set to OUT).

Figure 8: DOC30-0010 External interconnections.

COMVIEW STATUS MONITORING INTERCONNECTIONS



SD SERIES DRIVER CHASSIS CABLING

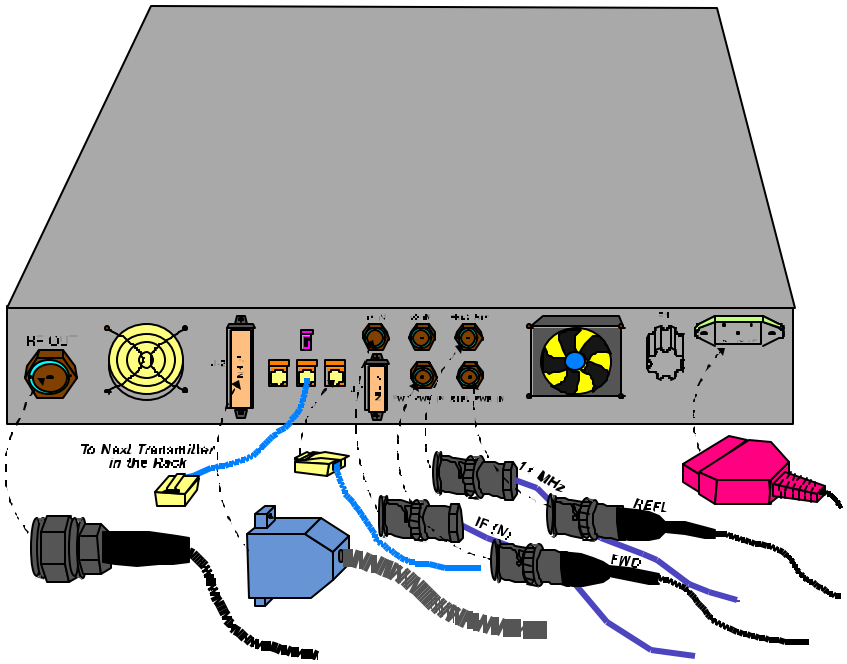
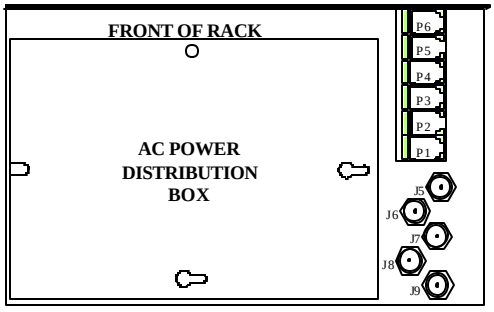


Figure 6: Driver chassis cabling.

TOP PANEL INTERFACE FOR THE SD/SDA/HPB SERIES OF TRANSMITTERS/BOOSTERS



P6 - Comview Input
P5 - Comview Output
P4 - Agile Control Input (Transmitter 4) (NOT USED IN THE HPB SYSTEM)
P3 - Agile Control Input (Transmitter 3) (NOT USED IN THE HPB SYSTEM)
P2 - Agile Control Input (Transmitter 2) (NOT USED IN THE HPB SYSTEM)
P1 - Agile Control Input (Transmitter 1) (NOT USED IN THE HPB SYSTEM)
J5 - Reference Signal Input
J6-J9 - IF Signal Input (Transmitters 1 through 4) (NOT USED IN THE HPB SYSTEM)

Figure 7: AC interface box.

CABLING FOR THE SD SERIES TRANSMITTER

DOC18-0019

DRIVER

Pull the driver out of the rack until the rack slides lock, to provide access to the rear panel of the driver chassis. Wrap-around labels are located on each cable to denote proper destination. Refer to Figure6 for cabling details.

REFERENCE DISTRIBUTION

The reference drawer distributes a signal through the top of each rack, refer to the system interconnect diagram, document # DOC30-0010, for more detail. The RG-59 coaxial cable enters the rack at connector J5. The level should equal 15 +5 dB/-10 dB at the input of each rack (point 2 on the system interconnect diagram). This level should be measured to determine if attenuation is needed. Place the appropriate size attenuator in-line with the frequency reference input to the rack. Refer to Figure6 for cabling details.

IF DISTRIBUTION

The modulators that provide the IF signal are typically located in a separate rack. Cabling is accomplished by distributing the modulator outputs using RG-59 coaxial cable to the top of each rack. Refer to the system interconnect diagram, document # DOC30-0010 for more detail. The cables enter the top of the rack through connectors J6 - J9 Refer to the top panel interface diagram, Figure7, for connector locations. The modulator levels should be set to equal -15 dBm at the top of the rack.

COMVIEW INTERCONNECTIONS

ComView interconnections are achieved through six-conductor telephone cables with RJ-11 connectors at each end. The first cabling harness exits the PC and enters the ComView Port P6 on the top of the rack, refer to the top panel interface diagram, Figure7, for connector location. Once inside the rack, a second harness is cabled from a RJ-11 socket at the inside of the top of the rack to the net input on the RS-485 board of the first transmitter. Another harness is cabled from the net output of the first transmitter to the net input of the second transmitter. This daisy chain effect continues to the last transmitter in the rack. At the last transmitter in the rack, a harness is cabled from the net out back to the top of the rack at connector, P5. This enables the cabling to continue in the same manner to the next rack. Refer to the system interconnect diagram, document # DOC30-0010, for more detail on daisy chain cabling. DOC30-0005 will also provide information regarding ComView interconnections.

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Document #: DOC33-0040 ***REV: DEC.09.99***

Installation of the Driver Chassis

The rack is equipped with slide rails for convenient installation of the driver chassis. Slide rails also enable easy access to internal adjustable controls and other maintenance/adjustments. To install the driver chassis in the rack, pull the slide rails outward until they lock into place. Carefully align drawer with the slide rails and mate. Unlock the slide rails by depressing the lock button on each rail while pushing the chassis inward. The chassis should slide easily into rack. If binding occurs, rail-mounting brackets are in need of adjustment. Loosen brackets and manipulate drawer to seat rails to match transmitter drawer. Tighten brackets once free sliding motion has been achieved.

Once the driver chassis has been installed in the rack and the rack slides are adjusted, cabling can begin. Refer to the cabling section of this manual for assistance.

Installation of the Power Amplifier Segments

The power amplifier segments slide into the sub-rack on nylon slides and connect to the motherboard via a floating connector. The key-lock switch, located on the segment's front panel, must be in the OFF position in order to plug the segment into the sub-rack. This is to ensure that there is no arcing between connections before the segment is fully engaged. Once the segment is slid into place, thumbscrews on the segment's front panel are provided to fasten the segment to the sub-rack and to provide additional ground connection. The key-lock switch may now be turned to the ON position to apply power to the segment. Once the key-lock switch is turned on, the segment will automatically set the gain and currents of the amplifier.

SYSTEM GROUNDING

For proper system operation, it is imperative that the system be adequately grounded. Each individual equipment rack requires grounding to the main building ground. When bolting ground wires to racks, sand finish to remove paint ensuring a good bond.

ENVIRONMENTAL AND SAFETY CONSIDERATIONS

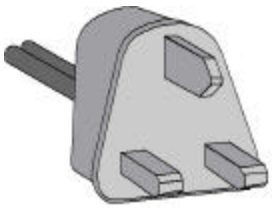
Environmental Considerations

The equipment can be safely operated in ambient temperatures of -30 to +50 degrees Celsius (-22 to +122 degrees Fahrenheit). However, moderate temperatures generally extend equipment life. Although the equipment may be operated with relative humidity of up to 95%, the equipment must be protected from conditions that cause condensation within the equipment.

A rear door is used to force proper ventilation through the cabinet (600 cfm fans per transmitter are used). If failure of a fan occurs, replacement should be made as soon as possible. An air or temperature interlock should be incorporated for protection against interruption of ventilation. The area should be kept dry and clean.

There should be sufficient space in front of the transmitter cabinet for the serviceman and test equipment plus the full extension of the racked 27" deep chassis. A minimum of 36" behind the cabinet should be free for rear cabinet access and air movement. Also, ample room must be available at the cabinet rear for cable placement.

Safety Considerations



This equipment uses a grounding plug on all power cords. For personal safety, do not defeat this safety feature. As with all similar types of equipment, high voltage can be accessed when the driver chassis cover is removed. Special care should be given in areas of fuses, line switches, and power supplies.

Modern high power solid state equipment contains low output voltage power supplies with very high current capability. To prevent severe burns, avoid contact of rings; watch bands, etc., with these circuits. When servicing the transmission line and antenna, care must be taken to avoid exposure to high-energy microwave.

Non-Upgradeable Series

To begin mounting, align the holes on the bottom side of the notch filter to the slots located on the mounting bracket. Insert the three #4-40 3/8" screws, flat washers and split-locking washers provided (do not tighten). Once the notch filter is in place, connect it to the corresponding channel combiner and tighten the three #4-40 3/8" screws. Now, the mounting bracket must be attached to the mounting plate. Align the bracket to the tapped holes in the mounting plate and secure the bracket with the two #10-32 1/2" screws, flat washers and split-locking washers provided. Finally, the mounting plate must be mounted to the top of the racks. Position the plate so that the holes in the mounting plate correspond to the pre-drilled holes in the top of the racks. Secure the mounting plate to the top of the racks using the three 1/4-20 3/4" bolts, nuts and split locking washers provided. See Figure5 for a pictorial.

NOTE: The following diagram is not drawn to scale. The mounting plate is eight feet long, occupies four rack-tops, and accommodates 16 notch filters.

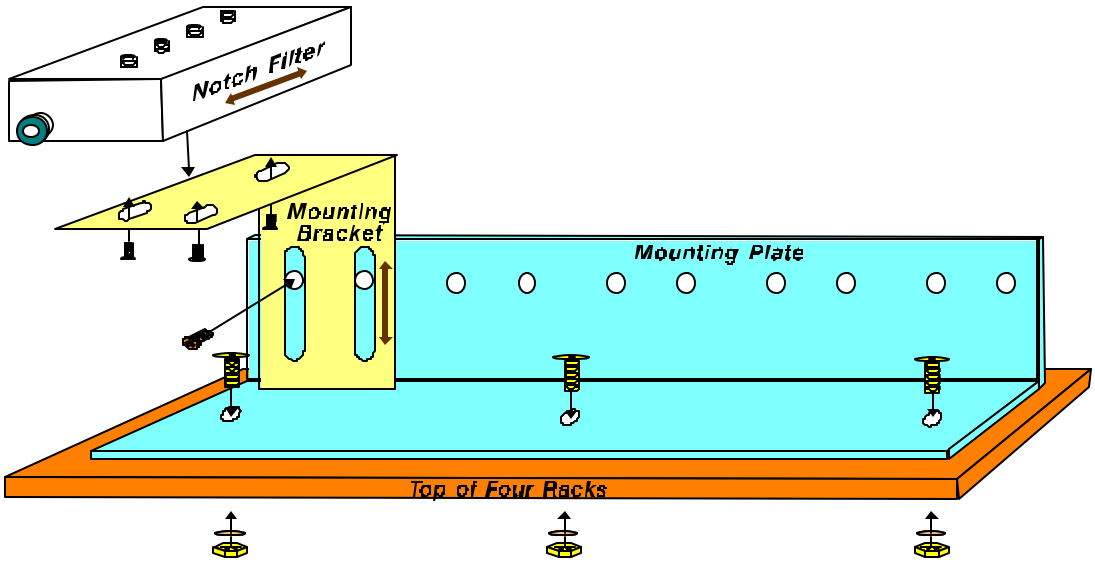


Figure 5: Notch filter mounting for the upgradeable series of transmitters.

Notch Filter Mounting

The notch filters are mounted on the top of the rack(s). The upgradeable and non-upgradeable series have different mounting plates and separate mounting instructions, refer to the instructions which correspond to your system.

Upgradeable Series

To begin mounting, align the holes on the bottom side of the notch filter to the slots located on the mounting bracket. Insert the three #4-40 3/8" screws, flat washers, and split-locking washers provided (do not tighten screws). Once the notch filter is in place, connect it to the corresponding channel combiner. Now, the mounting bracket must be attached to the mounting plate, which is already installed on the top of the rack. Align the bracket to the mounting plate slots, being sure the notch filter is in the desired location. Secure the mounting bracket with two #10-32 1/2" screws, nuts, flat washers and split-locking washers provided. Finally, tighten the three, #4-40 3/8" screws that secure the notch filter to the mounting bracket. Refer to Figure4 for a pictorial.

- This mounting system is designed to allow movement of the notch filter and mounting bracket. The double-sided arrows denote motion. If a different position of the notch filter or mounting bracket is desired, loosen the corresponding hardware, move to the new position, and retighten the hardware.

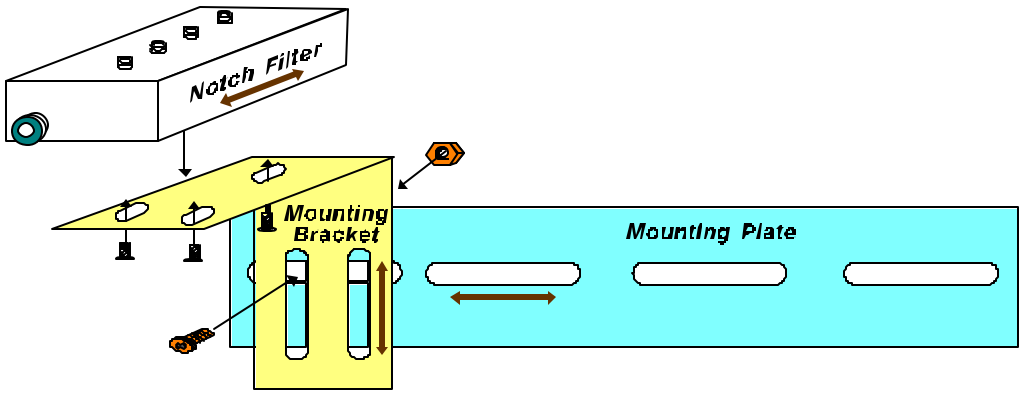


Figure 4: Notch filter mounting for the upgradeable series of transmitters.

Channel *Combiner Mounting*

See Figure3 for numerical references. A 99-093-02-option kit is typically used to mount the channel combiners to the top of the rack. To begin mounting, the C-Channel must be fastened to the top of the rack. Refer to Bubble #1 for a magnified view of mounting the C-Channel to the rack. Align the pre-drilled holes of the C-Channel (A) to the pre-existing #10-32 2" screws, nuts, and split-locking washers (B) in the top of the rack. Insert hole A onto hardware B and secure with a nut and split-locking washer as shown.

Once the C-Channels are mounted to the top of the rack, the channel combiners can be attached to the C-Channels. Refer to Bubble #2 for mounting the channel combiner to the C-Channel. Align the holes on the feet of the channel combiner (A) to the pre-drilled holes in the C-Channel (B). Secure the channel combiner foot A with the 1/4-20 1/2" bolt and split-locking washer provided. If pre-existing holes cannot be found on the C-Channel, stage the channel combiners on the floor and determine where the combiner's feet will rest on the mounting channel. Drill holes in the mounting channel to accommodate the channel combiner feet. Secure the feet with the 1/4-20 1/2" bolts, split-locking washers and nuts provided. After the channel combiners are mounted in place, the notch filter can be mounted to the top of the rack. Proceed to the next section for detailed instructions.

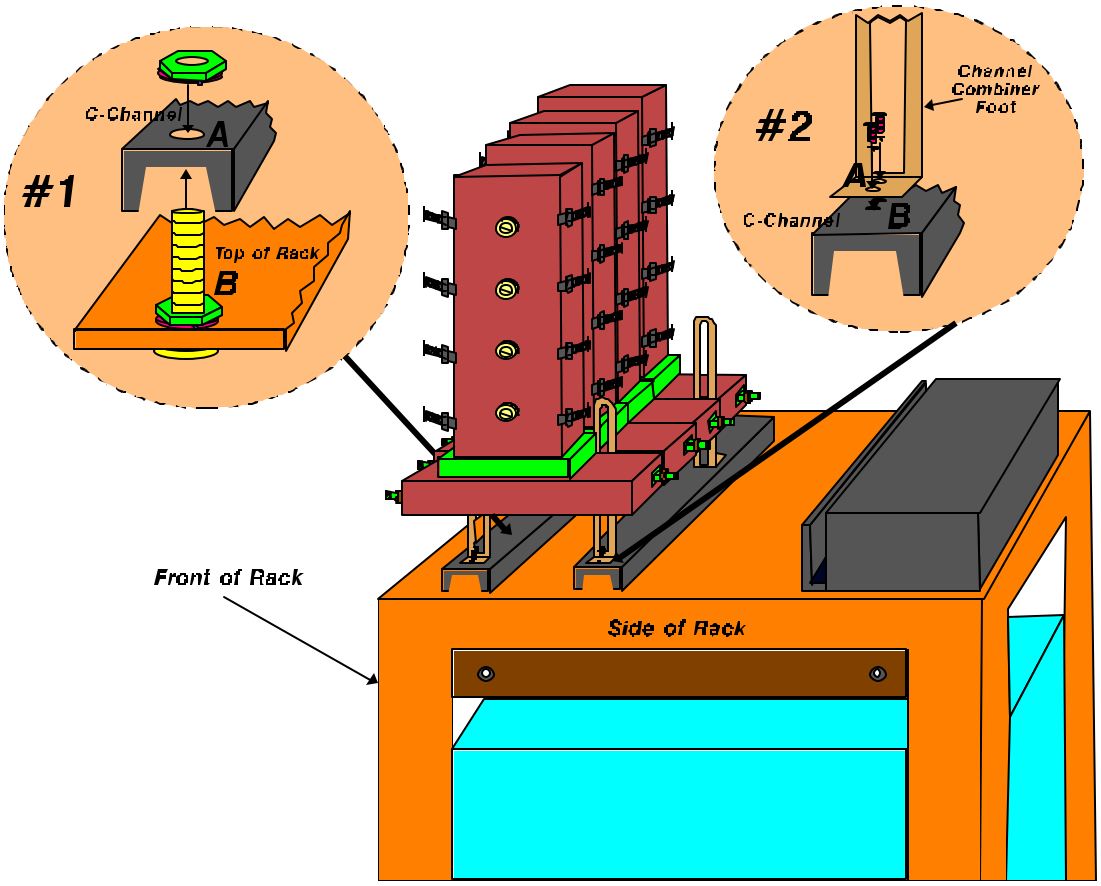


Figure 3: Channel combiner mounting.

Bolting the Racks Together

A minimum of six bolts should be used to bolt each rack to the adjacent (three in the front and three in the rear). After all of the racks have been placed in their final destination; insert the provided hardware in the accessible-side-panel holes of the racks. The hardware can be located on the bottom side of the racks. Refer to Figure2 for hole locations.

NOTE: Be sure that all three exposed planes of the Racks are straight and flush before the bolts are tightened.

After the racks are bolted together, bolt the side-panels to the ends of the outer racks.

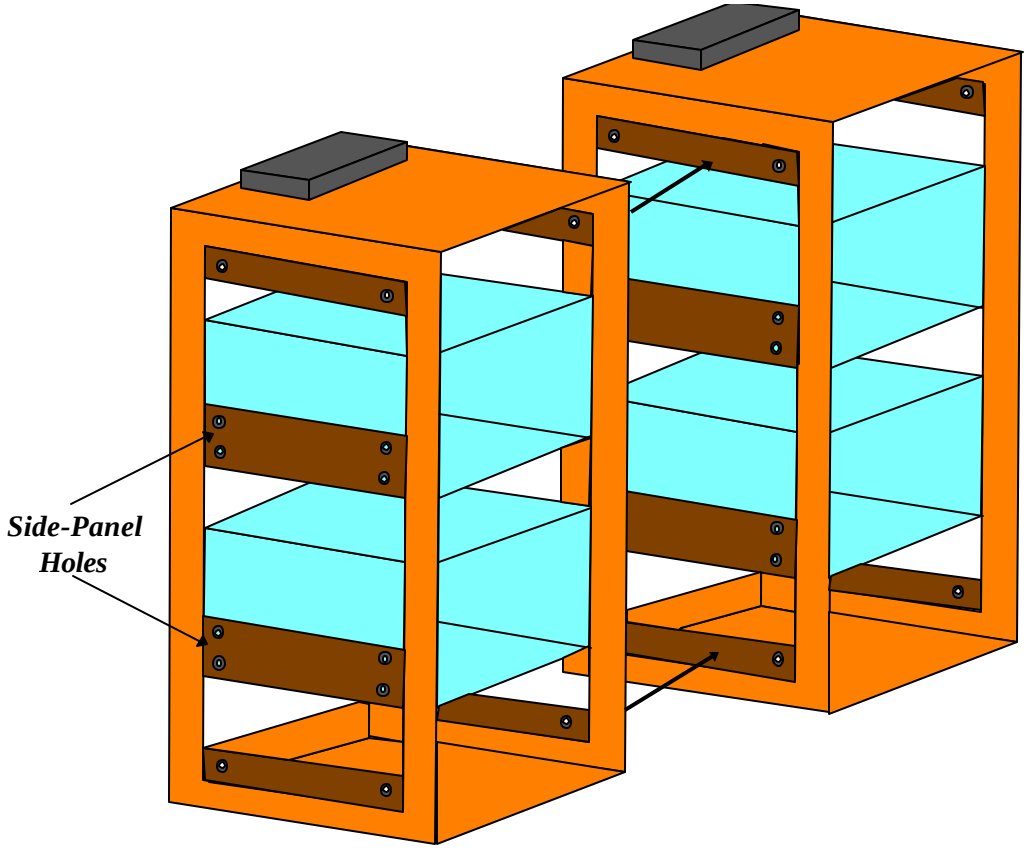


Figure 2: Racks.

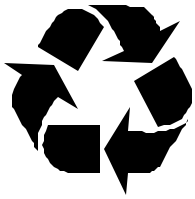
INSTALLATION PROCEDURE

DOC17-0006

UNPACKING

The racks should remain in their original packing containers until they are placed in the equipment shelter. Place all racks outside of the shelter sequentially so they can be installed in their proper position. Packing materials should be removed from the racks inside the equipment shelter as they are being installed.

The drivers and power amplifier segments should be removed from their boxes, as they are ready to be installed. Any unused equipment should remain in the original packing box until needed. As each piece of equipment is being unpacked, compare the packing list with the contents of the box and check for in-transit damage. Should any damage be noted, notify the freight carrier immediately to file a freight claim. Also, notify Comwave of any damages or of materials missing from the shipment. Refer to the customer service document # DOC20-0001 for information about contacting Comwave.



Please do not discard original packaging material. It should be returned to Comwave to be recycled. Be sure to retain several boxes for each type of equipment at the transmitting site. This is to be used in the event the equipment is shipped back to the factory for repairs, upgrades, or modifications to ensure adequate protection.

PHYSICAL INSTALLATION:

Installation of the Rear Door
Install the rear door of each transmitter as it is unpacked. Place the hinged portion of the door over the corresponding holes in the fan shroud assembly. Insert the screws provided into the existing rack clips. After adjusting the door position, close and lock the door to ensure proper mechanical operation.

AC Power Connections to the Exhaust Fans
The exhaust fans located on the rear door of the rack have attached wiring harnesses. The harnesses must be routed into the transmitter chassis through a hole in the fan shroud and connected to the AC terminal strip. The terminal strip must be accessed before the racks are bolted together. Verify that the circuit breaker is in the OFF position. Connect the fan harness to the terminal strip.

Parameter	*Specification*	*Notes / Test Conditions*
	AURAL PERFORMANCE	
Output Power[12]	15 dB visual/aural ratio +0.5 dB to -2 dB	Measured at transmitter output Other ratios available upon request
IF Input Level Impedance/Connector	-23 dBm peak ± 2 dB 75O / female BNC	Combined visual and aural
Emission	250KF3E or per CCIR	
Inter Carrier Frequency Accuracy	= ± 50 Hz relative to visual carrier	
Frequency Response[13, 14] Mono Stereo	 = ± 1 dB 30 Hz to 15 KHz = ± 1 dB 50 Hz to 105 KHz w/o pre-emphasis	
Pre-emphasis	50 or 75 microseconds (defeatable)	
Deviation	±25 KHz (System M/N) (±50 KHz Stereo) ±50 KHz (System B/G/D/K/I) NICAM and IRT Stereo compatible	
Harmonic Distortion[13, 14]	= 1%	
FM Noise[13, 14]	= -60 dB	
Audio Input Level[13] Mono @ ±25 KHz deviation Mono @ ±50 KHz deviation Stereo @ ±50 KHz deviation	 -10 to +10 dBm into 600Ω -10 to +10 dBm into 600Ω -10 to +10 dBm	
	GENERAL	
Power Requirement (Line PF =0.95) Operating Stand-by Mode	117/230 V_{AC} ±10%; 50/60 Hz <900 VA <950 VA	
Operating Temperature	0°C to +50°C	Frequency stability and equipment functionality guaranteed
Specified Temperature Range	13° to +33°C	All Specified parameters guaranteed
Relative Humidity	95% non-condensing	
Vertical Rack Requirement	12.25"	Does not include modulator
Dimensions	15.75" H x 21.1" W x 34.5" D 40.0cm H x 53.6 cm W x 87.6 cm D	
Approximate Shipping Weight	215 lb (97.40 kg)	

[12] *In band intermodulation specification is based on 15 dB visual to aural ratio. Contact factory for specification change due to other ratios*
[13] *Using TVM-102 modulator*
[14] *Factory video/audio performance test limits may include up to 50% of the test demodulator measurement uncertainty.*

Parameter	*Specification*	*Notes / Test Conditions*
ANALOG		
VISUAL PERFORMANCE		
Output Power	10 - 100 Watts Peak Sync	Adjustable from 10 to 100% of peak sync power
Output Frequency	Any 6, 7, or 8 MHz Channel	2000 - 2700 MHz In select bands
Emission	5M75C3F or per CCIR	
Impedance/Connector Input Output	 75Ω/F female 50Ω/N female	
Input Level	Video 1 VP-P ± 6dB	
IF Input Level Impedance/Connector	-8 dBm peak ± 2 dB 75O / female BNC	
Frequency Stability	= ± 500 Hz = ± 1 Hz (Optional GPS)	
Frequency Response[8], [9], [10]	= ± 1 dB	FCC Multiburst video pattern
Group Delay [8, 10]	Per FCC 73.687(a)(3) or per CCIR	Sin(x)/x video pattern
Harmonics	= -60 dBc	Measured in 30 KHz RBW at transmitter output relative to visual carrier (unmodulated carriers)
Spurious Products [8]	= -60 dBc (out of band)	Measured in 30 KHz RBW at transmitter output relative to visual carrier using 75% color bars video pattern
Intermodulation Distortion (IM3)[11]	= -60 dBc (in band)	Measured in 100 KHz RBW at transmitter output relative to visual carrier using red field video pattern
Differential Gain[8, 10]	= 3%	NTC-7 composite video pattern
Differential Phase[8, 10]	= 2°	NTC-7 composite video pattern
Sync Pulse Amplitude[8, 10]	= ±5%	NTC-7 composite video pattern
Luminance Non-linearity[8, 10]	= 3%	NTC-7 composite video pattern
Weighted SNR[8, 10]	= 55 dB	Quiet Line - Line 12
Hum and Noise[8, 10]	= 60 dB	
K Factor 2T[8, 10]	= 2%	NTC-7 composite video pattern
Incidental Carrier Phase[8, 10] Modulation (I.C.P.M.)	= 3°	NTC-7 composite video pattern
RF Output Regulation	= ± 0.2 dB	
SSB Phase Noise Direct measurement of microwave LO	= -80 dBc/Hz @ 10 KHz offset = -110 dBc/Hz @ 10 KHz offset	Standard Optional (recommended for digital transmission)

[8] *Using TVM-102 modulator.*
[9] *Spectral occupancy per FCC ruling for both analog and digital*
[10] *Factory video/audio performance test limits may include up to 50% of the test demodulator measurement uncertainty.*
[11] *In band intermodulation specification is based on 15 dB visual to aural ratio. Contact factory for specification change due to other ratios*

SD2500 TRANSMITTER SPECIFICATIONS TRANSMITTER[1]

DOC19-0087

Parameter	*Specification*	*Notes / Test Conditions*
DIGITAL		
Average Output Power	2 - 25 Watts	2^{23}-1 PN data sequence (at transmitter output)
IF Input Frequency	44 MHz	Other frequency options available
Impedance/Connector Input Output	 75 Ω/BNC-female 50 Ω/N-female	
Average Input Power	-15 dBm ± 0.5 dB	2^{23}-1 PN data sequence (at transmitter output)
Output Frequency	2000 - 2700 MHz	In select bands
Frequency Response[2]	≤ ±0.25 dB	F_C ±2.6 MHz Measured at channel combiner output
Frequency Stability	≤ ±500 Hz ≤ ±1 Hz (Optional GPS)	
Carrier to Noise (C/N)	≥ 55 dB	
Hum and Noise	≤ -60 dBc	
Group Delay[2]	≤ ±15 ns	F_C ±2.6 MHz Measured at channel combiner output
Digital Modulation Error Vector Magnitude [2, 3] (EVM)	≤ 2.0%	64-QAM/8-VSB @ 5.06 Msps RMS average over 12,500 symbols Measured at channel combiner output
Digital Modulation Signal to Noise Ratio [2,3] (SNR)	≥ 30 dB	64-QAM/8-VSB @ 5.06 Msps RMS average over 12,500 symbols Measured at channel combiner output
Magnitude Linearity (AM-AM conversion)	≤ ±0.125 dB	Measured at channel combiner output
Phase Linearity (AM-PM conversion)	≤ ±0.75°	Measured at channel combiner output
Adjacent Channel Interference[4], [5] (FCC ATV Spectral Mask)	Sidelobe power spectral density (PSD) ≤ -38 dB at channel edge; decreasing to ≤ -60dB at ±3 MHz from channel edge	Relative to in-band average PSD measured @ 100 KHz RBW at the channel combiner output
Harmonics[6]	≤ -60 dBc	Relative to unmodulated carrier power measured @ 100 KHz RBW at the channel combiner output
Spurious Products[7]	≤ -60 dBc	Relative to unmodulated carrier power measured @ 100 KHz RBW at the channel combiner output
RF Output Regulation	≤ ± .2 dB	Measured at transmitter output
SSB Phase Noise Direct measurement of microwave LO	= -80 dBc/Hz @ 10 KHz offset = -110 dBc/Hz @ 10 KHz offset	Optional Standard (recommended for digital transmission)

[1] *All factory test measurements made at approximately 23°C.*
[2] *Upconverter amplifier drawer with optional group delay and frequency equalizer @ the output of the non-adjacent channel combiner.*
[3] *Or equivalent threshold BER measurement.*
[4] *Spectral occupancy per FCC ruling for both analog and digital*
[5] *Measured with a non-adjacent channel combiner, notch filter and optional IF equalizer module.*
[6] *Undesired signal power 2 dB higher than the nominal PSD of the adjacent spectral regions that is harmonically related to unmodulated carrier*
[7] *Undesired signal power 2 dB higher than the nominal PSD of the adjacent spectral regions that is harmonically related to internal system signals such as clock, LOs, etc.*

NOTE: ALL SPECIFICATIONS CONTAINED WITHIN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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THOMCAST COMMUNICATIONS, COMWAVE DIVISION TWO YEAR LIMITED WARRANTY

DOC12-0001

Thomcast warrants each product of its manufacture to be free from any defect in material and workmanship for a period of two years after delivery to, and return by the original purchaser. No returns, however, will be accepted unless accompanied by a written factory return authorization.

The limit of liability under this warranty shall be to repair or replace any product, or part thereof, which proves to be defective after inspection by Thomcast with the exception of tubes, semiconductor devices, lamps, fuses or equipment (i.e. modulators) manufactured by others, which are subject to only such loss adjustment as Thomcast may obtain for the suppliers thereof.

This warranty shall not apply to any Thomcast product which has been modified, physically or electrically damaged, or to modules which seals have been broken, or any product which has been subjected to conditions exceeding the applicable specifications or ratings or improper service techniques.

Thomcast will not be liable for any direct or consequential injury, loss or damage incurred through the use, or the inability to use, any Thomcast product.

Thomcast reserves the right to make design changes to any Thomcast product without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of the obligation and liability assumed by Thomcast with respect to any and all Thomcast products. Thomcast neither makes, nor authorizes any person to make, any other guarantee or warranty concerning Thomcast products.

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TECHNICAL MANUAL

DOC33-0040

SD2500 - 25 Watt Digital Transmitter System

THOMCAST
COMMUNICATIONS Inc.
COMWAVE DIVISION

Figure 1: SD2500 transmitting system.

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