

2002

## OVERALL VIEW

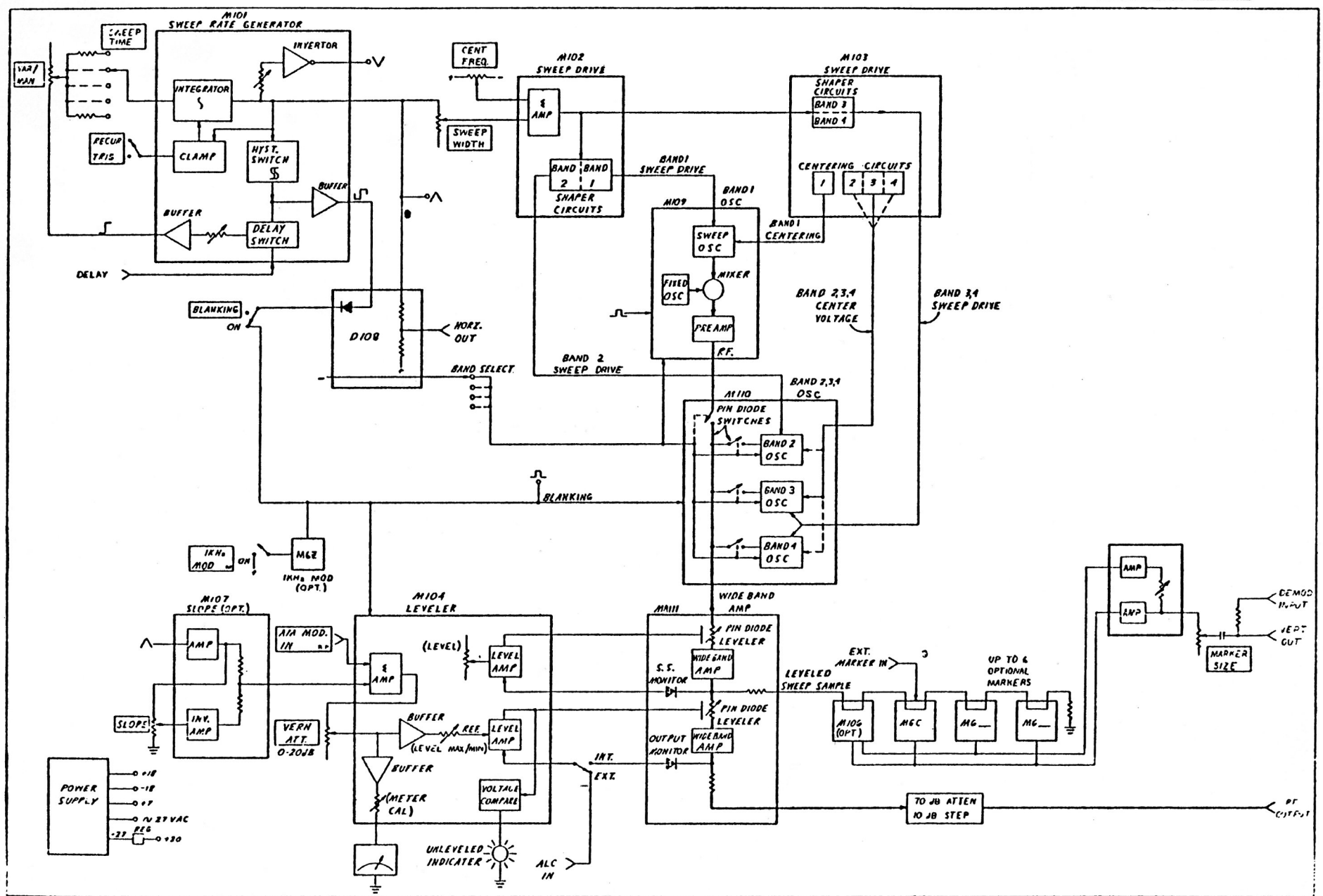
The front-panel CENT FREQ and SWEEP WIDTH control settings are fed into the M102 and M103 Sweep Drive modules, where they are combined into a single signal.

This signal (sweep drive) is used to drive the varactor diodes in the appropriate Sweep Oscillator (M109 or M110).

The Sweep Oscillator output is fed into the MA111 Wide Band Amplifier, and then through the STEP ATTENUATOR to the RF output. Leveling is accomplished by a Monitor Diode in the MA111 which compares the output level to a reference voltage supplied by the OUTPUT VERNIER. Any error is amplified in the M104 Leveler module, and correction is made at the PIN Diode Leveler in the MA111.

The marker circuit is composed of the M105 Marker Adder module, the M6C External Marker module, and the various marker options selected by the customer. The Marker circuit uses a sample of the RF signal (sweep sample) which is also leveled in the M104 Leveler.

2002  
BLOCK DIAGRAM



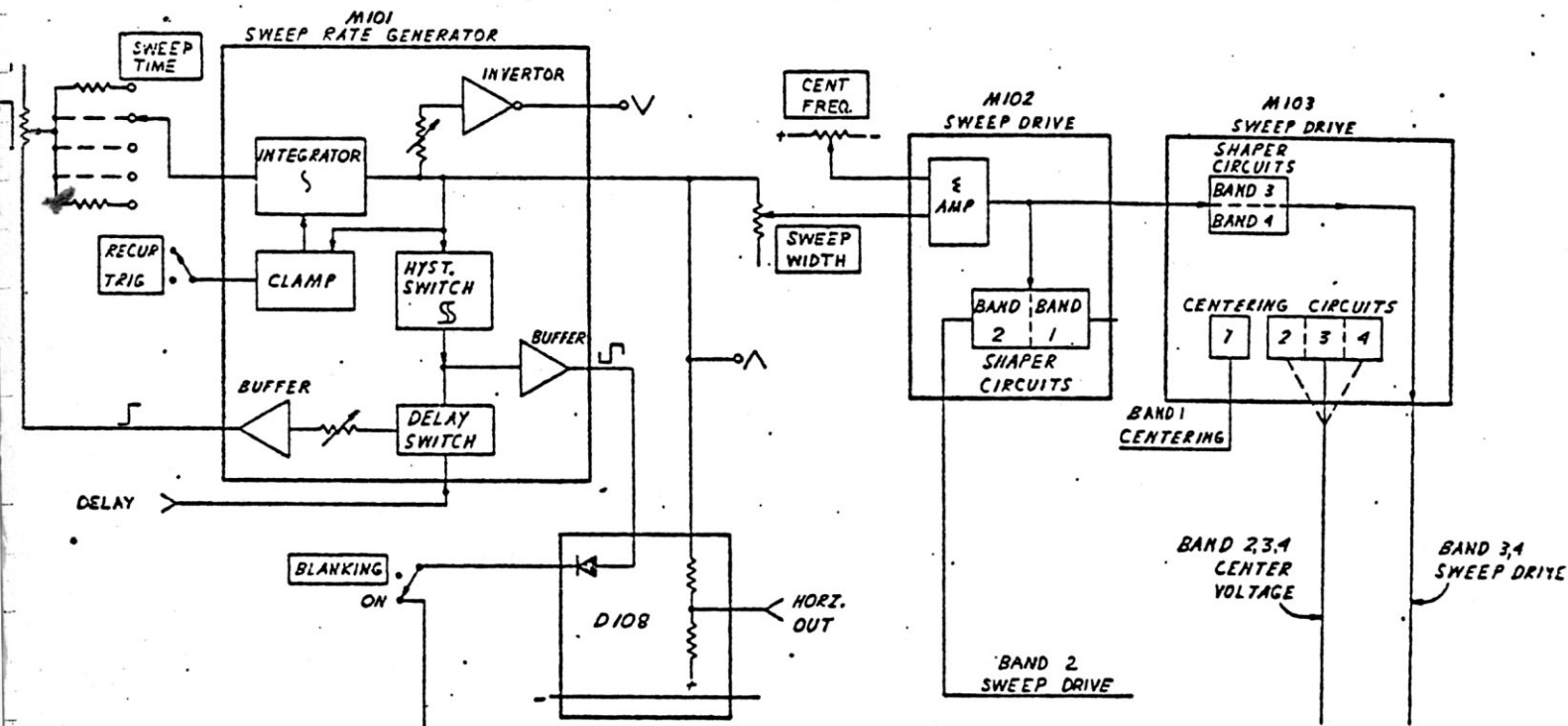
## DC GROUP

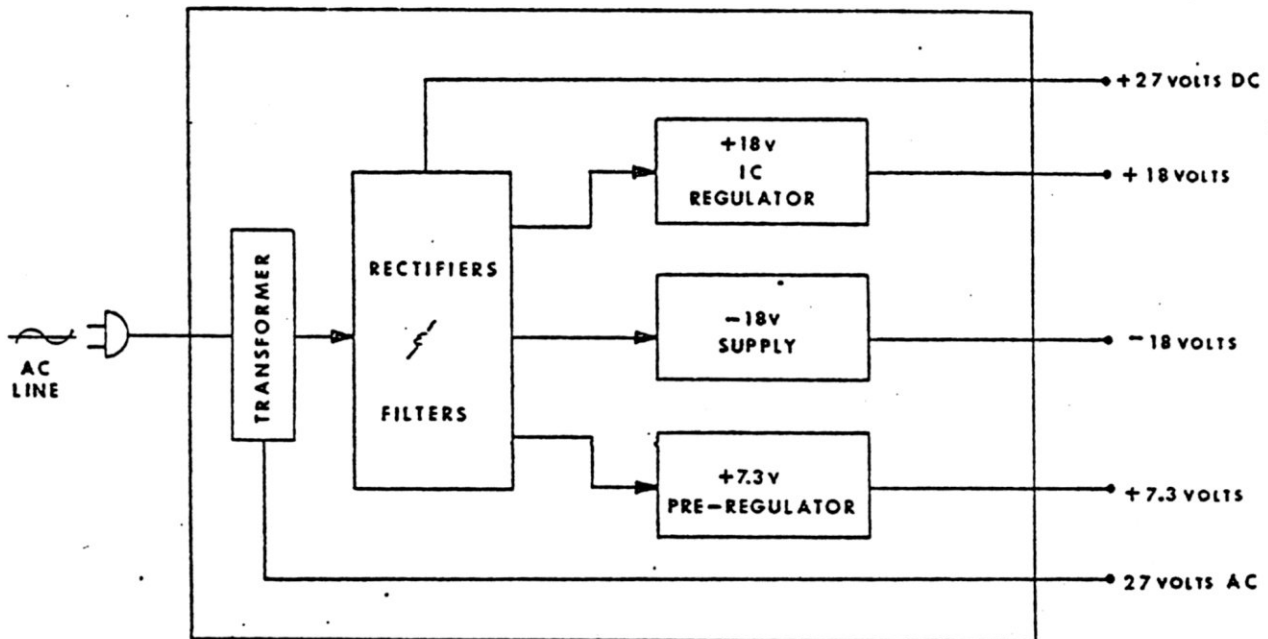
The DC Group provides the power for the instrument and appropriate sweep drives. The Sweep Time Rate Generator (M101) is also contained in this group.

The Power Supply provides DC power for the rest of the instrument, and a 27 VAC signal to the M101 Sweep Rate Generator module.

The Sweep Rate Generator (M101) provides the basic Sweep Ramp for the instrument and output for Horizontal and Synchronous display.

The Sweep Drive modules (M102 and M103) provides DC control and shaping of sweep drive signals for all oscillators.





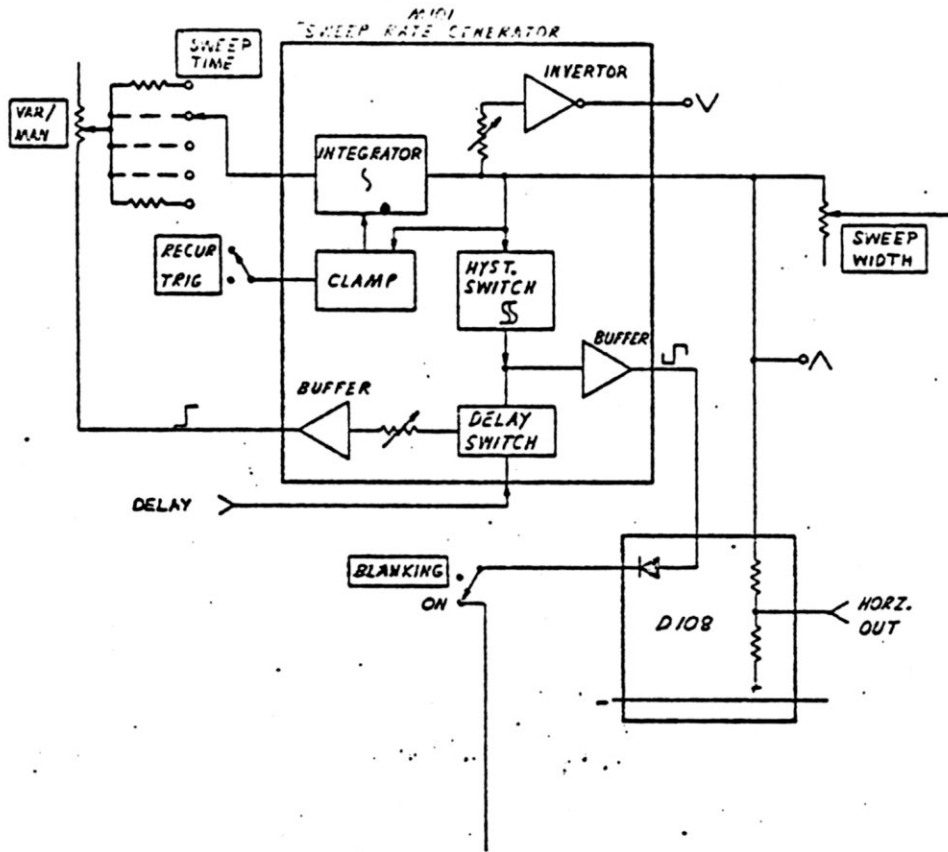
### POWER SUPPLY (DPS2-1)

The Power Supply provides DC power for the rest of the instrument.

The +18 V supply is based on a high-accuracy, very stable IC voltage regulator, and also includes current limiting.

The -18 V supply compares the +18 and -18 V outputs and holds the difference in their magnitude to zero. Current limiting is also included.

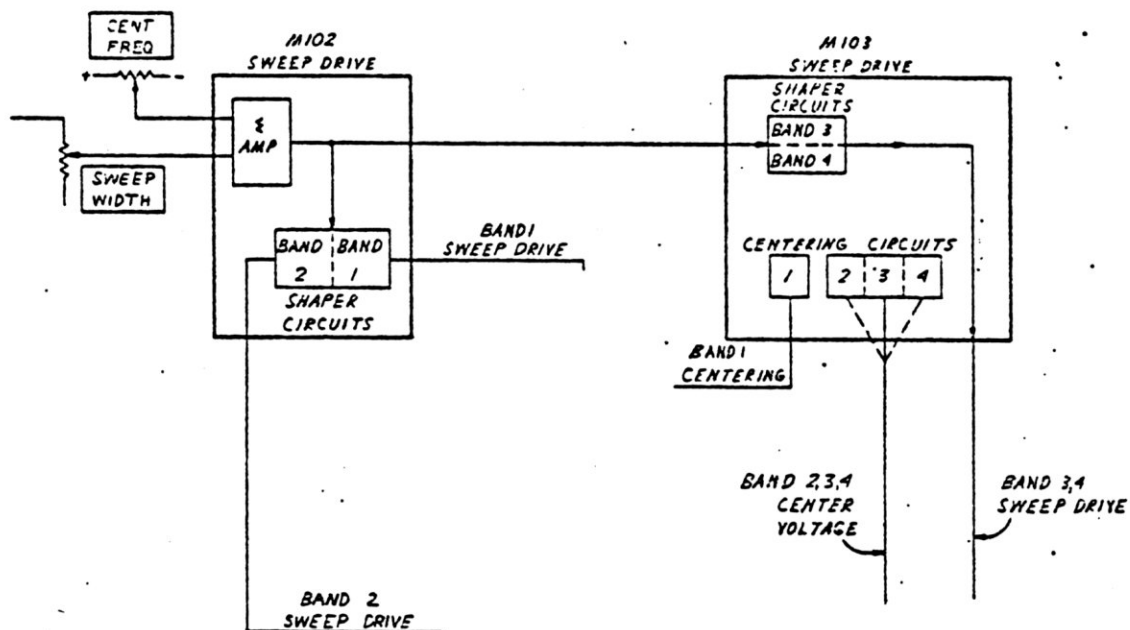
The +7.3 V supply is a pre-regulator which supplies power to the +5 V regulators located throughout the instrument. It too is a comparator referenced to the +18 V supply.



## M101 - SWEEP RATE

This module generates the basic sweep ramp for the instrument, an inverted ramp used in S/S mode, and a synchronous square wave used for blanking and in band stacking operation.

The M101 is basically a hysteresis oscillator, consisting of a Hysteresis Switch (IC5A) and an Inverting Integrator (IC1 with C9). The sweep ramp is the Integrator output, while the inverted ramp (derived from the sweep ramp) is the output of an Inverting Buffer (IC2).



### M102 - SWEEP DRIVE

This module provides the correct sweep drive voltage required by the Sweep Oscillators for bands 1 and 2.

The M102 sums the voltage from the CENT FREQ control with a portion of the sweep ramp selected by the SWEEP WIDTH control setting. The combined ramp is then shaped into the proper signal to drive the Oscillators. The unshaped ramp and two offset ( $\pm 7.5$  V) ramps appear as outputs from the M102 to the M103, where they are used, in shaping the sweep drive signals for bands 3 and 4.

### M103 - SWEEP DRIVE

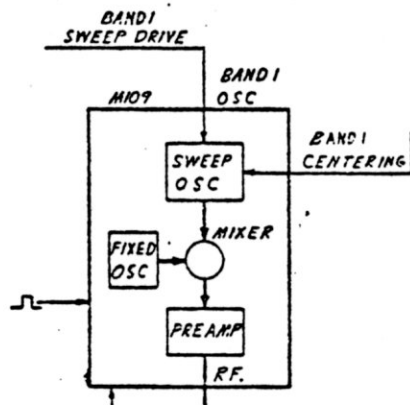
This module supplies the centering voltages to the four Voltage Controlled Sweep Oscillators in the instrument, and also provides the correct sweep drive voltages required for bands 3 and 4.

The centering voltages are adjusted with potentiometers R7, R8, R9 and R10. These voltages are applied as bias voltages to the varactor diodes in each Sweep Oscillator. The bias is adjusted such that each Sweep Oscillator will be at its center frequency when its sweep drive voltage is zero.

The sweep drive circuitry in the M103 is very similar to that in the M102 described above.

## RF GENERATION GROUP

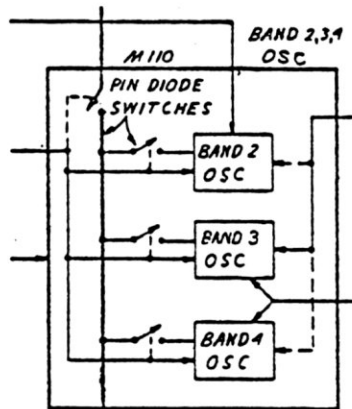
The RF Generation group provides the low power RF in four discrete bands. Band one (1-530 MHz), Band two (500-1000 MHz), Band three (1000-1500 MHz), Band four (1500-2500 MHz). All RF generation is achieved through the use of voltage variable capacitance in the tank circuit of the appropriate oscillator. Band one (1-530 MHz) occurs in the M109, Bands two, three and four generation take place in the M110.



### M109 - BAND 1 SWEEP OSCILLATOR

This module generates the 1-530 MHz band 1 frequency range by heterodyning the output of an 1198 MHz Fixed Oscillator (Q5) and an 1199-1728 VCO (Q2). (The VCO is biased to oscillate at 1448 MHz when the sweep drive signal is 0 V, and varies above and below this frequency as the sweep drive is varied.) Both outputs are buffered and leveled before being heterodyned in the Mixer (CR101 through CR104). The Mixer IF output is preamplified (Q201 through Q204) and sent through the M110 to the M111 Output Amplifier.





#### M110 - BAND 2, 3, 4 SWEEP OSCILLATOR

This module generates the band 2, 3, and 4 frequency ranges. The M110 consists mainly of three separate VCOs, one for each band. The VCOs are turned on individually by -18 V signals (B-2, B-3, B-4) from the front-panel BAND switch. Each VCO is biased to oscillate at its respective band center frequency when its sweep drive signal is 0 V. As the sweep drive signal varies, so does the frequency of the selected VCO. A PIN diode switch at the output of each VCO couples the output signal to the module output, J2, and also serves to isolate the VCO from the other two VCOs. From J2, the output signal is sent to the M111 Output Amplifier.

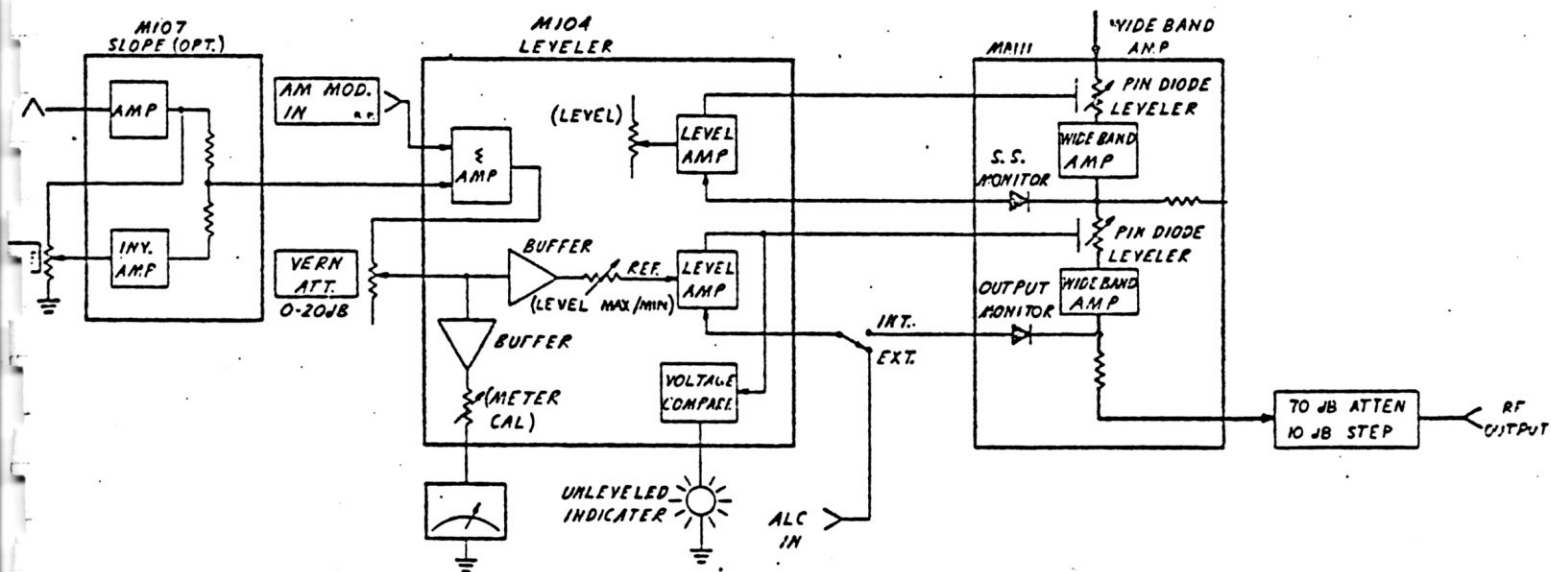
When band 1 is selected, the B-1 signal turns on the PIN diode switch formed by CR8 and CR9, routing the M109 Band 1 Sweep Oscillator output through to the M110 output, J2.

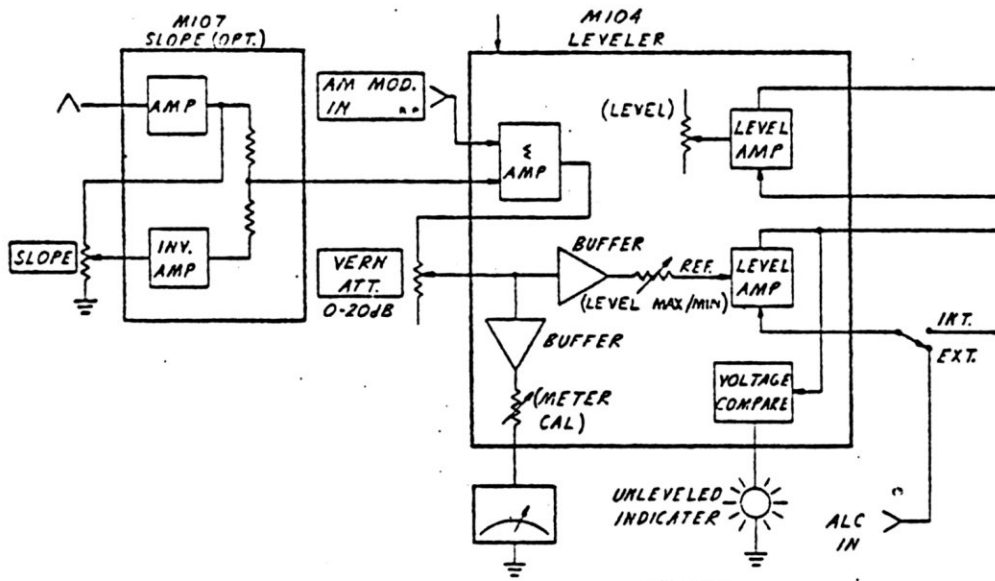
## OUTPUT GROUP

The output group controls the output signal amplitude and flatness.

The output frequency is generated in the M109 and M110 Sweep Oscillator's. The signal is amplified and leveled in the M111 Output Amplifier, with AM also being produced here. The signal is then attenuated to the desired output amplitude and sent to the front-panel RF OUT connector.

An option may be added into the above process, which will provide for slope compensation.



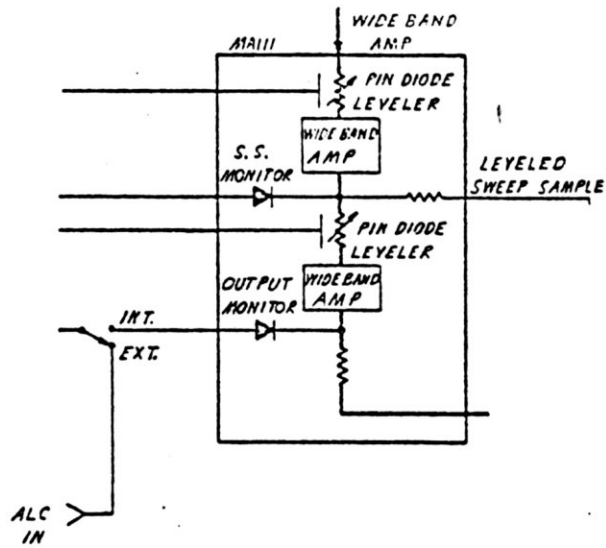


## M104 - LEVELER

This module contains the leveling circuitry for both the instrument RF output and internal sweep sample, and also drives the front-panel METER and UNLEVELED indicator lamp.

## M107 - SLOPE (OPTION B1)

This module produces a ramp output which is fed into the M104 Leveler to modulate the instrument RF output signal.



### MA111 - OUTPUT AMPLIFIER

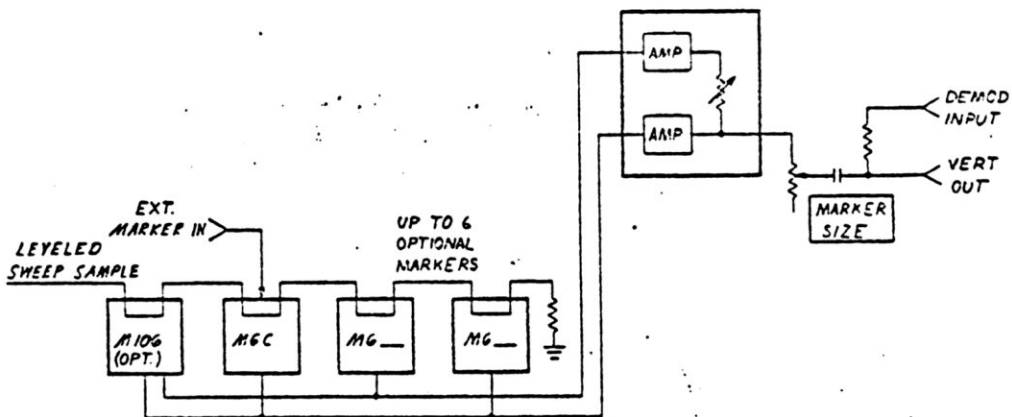
The MA111 is a six stage amplifier arranged in two sections of three stages each, the output of each section being individually monitored and leveled. The output of the first section feeds the input to the second section, and also supplies a sweep sample output to the marker modules.

## MARKER GROUP

The Marker Group provides a means of frequency measurement, synchronous to the swept RF.

Actual marker generation takes place in the M6 Module Mixer, generating a low level "Birdy" Marker.

M105 provides amplification and shaping of birdy, plus control of size and width of marker.



## M105 - MARKER ADDER

The function of this marker is to take the small beat-frequency marker signals from the various marker options, amplify them, and send them to the front-panel MARKER SIZE control to be added to the demodulated RF signal for display.

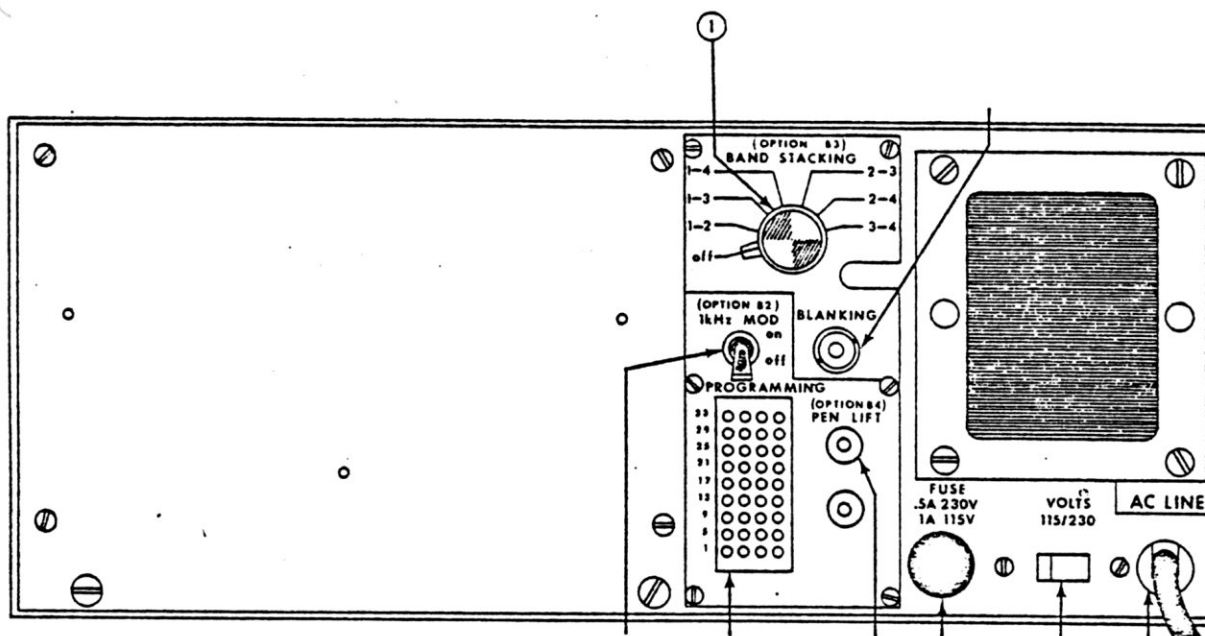
Two parallel amplifiers are used in this module. The output of one of the amplifiers is adjusted with the Size Ratio control, R29, to produce markers of different sizes.

## MARKERS

Several types of marker modules are available to cover the wide frequency range of the Model 2002, and to produce both single frequency and harmonic markers. These include:

	EXTERNAL
M6C	
M6S	SINGLE FREQUENCY (Option A1)
M6H	HARMONIC (Option A2)
M66H	DUAL HARMONIC (Option A2)
M106	DELUXE HARMONIC (Option A3)

## OPTION B3 - BANDSTACKING



### OPTION B3 - BAND STACKING

This option allows any 2, 3, or 4 adjacent bands to be swept and displayed together. Controls for Option B3 are located on the instrument rear panel. When the rear-panel BAND STACKING switch is set to OFF, normal, single band operation is effected. When the switch is set to any other position, the bands indicated are being swept, and the front-panel BAND, CENT FREQ/START, and SWEEP WIDTH/STOP controls are inactive.

### M108 - BAND STACKING (OPTION B3)

The function of this module is to produce a stacked display of any 2, 3, or 4 adjacent bands, as selected by the rear-panel BAND STACKING switch. It accomplishes this by sequentially activating the selected Sweep Oscillators while producing a composite horizontal drive signal.

The sequencing is performed by a counter (IC1) which is clocked by the blanking signal from the M101 Sweep Rate Generator. The counter is preset by the rear-panel BAND STACKING switch. The counter output is decoded by IC2, then buffered and raised to a +18 V level by Q10 through Q19. The -18 V signals pass through diodes CR3 through CR6 to turn on the selected Sweep Oscillators. (No more than one Sweep Oscillator will be selected at any given time.) When the band 4 Oscillator is selected, a -18 V signal is sent to the M101 to double the sweep time for band 4 sweep.