OPERATIONAL DESCRIPTION

DESCRIPTION OF EQUIPMENT

FCC Section 2.1033

1) Type of Emission: (c)(4) — 64/256 QAM; 6M00D7W

2) Frequency Range: (c)(5) — 2000-2700 MHz in select bands

3) Operating Range: (c)(6) — 2 – 25 watts

4) Power Rating: (c)(7) — 25 watts average

5) Variation of output power (c)(6) — See calibration section, document # DOC16-0003 of technical manual

6) E & I on Final: (c)(8)
   - Drain voltage — 10V
   - Drain current — 7A each

7) Tune-up Procedures: (c)(9) — See calibration section, document # DOC16-0003 of technical manual

8) Function of Active Devices: (c)(10)

The following is a list of active devices in the RF chains of the SD2500 transmitter. The relative position of each device may be found by referring to the block diagrams and schematics found in the technical manual.

- Frequency Stability Devices: See technical manual, document # DOC13-0170
- Spurious Suppression Circuits[k5]: Not applicable
- Describe Limiters:
  - Modulation: Not applicable
  - Power: See technical manual, document # DOC13-0062

TOP LEVEL DESCRIPTION

DOC13-0168

The SD2500 high power single channel (HPSC) transmission system generates a digitally modulated 25-Watt average power signal on all MDS, MMDS, and ITFS channels. The system architecture is based on advanced transistor technology, low loss power combining, and distributed control and power conversion. Some unique advantages of this new design are flexibility/scalability, lower downtime, and lower operating costs. The modular structure of the power amplifier segments allows hot replacement, which means less downtime and convenient scalability. The high efficiency design and small size decreases operating expenses.

The SD2500 consists of a rack, sub-rack, digital driver, and power amplifier segments. Digital transmission techniques provide superior performance over analog methods, with reduced susceptibility to noise and co-channel interference. Advanced quadrature amplitude modulation provides exceptional throughput and spectral efficiency. The RF signal path of the system is shown below in Figure3. For more detail refer to the block diagram of the rack, document # DOC15-0009 found in this manual.

The HPSC Series of transmitters is available in both upgradeable and non-upgradeable models. A non-upgradeable model provides maximum space efficiency, where, the modular system architecture of an upgradeable model allows it to be easily upgraded from 10 to 200 Watts in 25-Watt increments. Similarly, it may also be downgraded; and, the power amplifier segments may be used elsewhere or kept as spares for hot replacement. As the output power is modified, the model name will change respectively, refer to Table 1 below. The Federal Communications Commission Identifier (FCC ID) will also be altered corresponding to the new model and power level. A new front panel label is needed to accommodate each FCC ID. The label is located on the digital driver as shown in Figure4, and will be replaced with each upgrade as needed.

In order to maximize power density, both the rack and the sub-rack are integral subsystems of the transmitter design. The rack provides either phase-to-phase or three-phase AC power to the transmitters, DC power to the sub-rack, and the cooling for the power amplifier segments. Similarly, the sub-rack provides an interface between the power amplifier segments and the entire system. Figure5 illustrates the distribution of AC and DC power throughout one transmitter in the system

One of the most prevalent user benefits of the High Power Single Channel Series of transmitters is hot replacement. Should a Power Amplifier Segment fail, hot replacement allows the transmitter to continue operating with only slight power loss and little to no change in the noise floor.

Table 1: Model names, output power, & FCC ID.

Model Name	Output Power	FCC ID
SD2500	2 to 25 Watts	CHP8BUSD2500B
SD5000	10 to 50 Watts	CHP8BUSD5000B
SD10000	20 to100 Watts	CHP8BUSD10000
SD15000	30 to 150 Watts	CHP8BUSD15000
SD20000	40 to 200 Watts	CHP8BUSD20000

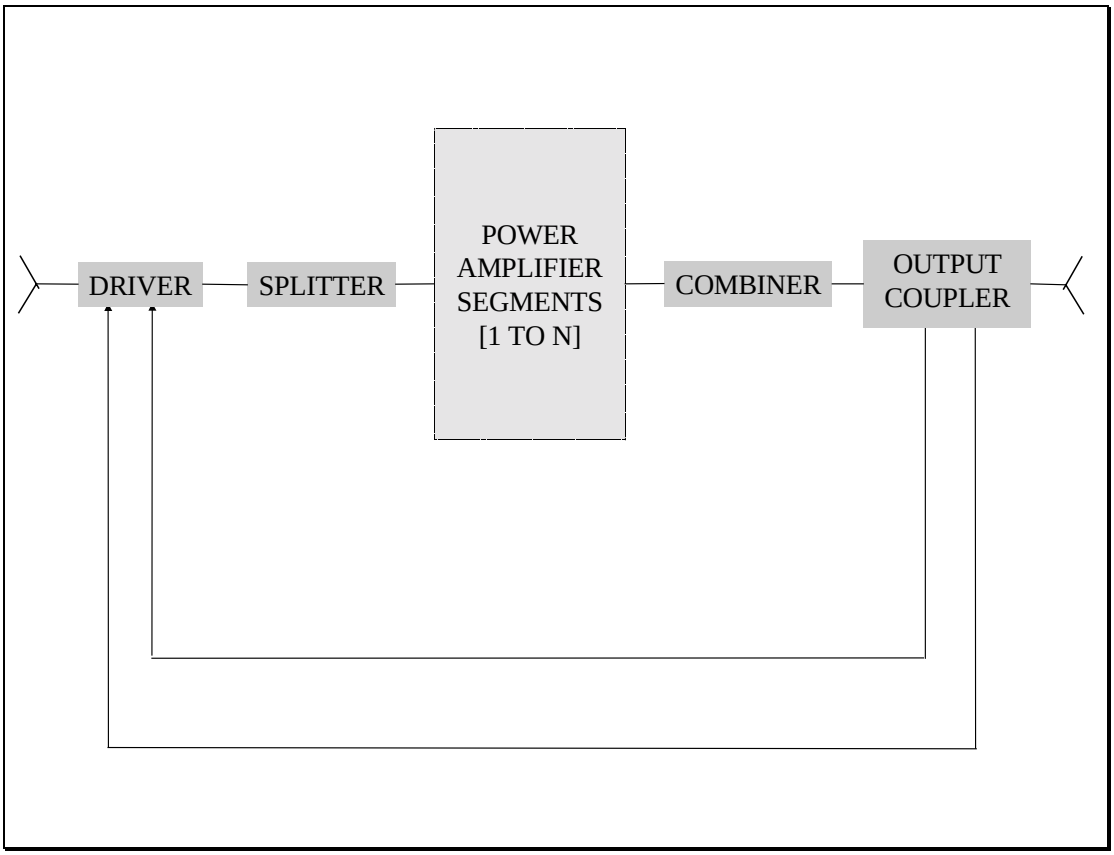

Figure 1: System RF signal path.

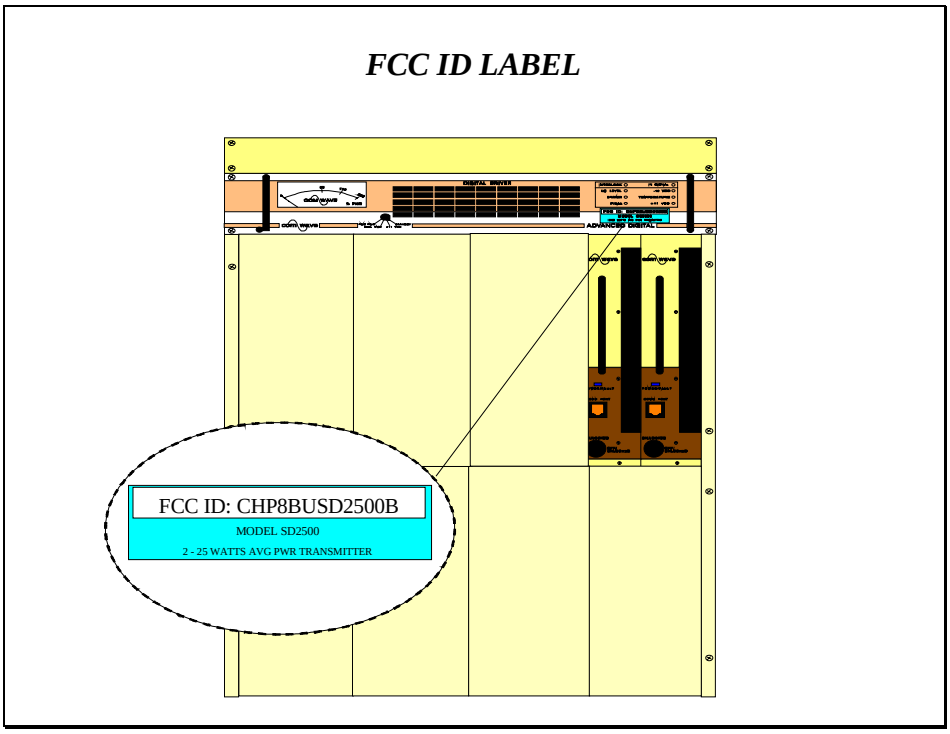

Figure 2: Location of FCC ID label.

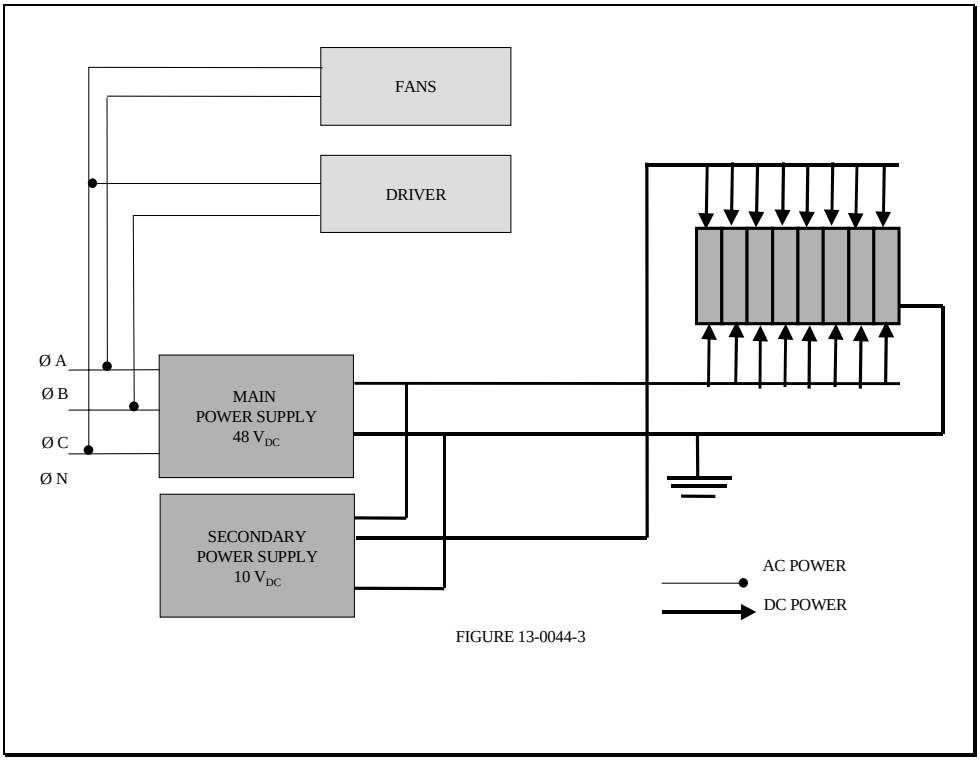

Figure 3: AC and DC power distribution.

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.

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.

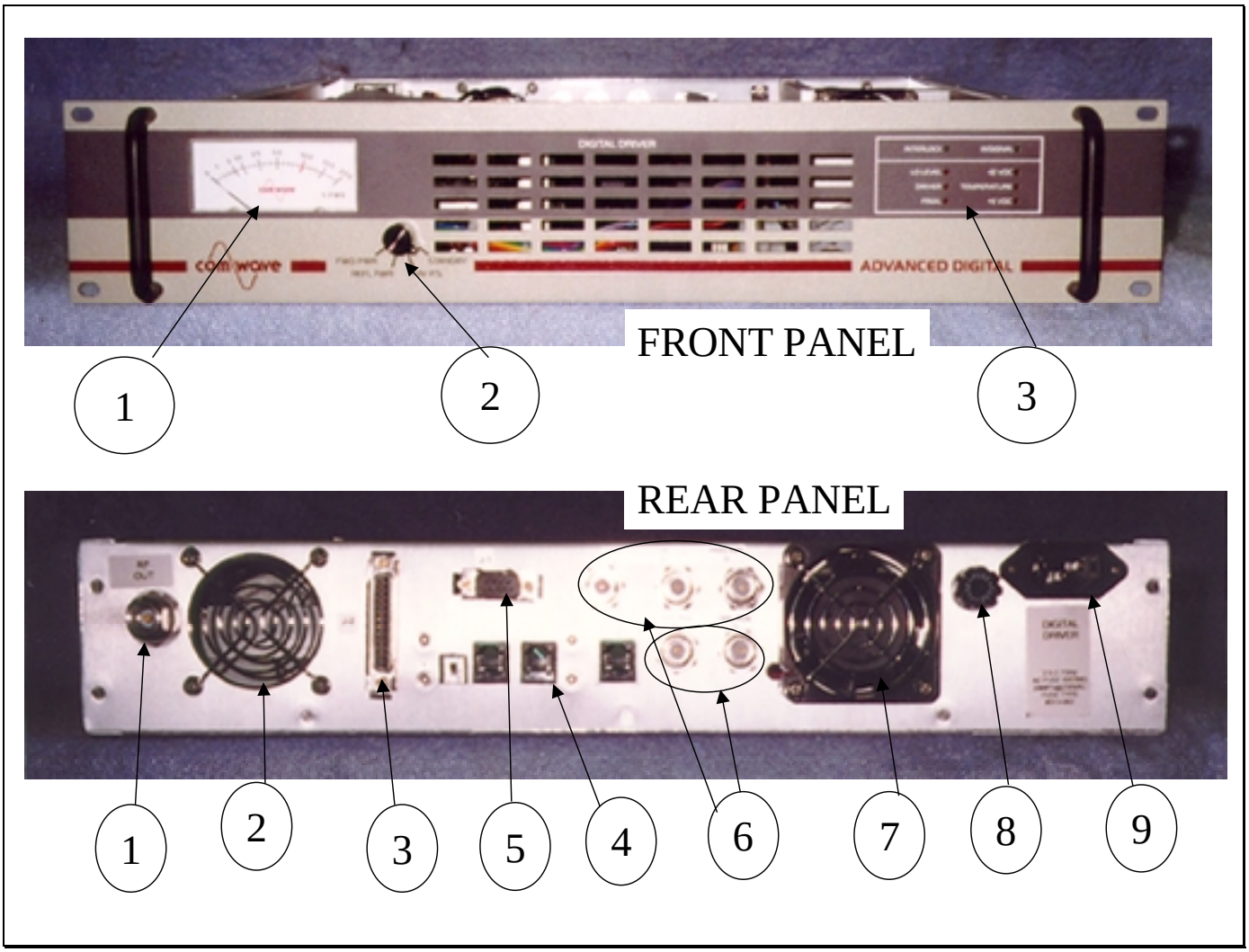

Figure 4: Driver front and rear panels.

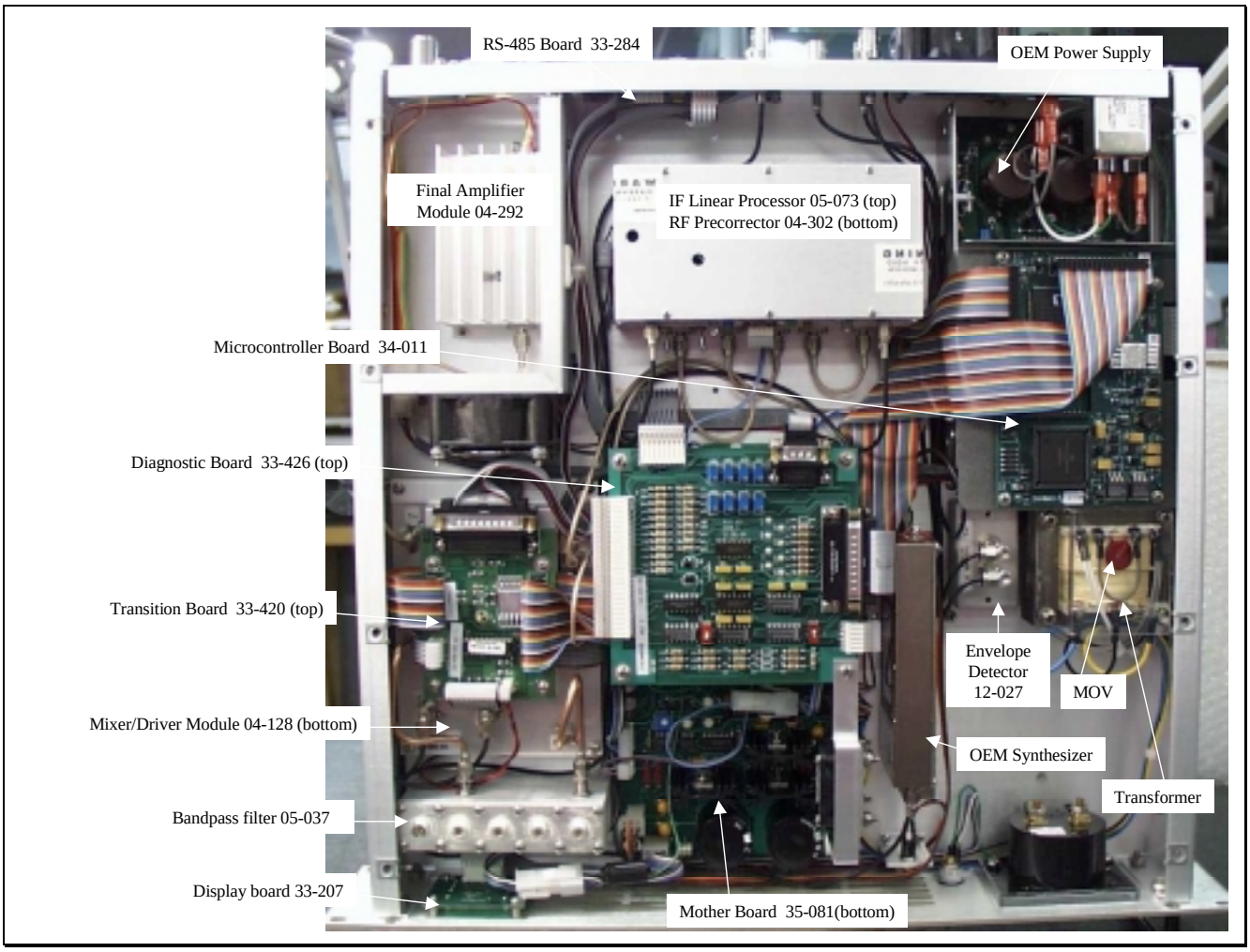

Figure 5: Driver layout.