

1100 Series Receivers



RF TELEMETRY
METEOROLOGICAL SATELLITES
COMMUNICATIONS SATELLITES
MISSILE AND AIRCRAFT TESTING
RF DATA ANALYSIS
ANTENNA TRACKING
WEAPONS SYSTEMS TESTING
EARTH RESOURCES DATA
VEHICULAR TESTING
RPV VIDEO LINKS

Corporate Synopsis

Table of Contents

Applications	2
General Description	2
Block Diagram	3
Special Purpose Modules	5
Special Purpose Receivers	6/23
General Specifications	7
RF Data Analysis Tuner	10
RF Tuners	11
Second IF Filters/Amplifiers	14
Demodulators	16
Spectrum Display Unit	19
Other Standard 1100-AR Features	20
Pre-D Converters	20
Internal Pre-D Converters	21
Additional Accessories	22
Met Satellite Configurations	24
Other Special Applications	26

Microdyne Corporation manufactures receivers and related equipment for RF telemetry, meteorological and communications satellites, aerospace research and satellite television use throughout the world. Major customers include agencies of the U.S. and foreign governments, major aerospace system manufacturers and domestic CATV stations.

The main product line consists of receivers, diversity combiners, precision signal generators, and predetection tape recording converters. The company also markets complete television satellite earth terminal systems and receivers.

In their respective market area, Microdyne's equipment is technically strong. In the general purpose satellite and RF telemetry market, the company's 1100 Series receiver is the standard of the industry and far outsells all competitive products of this type combined.

Corporate headquarters and principal production and engineering facilities are located in Rockville, Maryland, a suburb of Washington, D.C. The company also has a production facility in Cumberland, Maryland. Field sales and service offices are located in Newbury Park, California and in West Wareham, Massachusetts.



1100 Series Satellite and R.F. Telemetry Receivers

Electronic Tuning — Voltage tuned VFO's and patented four pole preselectors in RF tuners and patented (optional) voltage tuned 2nd IF bandwidths permit local, remote or computer receiver control.

RF Tuners — Available with standard frequency calibrated ribbon dial or with an optional frequency synthesizer, LED digital frequency display and keyboard entry, or with an optional LED digital frequency display only.

Versatility — One basic receiver chassis can be readily configured for all FM, PCM/FM, PCM/PM, Wide Angle PM and $\pm 90^\circ$ PSK Bi-Phase demodulation of Meteorological Satellite and IRIG RF telemetry formats by appropriate module selection.

Other Applications — Simultaneous antenna tracking and data processing, Pre-D record and playback plus pre- and post-detection diversity combining capability.

Integrated Circuit and Modular Design — Receiver reliability has been increased to a calculated MTBF in excess of 7,500 hours and a mean time to repair has been reduced to approximately 30 minutes by exchanging spare modules.

Automatic Search and Acquisition AFC — The entire signal search and lock cycle is completely automatic at any input level above threshold.

High Performance AFC — Any error at the 10 MHz 2nd IF input is compensated by high drift reduction AFC action and the spectrum is balanced around the receiver's center frequency rather than being offset by the accumulated error.



Applications

Two of the most widely used 1100 Series Receivers are the Models 1100-AR and 1100-AR(5) which are recognized world standards for Meteorological Satellite Earth Terminal and RF Telemetry Applications. This universal acceptance was earned by proven performance, competitive price and the capability of achieving great versatility through totally coordinated modular design.

By simply changing a few appropriate plug-in modules, just one basic receiver chassis is needed to process data and to provide antenna tracking information for all of the following programs: Landsat USB, VHRR, AVHRR, Meteosat, Nimbus-G, Seasat-B, Stretched VISSR, DMSP, MDS-WEFAX and MDS-APT, plus all IRIG Telemetry data link formats. The latter include such programs as Harpoon, Cruise Missile, Polaris, Trident, F-14, F-15, F-16, AWACS, NATO-5, MRCA, Space Shuttle and many others. Furthermore, no receiver modifications are required to interface with any of these systems and all receivers used in these applications can be locally, remotely or computer controlled. Receiver obsolescence is also avoided since compatible plug-in modules can be provided to meet any foreseeable requirement.

Thus, the need to purchase different types of specialized receivers for different applications is avoided. This flexibility also means that Microdyne receivers can be readily modified to meet many specialized applications which would otherwise require a new and expensive receiver design. Rugged design, the use of monolithic integrated circuits and their attendant reductions in component density insure high reliability and superior performance in aircraft, mobile vehicle and surface vessel applications of all types.

The same basic receiver chassis may also be configured for pre-detection record and playback use as well as for various types of diversity reception, and pseudo-monopulse antenna tracking applications.

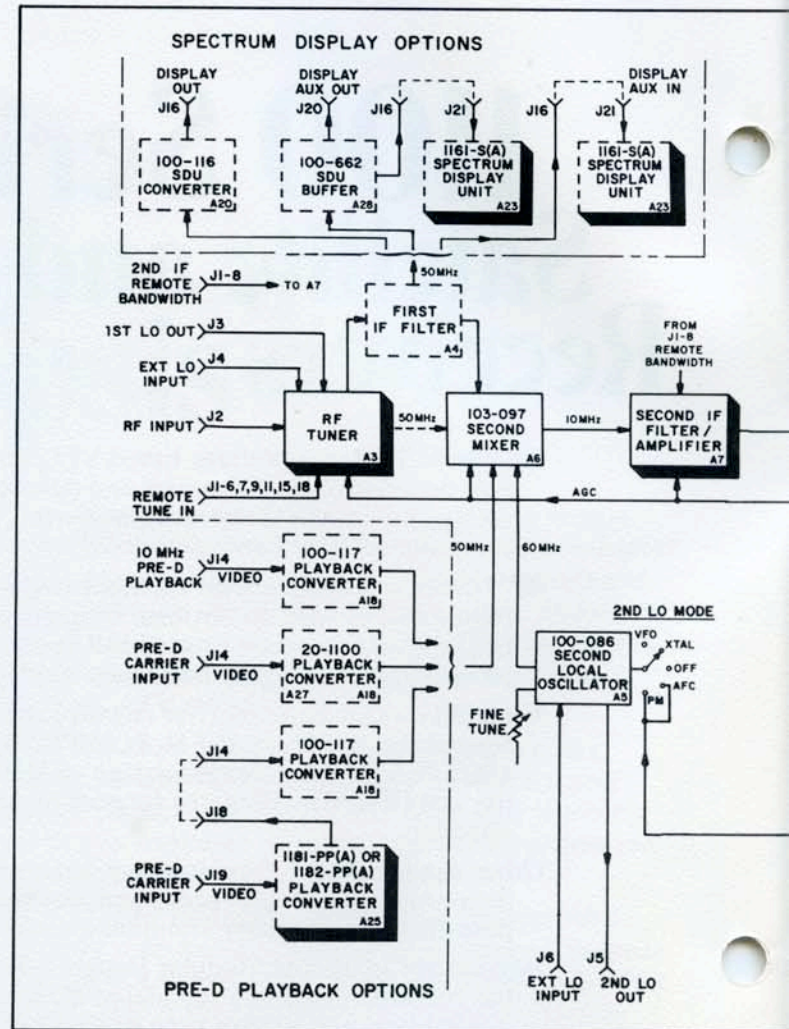
General Description

INTRODUCTION

As previously mentioned, 1100-AR Series Base Chassis are designed to accept a wide variety of plug-in modules. Each chassis contains its own power supply and internal wiring and associated circuitry for proper interface.

Standard plug-in 1100 Series RF tuners are available in discrete frequency ranges from 65 MHz to 4.2 GHz. Most tuners feature a patented voltage tuned, four pole preselector and first LO/VFO which permit the unique operational choice of local, remote or BCD/TTL compatible computer tuning.

RF Tuners are available with many different options. Each is identified by certain suffix letters, numbers or combinations of the two that have been added in parentheses after the model number. For example, those with a suffix (SYN) after the model number indicate an optional tuner with a keyboard entry. A frequency synthesized first LO that generates selected frequencies in 500 kHz or less increments provides an appropriate first LO signal having the same stability as standard crystals. In addition, the keyboard entry frequency is used to generate an analog preselector tuning voltage and a front panel digital display of the selected frequency. Either local or remote computer generated tuning commands may be selected. At the present time, synthesized tuners must be used with AM and FM data formats only.

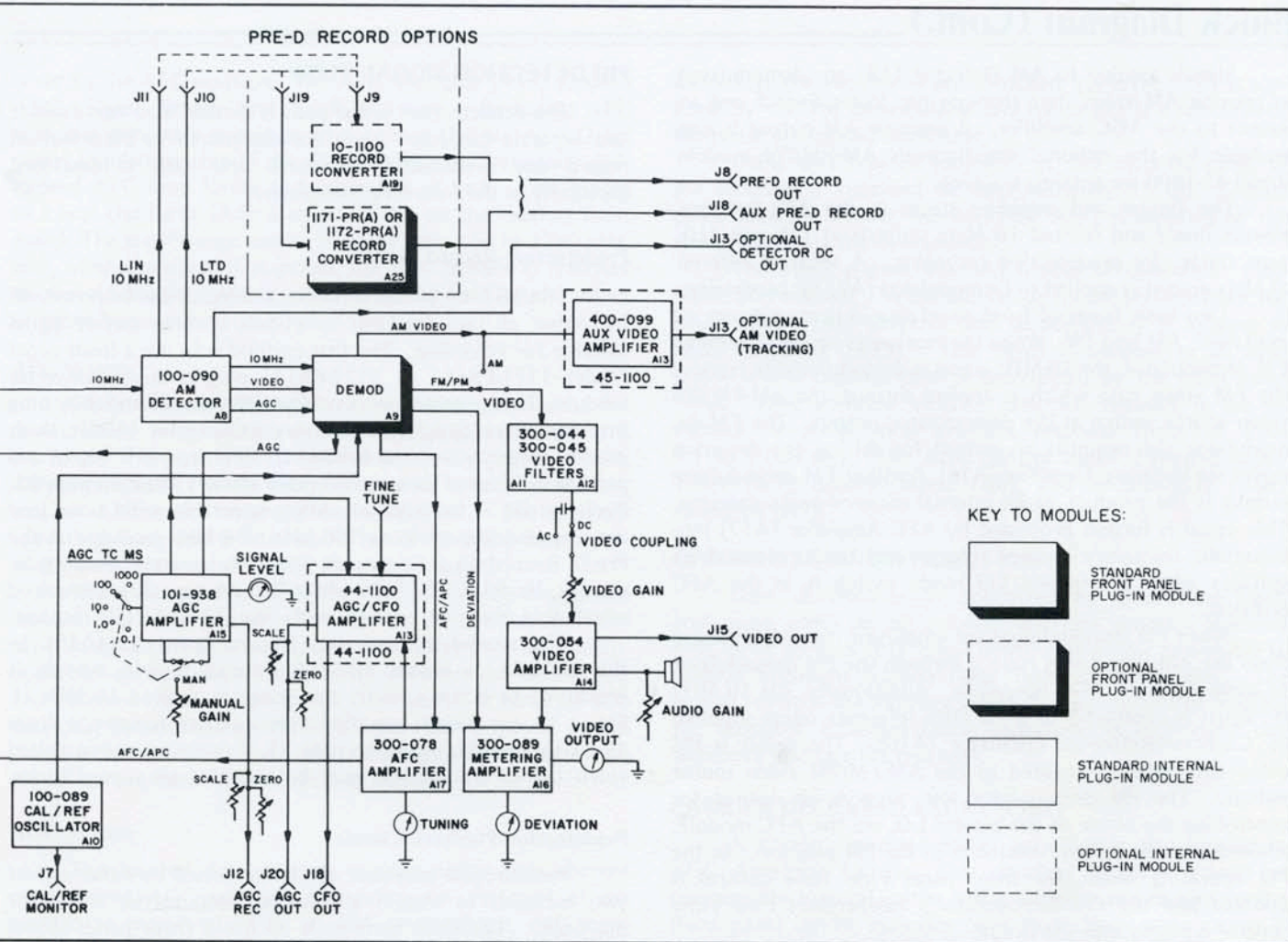


Optional tuners with a suffix (D) indicate a digital frequency display only. Continuous tuning is provided by a local, remote or computer interfaced multi-turn potentiometer. This control supplies the first LO/pre-selector with a voltage corresponding to the desired frequency. The frequency to which the receiver is tuned is then automatically indicated on the front panel digital display.

When tuners have a suffix (A) or no letter after the model number, a standard frequency calibrated ribbon dial is provided. A multi-turn potentiometer is also used to supply the correct tuning voltage, as with suffix (D) tuners, but here the potentiometer is coupled through a mechanical drive gear to a frequency calibrated ribbon dial display.

With few exceptions, such as option (K), all RF Tuners are interchangeable. Other available options are described in Table 2 on page 13.

In addition to an RF Tuner, a second IF Filter/Amplifier of an appropriate bandwidth and an FM or PM Demodulator, depending upon the data format employed, must also be plugged into the front panel for the receiver to function. These modules and their characteristics are fully described under their respective sections in this brochure and in the following paragraphs.



Block Diagram

MAJOR SIGNAL PATHS

Three major signal paths are provided in 1100-AR Series dual conversion receivers to process received data. They are: primary signal flow, predetection signal flow and control signal flow. These independent functions are achieved by internal receiver circuitry and by various plug-in modules represented in the receiver block diagram.

PRIMARY SIGNAL FLOW

Primary signal flow starts at the antenna input of RF Tuner (A3). Different tuners may be plugged in according to specific requirements; with each unit capable of being tuned locally, remotely, or by computer control. Remote Tune In connector J1 is provided to accept a remote or computer interfaced control voltage. A front panel switch is provided on RF tuners to select remote or local operation. Ext LO Input connector J4 permits external use of an ultra stable LO frequency standard or a frequency synthesizer in place of the internal LO/VFO. This also permits slaving one receiver LO to the LO of one or more other receivers for diversity reception applications. The First LO Out connector J3 is normally used for frequency measurements.

When RF signals are applied to the tuner input, they are mixed with the internal switch selectable crystal LO or VFO source, or an external source and are down converted to the 50 MHz first IF. The 50 MHz first IF output may then be fed

through optional 1st IF Filter (A4) or jumpered through to Second Mixer (A6). It should be noted, however, that a first IF filter must be used for proper interface when an optional internal or external plug-in spectrum display is employed. A first IF filter is also recommended to minimize the effects of adjacent channel interference. Six different filter bandwidths from 600 kHz to 9 MHz are available for this purpose. These units are listed on page 22.

The second IF conversion to 10 MHz is accomplished by mixing the 60 MHz output of Second Local Oscillator (A5) with the 50 MHz first IF signal. The second LO mode switch permits a choice of different internal LO sources as shown, while EXT LO Input connector J6 allows the use of any external LO source or the slaving of one receiver with one or more other receivers. Connector 2nd LO Out, J5, permits measuring the second LO frequency.

10 MHz Second Mixer (A6) output is routed to Second IF Filter/Amplifier (A7) which establishes the second IF bandwidth of the 10 MHz center frequency. Any one of three types of front panel plug-in IF Filter modules may be used. They consist of fixed single bandwidths, a choice of any two or three switch selectable fixed bandwidths installed in a single plug-in module or three different ranges of continuously variable IF bandwidths. Connector J1-8 permits remote control of the variable IF bandwidth filter. Refer to pages 14 and 15 for a complete listing of available IF Filter/Amplifier units.

Block Diagram (Cont.)

Signals applied to AM Detector (A8) are demodulated to provide AM video data through the Video Switch and an output to the AGC amplifier. A separate AM output is also available for the optional simultaneous AM-FM/PM module Model 45-1100 for antenna tracking.

The limiter and amplifier stages in the AM Detector provide linear and limited 10 MHz outputs at J11 and J10, respectively, for predetection recording. A separate filtered 10 MHz output is applied to Demodulator (A9) for processing.

Two basic types of front panel plug-in demodulators are available: FM and PM. When the receiver is equipped with an FM demodulator, the 10 MHz signal is demodulated to retrieve the FM video data which is applied through the AM-FM/PM video source switch at the demodulator output. The FM demodulator also supplies an output for driving the deviation meter via Metering Amplifier (A16). Another FM demodulator output is the product of an internal mean-of-peaks detector. This signal is further processed by AFC Amplifier (A17) into automatic frequency control voltages and tuning meter drive voltages when the second LO mode switch is in the AFC position.

When PM demodulators are employed, the AGC voltage from the AM detector is routed through the PM demodulator to allow coherent AGC operation. Additionally, the 10 MHz IF signal is compared to a 10 MHz reference signal supplied by Calibrate/Reference Oscillator (A10). The result is PM video data which is routed to the AM-FM/PM video source switch. The PM demodulator also supplies an output for controlling the phase of the second LO, via the AFC module, when the mode selector switch is in the PM position. In the PM operating mode, the front panel Fine Tune control is disabled and the PM demodulator's independent Fine Tune control is placed into the circuit.

Video data from either type of plug-in demodulator or AM detector is taken from the appropriate video source switch position and applied to the input of Video Filter (A11, A12) and Video Amplifier (A14). The video amplifier module contains two separate amplifier circuits. One amplifier accepts the video input and supplies a video output to rear apron connector J15. This output is adjusted by a front panel gain control. A second output drives the front panel Video Output meter through Metering Amplifier (A16). The second amplifier is for monitoring the audio signal via the Audio Gain control.

Model 1100-AR

Receiver with Standard 7" Panel



PREDETECTION SIGNAL FLOW

The predetection signal path is divided into two distinct and separate circuits. They are designated as predetection record and predetection playback and each is described separately in the following paragraphs:

Predetection Record Circuit

The 10 MHz predetection record signal can be processed by either of two methods to obtain a video carrier signal suitable for recording. The first method is to use a front panel Model 1171-PR(A) or 1172-PR(A) plug-in down converter module. These options are described on page 20 and they plug into the space designated as Record Converter (A25). Both models accept a linear or limited 10 MHz second IF signal and provide a choice of six standard video carriers listed on page 21. Each carrier is front panel switch selectable with associated data bandwidths of from 150 kHz to 4 MHz available at the Pre-D Record Out Connector J18. A separate housing assembly, Model 2281-PP(A) (described on page 20) is required when this method is used with the 1100-AR(5) receiver.

The second method uses Record Converter (A19). In this instance, a Model 10-1100 internal plug-in module is employed to down convert the linear or limited 10 MHz IF Signal to any single specified video carrier frequency from 112.5 to 900 kHz listed on page 21. If required, non-standard video carrier frequencies may be specified on special order.

Predetection Playback Circuit

Predetection playback can be processed by either one of two methods to obtain a suitable video carrier signal for playback. The first method is to use a front panel Model 1181-PP(A), 1182-PP(A) or 1182-PP(A1-A4) Series Pre-D Playback Converter in (A25) shown on page 2.

Each of these converter modules is switch selectable and will accept any one of six standard video carrier frequencies listed on page 21, and up convert it to 10 MHz. This signal is routed to internal plug-in Model 100-117, designated as Playback Converter (A18). The 10 MHz signal is then up converted to 50 MHz and fed to second mixer Block (A6) where it enters the predetection path of primary signal flow.

A separate housing assembly, Model 2281-PP(A) (described on page 20) is required when this method is used with the 1100-AR(5) receiver.

The second method uses an internal plug-in Model 20-1100, designated as Playback Converter (A27, A18). This module actually consists of two up converters. The first accepts any single 112.5 to 900 kHz specified video carrier from the tape recorder and up converts it to 6.8 MHz. This signal is again up converted in the second converter to a 50 MHz signal which is fed to Second Mixer (A6) as before.

CONTROL SIGNAL FLOW

Control signals include automatic gain control plus either automatic frequency control or phase control; depending on the demodulator in use.

AFC System

The AFC system is operable when the receiver is equipped with an FM demodulator and the second LO mode switch

is set to the AFC position. The AFC Amplifier (A17) supplies AFC, Signal Search and Lock Voltages. Basically, AFC circuitry generates a voltage that sweeps the second LO for signal acquisition should the signal fade or the frequency drift exceed AFC loop limits and cause loss of lock. Fine tuning of Local Oscillator (A5) is also available on the receiver front panel. The search range can be adjusted from ± 50 to ± 250 kHz; and, when the signal is acquired, the AFC System is returned to the automatic tracking mode to adjust for Doppler effect or other frequency errors.

APC System

The receiver's APC system is only operable when a PM demodulator is installed and the second LO mode switch is set to the PM position. This circuitry is composed of AFC Amplifier (A17), which includes internal retrace amplifiers, and an APC board in the PM demodulator. The system's operating mode and RC networks for determining loop bandwidth are also contained in the PM demodulator.

When the receiver is set for APC operation, the normal receiver fine tune control is replaced by the demodulator fine tune control. In this mode, the APC system not only maintains the correct phase relationship between the second LO and received signals, but it will also search a range of frequencies, determined by the loop bandwidth selected, should phase lock be broken. Two switch selectable signal acquisition modes are provided: automatic and manual.

AGC System

The receiver AGC System supplies either non-coherent or coherent AGC voltages, depending on the type of demodulator employed. With an FM demodulator, only non-coherent AGC voltages (which are a function of the carrier envelope), are generated. When a PM demodulator is installed, both coherent and non-coherent voltages may be generated; depending on whether or not the receiver is phase

locked. If the receiver is phase locked, coherent AGC is supplied by the PM demodulator and its output is a function of the phase modulated amplitude.

Using this type of gain control, the dynamic range of the receiver is increased by approximately 15 dB. Should phase lock be broken, non-coherent AGC is supplied by the AM detector via the demodulator.

The AGC system has two modes of operation: automatic and manual. In the automatic mode, voltage from the AGC source (AM detector and demodulator) is applied to AGC Amplifier (A15). This signal is coupled to an integrator whose response time is determined by the front panel "AGC" time constant switch. The RC network in the integrator feedback loop provides response times of from 0.1 to 1,000 m.s. The AGC control signal is applied to RF Tuner (A3), Second Mixer (A6), and to Second IF Filter/Amplifier (A7).

OPTIMIZED GAIN DISTRIBUTION

Gain distribution is optimized by controlling signal and noise levels at all receiver interface points. Receiver gain, prior to second IF band limiting, is as low as possible to achieve optimum receiver noise figure characteristics. The overall result is the industry's first receiver capable of meeting the stringent intermodulation requirements of present day telemetry and satellite receivers.

CARRIER OPERATED RELAY (COR)

A Carrier Operated Relay amplifier is also located in AGC Amplifier (A15). This standard function is used to energize the internal carrier operated relay and to turn on the front panel carrier indicator light that shows when carrier is acquired. COR contact closures are also available at rear panel connector J1 for external use. See other standard 1100-AR features on page 20.

Special Purpose Modules

OPTIONAL SPECTRUM DISPLAY MODULE AND EXTERNAL HOUSING ASSEMBLY

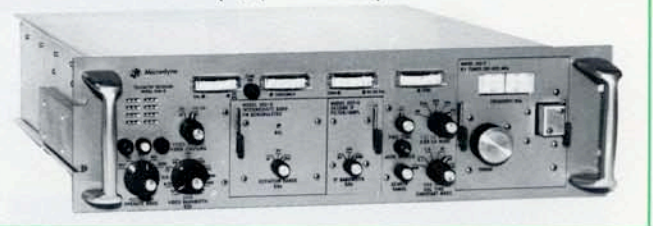
First IF Filter (A4) must be used whenever a spectrum display unit is used. A standard Model 1161-S(A) SDU, designated as A23, may be plugged into the front panel of 1100-AR receivers or installed externally in a Model 2261-S(A) Dual Housing Assembly when using 1100-AR(5) or other types of receivers.

The Spectrum Display Unit may be fed through SDU Buffer (A28), which also supplies an isolated output at J20 for noise measurements; or it can be fed directly from First IF Filter (A4). The SDU Converter (A20) is used to convert the 50 MHz first IF signal to an external, non-standard 30 MHz type SDU. (See page 19 for details).

OPTIONAL 45-1100 AUXILIARY VIDEO AMPLIFIER

Optional Model 45-1100 Auxiliary Video Amplifier (A13) is available to supply an AM output for antenna tracking use. This model utilizes an AM video signal from Demodulator (A9) to provide a separate output for tracking applications. Note that in addition to a 45-1100 module, internal plug-in Block A13 will also accommodate a 44-1100 AGC/

Model 1100-AR(5) (5/4" Panel)



CFO module but not both. If both are required, another space is provided.

OPTIONAL 44-1100 AGC/CFO MODULE

An optional Model 44-1100 internal module, also designated A13, is available to supply an auxiliary Automatic Gain Control (AGC Out) and a Center Frequency Output (CFO Out). The AGC output is normally used with external pre or post detection diversity combiners. Separate potentiometer controls are provided to adjust the AGC scale and the zero setting for compatible combiner operation. Unless otherwise specified, the output AGC polarity is 0 to -8V.

Special Purpose Modules (Cont.)

The CFO Out at connector J18 provides a DC offset voltage which is calibrated to indicate a relative offset frequency. Thus, the CFO output can be used to measure frequency, Doppler Effect and accumulated frequency errors.

Independent AGC and CFO functions are also supplied in separate modules. These and other related options are listed on page 22.

STANDARD AGC PRE-D RECORDING OUTPUT

AGC Amplifier (A15) supplies a separate output to AGC Receiver connector J12. This is used to supply an AGC

voltage to a Predetection Recording channel. Scale and zero potentiometer controls are provided as shown. A 0 to -8V or 0 to +8V AGC signal can be selected by a switch located on the rear panel of the receiver.

OPTIONAL VCXO

An optional VCXO Second Local Oscillator, Model 101-342, is occasionally required in place of standard Second Local Oscillator (A5). It is used when very narrow bandwidth second IF Filter/Amplifiers are employed with PM demodulators. See page 22 for details and other accessories available.

Special Purpose Receivers

The Model 1100-AR(PP) has the same basic receiver chassis as the 1100-AR, but is designed to be used exclusively for Pre-D playback of pre-recorded magnetic tapes. It is, therefore, supplied without an RF tuner and will accept a Model 1181-PP(A) or 1182-PP(A) Series front panel plug-in up converter module. A Model 100-117 10 to 50 MHz Playback Converter Module is standard with this receiver.

An optional Model 1100-AR(J) receiver with a 0.5 dB dc to 2.5 MHz video response is available in place of the standard dc to 2.0 MHz (+1 dB, -3 dB) video response. All other characteristics are the same as the 1100-AR.

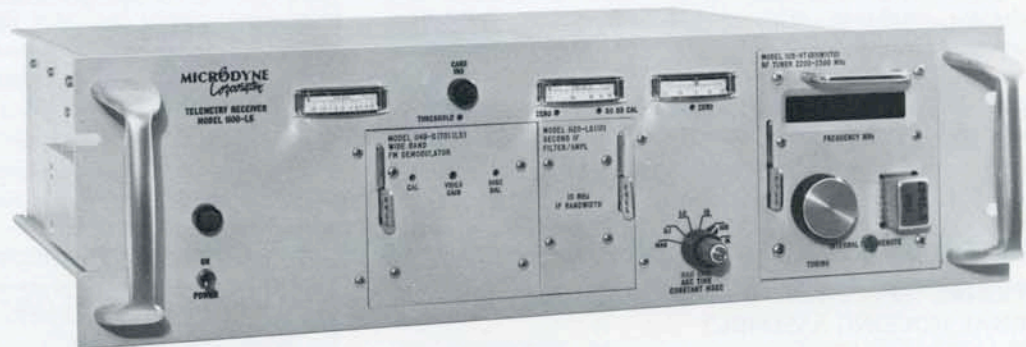
The 1100-AR(01) series receiver provides a video output

from dc to 2.0 MHz, ± 1 dB in place of the standard +1.0 dB, -3 dB specification.

Two or more separate 1100-AR or 1100-AR(5) receivers can be used for signal diversity reception by specifying that the first LO and, if need be, the second LO of the first receiver be slaved to the LO(s) of the other receiver(s).

Other modified versions of the 1100-AR receiver are described separately in this brochure. They include the 1100-AR(70) Satellite Communications Receiver, the 1100-LS Wideband Receiver, and the 550-AR Telemetry/Tracking Receiver described on page 23.

Model
1100-LS
Extra Wideband
Receiver



Model 2200-R(T)
Dual Channel Diversity Receiver

Microdyne also manufactures a complete line of dual channel receivers. These include the 2200-R(T) dual channel diversity receiver, the 2200-R(N)(B) dual channel computer controlled receiver, and the 2202-R dual channel monopulse antenna tracking/TM data receiver. These receivers, as well as other special purpose 1100 Series receivers, are fully described in separate brochures available from Microdyne.

ELECTRICAL:

Receiver Type	Double superheterodyne; 50 MHz first IF; 10 MHz second IF.
Frequency Range	65 MHz - 4.2 GHz, as determined by plug-in RF tuner. (See Table 1.)
Input Impedance	50 ohms, unbalanced.
Noise Figure	5.5 to 10.0 dB depending on RF tuner used. (See Table 1.)
VSWR	2:1 maximum, depending on RF tuner used.
Image Rejection	60 dB minimum, depending on RF tuner used.
IF Rejection	80 dB minimum, depending on RF tuner used.
Spurious Rejection	60 dB minimum.
Spurious Radiation	Meets or exceeds MIL-STD-461A and MIL-STD-826A.
Dynamic Range	Threshold to -10 dBm (threshold is defined as a 6 dB signal-to-noise ratio in the second IF passband).

NOTE

The following specifications are applicable to the respective portion of the receiver circuitry only. They are not to be interpreted as being applicable to a complete receiver or any configuration thereof due to variations in IF and loop bandwidths, RF tuner noise figure, and other similar limitations of the circuitry utilized in the receiver design. Also see pages 10, 11 and 13.

First LO Characteristics:

Modes	Switch selectable; VFO, XTAL (crystal), OFF (external input).
Stability:	
VFO	±0.001% per degree C.
Crystal	±0.0005% with oven, 0.005% without oven.
Synthesizer	±0.0005%, 0 to 50°C ambient. 1 part in 10 ⁶ for three months aging.

Second LO Characteristics:

Modes	Switch selectable; VFO, XTAL (crystal), AFC, PM, OFF (external input).
Stability:	
VFO	±0.001% per degree C.
Crystal	±0.005%.

AFC Characteristics:

Tracking Range	±400 kHz in addition to ±250 kHz fine tune control range.
Acquisition Range	Up to ±400 kHz from center frequencies in addition to ±250 kHz fine tune control range.
Drift Rejection Factor	Up to 10,000:1.
Search Range	50 kHz to greater than 800 kHz; approximately symmetrical about second LO frequency as set by front panel fine tune control.
Search Rate	1.5 MHz/second.

PM (APC) Characteristics:

Control Range	±250 kHz in addition to second LO fine tune range.
Search Range	50 kHz to greater than 500 kHz; approximately symmetrical about second LO frequency set by fine tune control. Range set by LOOP BANDWIDTH control.
Phase Loop Bandwidth	10, 30, 100, 300, 1000 Hz (standard) as determined by positioning of PM demodulator loop bandwidth switch.

Demodulation:

FM Demodulation	Refer to FM demodulator specifications, pages 16 and 17.
PM Demodulation	Refer to PM demodulator specifications, pages 17, 18 and 19.
AM Demodulation:	
AM Response	5 Hz to one-half IF bandwidth (1.6 MHz maximum).
AM Distortion	Less than 3% with 90% modulation at a 1 kHz rate.

General Specifications (Cont.)

AGC Time Constant	Switch selectable; 0.1, 1.0, 10, 100, 1000 msec normally supplied. Others available.
Video Characteristics:	
Output Impedance	75 ohms.
Rated Output	4 volts peak-to-peak.
Maximum Output	10 volts peak-to-peak.
Distortion	Less than 0.5% at rated output; less than 1% maximum output.
Source	Plug-in demodulator or AM detector.
Coupling	AC or DC; switch selectable.
Response	AC coupled - 5 Hz to 2.0 MHz +1.0 dB, -3 dB. DC coupled - DC to 2.0 MHz +1.0 dB, -3 dB.
Power Requirements	115/230 Vac, $\pm 10\%$, 50-400 Hz, 50 watts maximum. (Normally supplied wired for 115 Vac operation; specify 230 Vac operation, if desired, at time of order.)

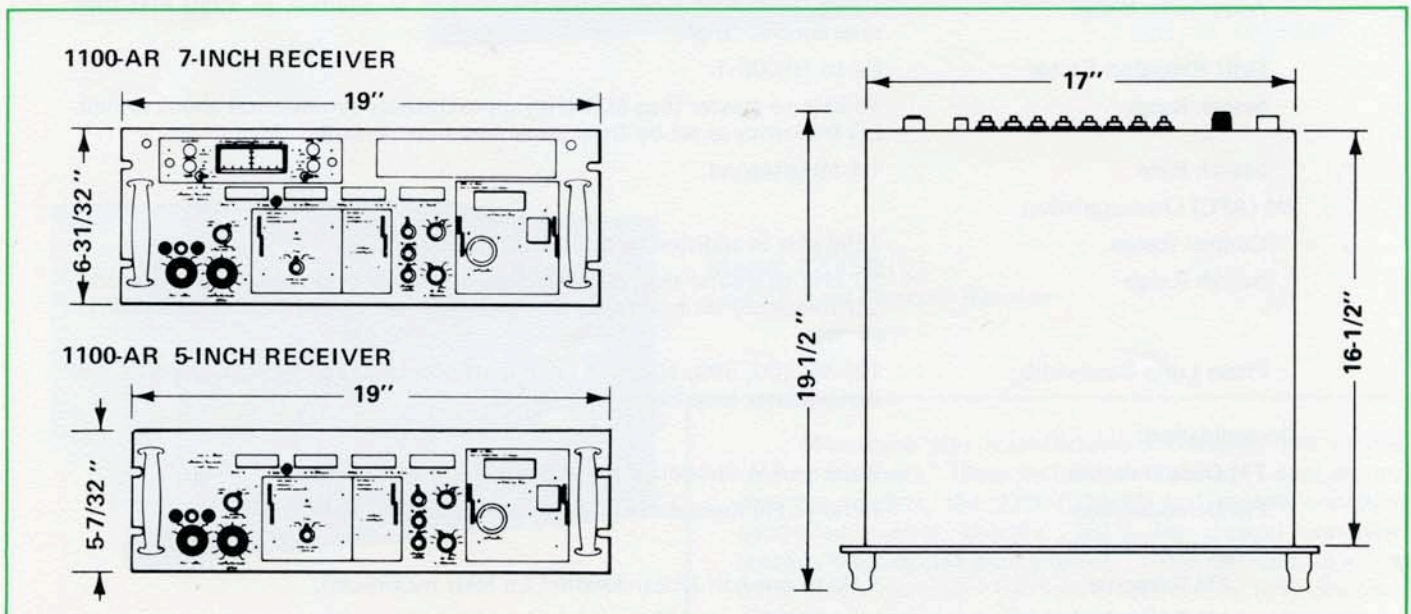
ENVIRONMENTAL:

Temperature Range:	
Storage	-62° to +65°C.
Operating	0° to +50°C.
Atmospheric Pressure:	
Storage	To 50,000 feet.
Operating	To 15,000 feet.
Humidity	Up to 95%.

MECHANICAL:

Height	5-7/32 inches - 1100-AR(5); 6-31/32 inches - 1100-AR.
Width	19 inches.
Depth	19-1/2 inches (including handles)
Weight	1100-AR(5) approximately 35 pounds; 1100-AR approximately 42 pounds.
Front Panel Finish	MIL-STD-595, Chip No. 25526 (blue gray). Other finishes available on special order.

Dimensions



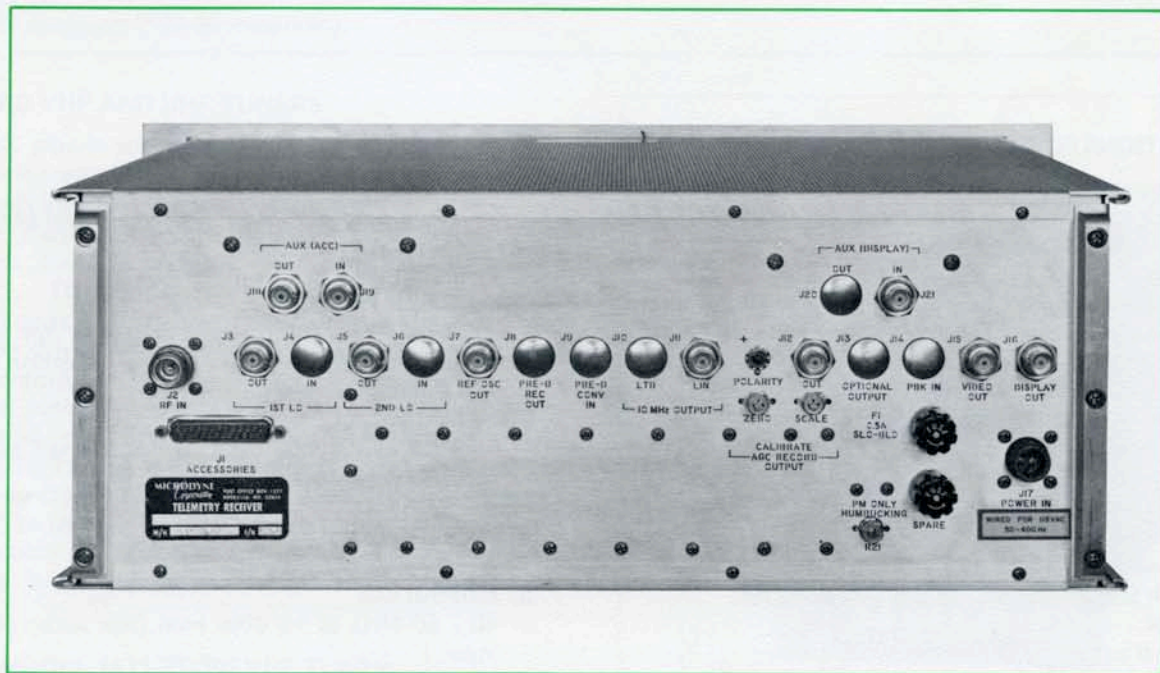
Base Chassis Rear Apron Connectors

- J1** ACCESSORY CONNECTOR: DC voltage outputs, loop lock monitoring, "carrier on" relay contacts, and remote tuning of the IF bandwidth and RF tuner.
- J2** RF IN: Input to tuner, 50 ohms, unbalanced.
- J3** 1ST LO OUT: Output for monitoring submultiple of first LO injection frequency, 50 ohms, -13 dBm nominal level.
- *J4** 1ST LO IN: Input for injecting external submultiple for first LO, 50 ohms, -13 dBm nominal level.
- J5** 2ND LO OUT: Output for monitoring second LO injection frequency, 60 MHz \pm 0.5 MHz, 50 ohms, -13 dBm nominal level.
- *J6** 2ND LO IN: Input for injecting external second LO frequency, 60 MHz \pm 0.5 MHz, 50 ohms, -13 dBm nominal level.
- J7** REF OSC OUT: Output for monitoring calibration/reference oscillator, 10 MHz, 50 ohms, -13 dBm nominal level.
- **J8** PRE-D REC OUT: Output from optional record converter. Choice of 900, 800, 600, 450, 225, and 112.5 kHz, 75 ohms, 4V p-p level.
- **J9** PRE-D CONV IN: Input to predetection record converter, 10 MHz, 50 ohms, -10 dBm nominal level.
- *J10** 10 MHz OUTPUT LTD: Output for limited second IF signal, 50 ohms, -10 dBm nominal level.
- J11** 10 MHz OUTPUT LIN: Output for linear second IF signal, 50 ohms, -10 dBm nominal level.
- J12** AGC REC OUT: Record output from AGC amplifier, 0 to 8 volts into 1K load, polarity selectable.
- *J13** OPTIONAL OUT: High impedance monitor output for AM detector or AM video (tracking).
- **J14** PBK IN: Input to internal playback converter, record carrier or 10 MHz depending on configurations, 50 ohms.
- J15** VIDEO OUT: Output for filtered video signals, 75 ohms, 10V p-p maximum.
- J16** DISPLAY OUT: Output for external spectrum display unit, 50 MHz, 50 ohms (30 MHz, 50 ohms, optional).
- J17** POWER IN: Input for AC power.
- *J18** AUX (ACC) OUT: Output from front panel predetection playback or record converter, 75/50 ohms.
- *J19** AUX (ACC) IN: Input to front panel predetection playback or record converter, 50 ohms.
- **J20** AUX OUT: Spare connector used in special applications.
- J21** AUX (DISPLAY): Input to front panel spectrum display unit, 50 MHz, 50 ohms.

NOTE:

The rear panel output connections as indicated "NON-ASTERISK" are standard items supplied with the receiver. Any one or a combination of those BNC rear panel connections shown with a "SINGLE ASTERISK" will be supplied for a nominal additional charge.

**These BNC rear panel connectors are required ONLY when the associated OPTIONAL plug-in modules are included in the receiver base chassis. (See Block Diagram, page 2.)



Mating connectors, except for J1 (Accessories) and J17, are available at extra charge from Microdyne; the mating connector for J1 is shipped with the receiver and the mating connector for J17 is an integral part of the power cable.

RF Tuners

SPECIAL 1185-T(D) RF DATA ANALYSIS TUNER – 10 kHz to 10 MHz (For Pre-recorded Magnetic Tape Playback Analysis)

Microdyne's Plug-in Model 1185-T(D) Data Analysis Tuner permits the 1100-AR Receiver to be used to process data that has been recorded on magnetic tape at frequencies between 10 kHz and 10 MHz. Signals appearing in this band are up converted to the receiver's 50 MHz first IF frequency. Single sideband techniques are utilized in order to process the wideband predetected input. Tuning is accomplished by front panel controls or by remote control.

Frequency coverage is in two bands: 10 kHz to 1 MHz and 100 kHz to 10 MHz. An external 40-50 MHz input may also be used as the LO source. Front panel 10-turn tuning controls consist of a coarse control at 1 MHz per turn and a fine tuning control at 10 kHz per turn. The frequency to which the unit is tuned is displayed on a five digit, numeric readout driven by the selected local oscillator source.

In order to handle the widest possible range of input signal levels, the 1185-T(D) is equipped with switch selectable input attenuators of 0 dB, 15 dB, 30 dB and 45 dB. Additionally, a variable attenuator, controlled by a tuner generated AGC voltage or a manually set gain control voltage, is integral to the tuner and provides a minimum gain control range of 20 dB.

This circuit serves two purposes: first, it maintains a constant level to the mixers so that the specified LO rejection is maintained, and second, it compensates for up to ± 10 dB variations in the tape recorder input level. The detector used for gain control drives a front panel meter to indicate the correct signal level to the tuner mixers.

A front panel red LED flashes a signal should the operator try to tune outside the tuning range. This works with local or remote tuning and the internal/external local oscillator. The internal counter also displays the tuned center frequency with an external local oscillator.

SPECIFICATIONS FOR 1185-T(D) DATA ANALYSIS TUNER

Input Frequency Range:

10 kHz to 10 MHz in two overlapping bands of 10 kHz-1 MHz and 100 kHz-10 MHz.

Tuning:

Continuously tunable with tuned frequency displayed on five digit readout.

Input Impedance:

50 ohms (75 ohms optional).

Input VSWR:

1.5:1 Maximum.

Input Level:

10 V p-p Maximum
1 V p-p Nominal

Input Attenuation:

Switch Selectable 0 dB, 15 dB, 30 dB, 45 dB.

Gain Control:

Internal automatic or manual.

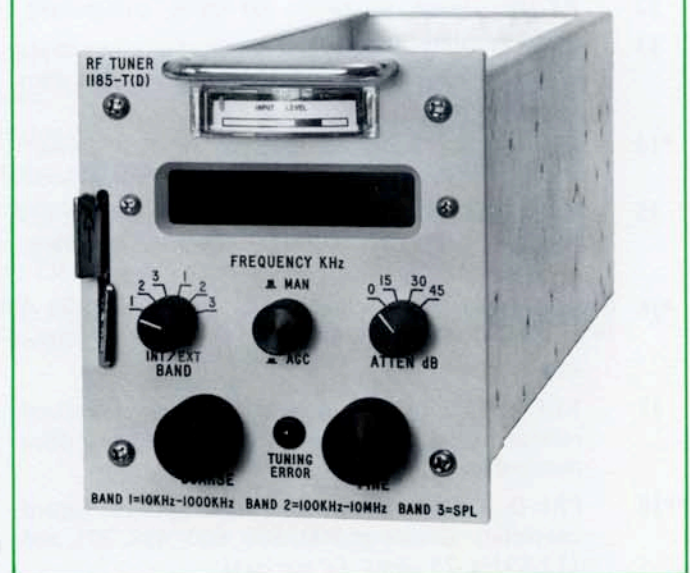
Automatic:

The tuner will maintain the signal level to the mixers constant within ± 1 dB over a range of ± 10 dB.

Manual:

≥ 20 dB continuously variable

Model 1185-T(D) 10 kHz to 10 MHz RF Data Analysis Tuner



A companion Model 1175-PR Pre-D Record Converter can also be plugged into the same receiver to down convert the pre-recorded 10 kHz to 10 MHz signals through the receiver's 10 MHz 2nd IF for real time tape monitoring or for rerecording and later analysis. This technique provides eight crystal selected output data center frequencies from 0 Hz to 3 MHz and output data frequency ranges from 50 Hz to 6 MHz. Either an internal or an external LO can be used. Detailed 1175-PR specifications are available upon request.

Spurious Levels:

≥ -30 dB with AGC on or Correct manual gain.

Image Frequency:

≥ 60 dB down.

Undesired Mixer Product:

The undesired (difference) frequency for single sideband upconversion has a typical rejection of 20 dB and a minimum rejection of 15 dB.

LO Rejection:

-25 dB down with AGC on or correct manual gain control (typically -35 dB down).

LO Characteristics:

A. Internal VCO:

40 - 50 MHz continuously tunable.

B. External LO:

40 - 50 MHz at +3 dBm level (rear apron of 1100-AR input).

C. Remote Control:

0 - 10 VDC to vary internal VCO from 40 - 50 MHz. May be swept.

FREQUENCY SYNTHESIZED RF TUNERS

Microdyne's new 1100-VT(SYN) Series Frequency Synthesized RF Tuners are currently used in FM receivers only and provide the ultimate in versatility, ease of operation and stability. Frequency selection is accomplished locally by means of a front panel keyboard entry or from a remote location or computer interface control. An LED digital readout displays the frequency selected from either a local or remote location.

Step frequencies are 500 kHz or less which enables selection of any standard IRIG channel or satellite down link frequency. By using the second LO fine tuning range of greater than 500 kHz, the operator has complete coverage of the entire frequency band.

SPECIFICATIONS FOR (SYN) TUNERS

Frequency Ranges:

1111-VT(SYN)	105 - 155 MHz.
1112-VT(SYN)	215 - 320 MHz.
1114-VT(SYN)	1435 - 1540 MHz.
1115-VT(SYN)	2200 - 2300 MHz.
*1115-VT(SYN)(E)	2185 - 2485 MHz.
1116-VT(SYN)	1650 - 1720 MHz.

For other non-standard frequency synthesized tuning ranges, consult factory.

Operating Modes:

Local or Remote; selectable.

Remote Control:

Digit-Serial-Bit-Parallel, TTL Logic.

Input Impedance:

50 ohms.

Noise Figures:

See RF Tuner Specifications, Table 1.

Image Rejection:

60 dB minimum (*50 dB minimum).

Since the synthesizer provides the stability of a crystal and oven assembly, the need to purchase and store crystals for many different frequencies is eliminated. These tuners are also interchangeable with other Microdyne RF tuners with comparable tuning ranges.

As with all other 1100-VT Series, synthesized tuners feature electronically tuned four-pole preselection and LO multipliers. This completely eliminates mechanical tuning, either contacting or non-contacting, and results in greatly improved reliability. A digital-to-analog converter translates the locally or remotely selected programmed frequency to the proper tuning voltage. Thus, all tuning is accomplished by digital selection.

IF Rejection:

80 dB minimum.

Spurious Rejection:

60 dB minimum (*50 dB minimum).

First Local Oscillator:

Frequency Synthesizer.

Frequency Selection:

Keyboard entry with digital display of selected RF frequency.

Transfer Bandwidth:

See RF Tuner Specifications, Table 1.

Frequency Steps:

100 kHz for 1111 & 1112 Series.

500 kHz for 1114, 1115 & 1116 Series.

Stability:

$\pm 0.0005\%$, 0 to 50°C ambient. 1 part in 10^6 for three month's aging.

STANDARD VHF AND UHF TUNERS

These plug-in modules feature voltage tuning and are available with standard frequency calibrated ribbon dials or optional high intensity numeric LED displays.

With digital frequency displays, tuning errors or misadjustments due to poor dial resolution and backlash are eliminated. The frequency displayed numerically is the desired frequency. The total absence of mechanical gear trains, tape drives, and readout tapes also greatly enhances MTBF performance.

Local tuning is accomplished with a ten-turn potentiometer located on the front panel. Microdyne's unique voltage tuning of the 1st LO and preselector also permits remote or computer controlled tuning. A front panel "Internal-Remote" switch can be used to transfer the tuning function to the rear panel accessory connector J1 and thus tuning can be accomplished by a remote potentiometer control or computer interface.

SPECIAL MODEL 1111-FT(70) VHF TUNER

A fixed tuned Model 1111-FT(70) plug-in RF Tuner is also available to accommodate non-standard down converted carrier frequencies with standard 1100-AR receivers. It can be pre-tuned to any frequency between 65 and 75 MHz



and supplies a 50 MHz output to the second mixer of the 1100-AR receiver. An appropriate crystal is included with this tuner. (Please specify operating frequency.)

TABLE 1. VHF AND UHF TUNER SPECIFICATIONS

Model No.	Frequency (MHz)	Noise Figure Maximum dB	Noise Figure Nominal dB	Transfer BW (MHz)	Type Crystal Used (See Notes 1 - 6)
1110-ST(2)	3700-4200	16	13	24-40	CR-82/U ₁
1111-FT(70)	65-75	12.0	10.0	6.0	CR-82/U (Included)
*1111-VT(A)	105-155	5.5	4.5	3	CR-52A/U or CR-65/U ₂
*1112-VT(A)	215-320	7.0	6.0	6	CR-52A/U ₃
*1112-VT(A)(4)	215-320	7.0	6.0	6	CR-52A/U ₃
*1112-VT(D)(10)	215-320	7.0	6.0	6	CR-81/U ₄
1113-VT(A)	285-410	8.0	7.0	6	CR-52A/U or CR-65/U ₂
1113-VT(A)(4)	285-410	8.0	7.0	6	CR-52A/U ₃
1113-VT(D)(10)	285-410	8.0	7.0	6	CR-81/U ₄
1113-VT(W)(70)	285-410	9.0	8.0	24	CR-75/U ₅
1114-VT(A)	1435-1540	10.0	9.0	7.5	CR-52A/U or CR65/U ₂
1114-VT(A)(4)	1435-1540	10.0	9.0	7.5	CR-52A/U ₃
1114-VT(10)(D)	1435-1540	10.0	9.0	7.5	CR-81/U ₄
1114-VT(W)(70)	1435-1540	10.0	9.0	24	CR-52A/U or CR-65/U ₂
1115-VT(A)	2200-2300	10.0	9.0	7.5	CR-52A/U or CR-65/U ₂
1115-VT(A)(4)	2200-2300	10.0	9.0	7.5	CR-52A/U ₃
1115-VT(10)(D)	2200-2300	10.0	9.0	7.5	CR-81/U ₄
1115-VT(W)(70)	2200-2300	10.0	9.0	24	CR-52A/U or CR-65/U ₂
1115-VT(SYN)(E)	2185-2485	12.0	1.0	10.0	Frequency Synthesizer
1116-VT(A)	1700-1850	10.0	9.5	7.5	CR-52A/U or CR-65/U ₂
1116-VT(10)(D)	1700-1850	10.0	9.5	7.5	CR-81/U ₄
1116-VT(W)(70)	1700-1850	10.0	9.5	24	CR-52A/U or CR-65/U ₂
1116-VT(A)(N)	1650-1720	10.0	9.5	7.5	CR-52A/U or CR-65/U ₂
1116-VT(S)	1540-1660	10.0	9.5	7.5	CR-52A/U or CR-65/U ₂
1117-VT(A)	215-410	8.5	6.5	6.0	CR-54A/U or CR-75/U ₆
1118-VT(A)	370-470	8.0	6.5	6.0	CR-52A/U or CR-65/U ₂
1118-VT(A)(4)	370-470	8.0	6.5	6.0	CR-52A/U ₃
1119-VT(A)	790-850	10.0	9.0	7.5	CR-52A/U or CR-65/U ₂
1119-VT(M)	400-560	10.0	8.5	6.0	CR-54A/U or CR-75/U ₆
1185-T(D)	0.01-10	(See description, page 10)		9.0	Not used

*1111-VT Series tuners cannot be used with IF Filter/Amps above 2.4 MHz, and 1112-VT Series tuners cannot be used with IF Filter/Amps above 4.0 MHz unless higher bandwidths are specified at time of order.

NOTES FOR TABLE 1.

Notes 1 thru 6 for appropriate oven, adapter and crystal selection:

1. One to two internal CR-82/U crystals are required without a 100-001 oven or 200-070 adapter for the two internal RF tuner crystal positions provided.
2. One each CR-52A/U crystal with 200-070 crystal adapter or one each CR-65/U crystal with 100-001 crystal oven are required as RF tuner front panel plugs for each frequency required.
3. One to four CR-52A/U crystals without a 100-001 crystal oven or 200-070 crystal adapter are required for the four internal RF tuner crystal positions provided.
4. One to ten CR-81/U crystals without a 100-001 crystal oven or 200-070 crystal adapter are required for the ten internal RF tuner crystal positions provided.
5. One to two CR-75/U crystals without a 100-001 crystal oven or 200-070 crystal adapter are required for the two internal RF tuner crystal positions provided.
6. One CR-54A/U or one CR-75/U, each with a 200-070 crystal adapter, is required for each frequency used.



Model 1116-VT(D)
with Digital
Frequency Display

TABLE 2. RF TUNER MODEL NUMBER AND SUFFIX DESCRIPTIONS

Suffix Letter or Number	Description	Suffix Letter or Number	Description
(D)	To specify a digital frequency display in place of a standard ribbon dial, replace the model number suffix (A) with a (D). If a suffix (D) is already included with the model number, a digital frequency display is standard.	(M)(T)(N) (G) & (S)	These suffixes indicate tuners that have already been modified for standard tuning ranges.
(SYN)	When specifying an RF tuner with a frequency synthesizer, digital frequency display and keyboard entry, add the suffix (SYN) to the model number in place of (A). Synthesized tuners are currently available in the 1111-VT, 1112-VT, 1114-VT, 1115-VT and 1116-VT series of RF tuners and cannot be used in conjunction with PM demodulators. For synthesized tuner requirements covering other frequency ranges, please consult the factory. Additional technical details will be found under Frequency Synthesized RF Tuners, page 11.	-FT	This suffix in place of VT after the 1100 Series number indicates a fixed tuned model.
-VT(10)(D)	RF Tuners with the -VT(10)(D) option can operate with up to 10 preset, crystal controlled receive frequencies which can be locally or remotely selected. (See Multi-Crystal Channel RF Tuners, page 14).	-ST	This suffix in place of VT after the 1100 Series number indicates a special UHF tuner that interfaces with a 50 MHz 1st IF.
-VT(A)(4) & -VT(D)(4)	RF Tuner Model numbers with suffixes -VT(A)(4) or -VT(D)(4) may be specified to permit a more simplified type of local, remote or computer controlled frequency selection (See Multi-Crystal Channel RF Tuners, page 14).	(W)(70)	These suffixes indicate special wideband RF tuners used exclusively with extra wideband Model 1100-LS Landsat (MSS/RBV) type receivers. They incorporate a 70 MHz 1st IF instead of the standard 50 MHz.
(01)	Option available with S-Band tuners only (2200-2300 MHz) to provide third order intermodulation products of less than -80 dBm with -20 dBm signals greater than 18 MHz from tuned frequency.	(K)	Suffix (K) indicates a special RF tuner with a long AFC loop around the 1st LO. This tuner is required to correct for Doppler and shock imposed transmitter frequency shifts of ± 5 MHz minimum that may be encountered with rocket-sondes, missiles, instrumented projectiles and similar telemetry applications. It is not interchangeable with other tuners and requires receiver modifications.
		(R)	Special suffix (R) represents an RF tuner capable of being mounted in a weatherproof housing at the antenna and remotely tuned across its frequency band. It is primarily used to down convert receiver UHF signals to the 50 or 70 MHz 1st IF of the receiver to minimize long cable losses. Please consult factory for details.
		(NS)	This option indicates a non-standard tuning range covering any 100 MHz increment in any required band from 1400 MHz to 2300 MHz.

ADDITIONAL SPECIFICATIONS FOR VHF AND UHF TUNERS

Tuning Ranges	See Table 1.	Stability:	
Input Impedance	Operates from 50 ohm source.	VFO	$\pm 0.001\%$ per degree C.
Noise Figure	See Table 1.	Crystal	$\pm 0.0005\%$ with oven, $\pm 0.005\%$ without oven.
Image Rejection	60 dB minimum.	Monitor Output:	
IF Rejection	90 dB minimum.	Frequency	Submultiple of injection frequency.
Spurious Rejection	60 dB minimum.	Voltage	50 mV into 50 ohms (-13 dBm) nominal.
Spurious Emissions	Meets or exceeds MIL-STD-826A and MIL-STD-461A.	First IF:	
First Local Oscillator:		Output Frequency	50.0 MHz.
Type	Crystal or VFO controlled by 1st LO MODE switch on base unit. Mixer injection frequency 50 MHz above RF input.	Bandwidth	See Table 1.
		Dynamic Range	Nominally -10 dBm to noise threshold of the receiver.

RF Tuners (Cont.)

MULTI-CRYSTAL CHANNEL RF TUNERS

Suffix -VT(10)(D)

The majority of voltage tuned RF Tuners previously described can be supplied with up to 10 preset, crystal-controlled, pushbutton selectable receive frequencies with a digital readout. These tuners, designated -VT(10)(D), can accommodate one to ten miniature crystals that can be selected either from the front panel switch or from a remote source via a rear panel interface connection.

Remote switching is accomplished by a 4-line BCD signal input to J-1 on rear panel. No adjustment to front panel tuning control is necessary, as all tuning voltages used in adjusting the preselector center frequency and multiplier stages are derived from an internal frequency counter and D/A converter. Crystals can be changed in the field to accommodate changes in operating frequencies without further adjustments to the tuner.

Suffixes -VT(A)(4) & -VT(D)(4)

RF Tuners are also available with -VT(A)(4) and -VT(D)(4) suffixes having up to 4 preset frequencies. If specified at the time of order, the -VT(A)(4) type will permit crystals to be selected either locally or remotely. Since certain tuning ranges may involve a slight additional cost, please consult factory for details. The -VT(D)(4) type, however, permits crystals to be selected either locally or remotely, but not both. Please specify at time of order.

Crystals and calibration controls are mounted in both types of tuners and are readily accessible. Although this



method is not as versatile as the -VT(10)(D) type described above, it does allow crystals to be changed in the field and to be preset to other frequencies. Calibration is accomplished in a matter of minutes. Adjustment of a single potentiometer for each crystal frequency is all that is required to set the frequency and automatically apply the correct tuning voltage to the voltage tuned preselector. Remote frequency selection is achieved by applying a 15 volt DC switching voltage to appropriate pins in J-1 on the rear panel.

When ordering, indicate the number of channels desired by adding a numerical suffix. (See Table 2.)

Also include the frequencies to be received so that the correct crystals can be supplied.

Second IF Filter/Amplifiers

The second IF filter/amplifier is a front panel plug-in module used to establish the bandwidth of the 10 MHz second IF signal before demodulation. Each of the fixed bandwidth modules provides a single bandwidth in the range of 3 kHz to 6 MHz. These filters are also available with any two or three different IF bandwidths installed in a single plug-in module. Each is switch selectable from the front panel. A third type is continuously variable in three different ranges from 0.1 to 3.5 MHz (see page 15).

Linear-phase, steep-skirted IF filters are used to optimize phase non-linearity in the second IF filter/amplifier without compromising the filter shape factor and subsequent degradation of overall receiver selectivity. Circuitry employed in filter/amplifiers of 100 kHz bandwidths or greater is at the lumped constant design which provides a

phase linearity of 8° while maintaining a 3 to 1 shape factor. However, those with less than 100 kHz bandwidth utilize crystal filters to establish the required bandwidth. These filters provide a phase linearity of 10° over 80% of the 3 dB bandwidth.

In addition, optional fixed bandwidths of 100 kHz or greater can be provided with phase linearity characteristics of 3° over 80% of the 3 dB bandwidth, if required.

Note:

A simple rule of thumb that may be employed to establish the required second IF filter bandwidth for FM signals is: Two times the peak deviation plus two times the highest modulation frequency. For PCM, FM and PCM-PM NRZ signals, the second IF filter bandwidth is usually 2.2 times the bit rate. See appropriate FM demodulators used with IF Filter Bandwidths on page 16.

Model 1122-I(B)
IF Filter/Amplifier

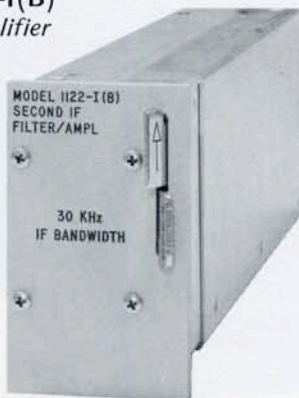


TABLE 3. IF FILTER

The following modules are available to the user who requires one or more fixed IF bandwidths:

Model	Bandwidths	Model	Bandwidths
Model 1121-I(C)	3 kHz	Model 1129-I(B)	1.5 MHz
Model 1121-I(B)	10 kHz	Model 1130-I(B)	3.3 MHz
Model 1122-I(B)	30 kHz	Model 1134-I(B)	4.0 MHz
Model 1123-I(B)	50 kHz	Model 1135-I(B)	6.0 MHz
Model 1124-I(B)	100 kHz	Model 1136-I(B)	200 kHz
Model 1125-I(B)	300 kHz	Model 1137-I(B)	2.0 MHz
Model 1126-I(B)	500 kHz	Model 1138-I(B)	2.4 MHz
Model 1127-I(B)	750 kHz	Model 1139-I(B)	5.0 MHz
Model 1128-I(B)	1.0 MHz		

See note next page

SWITCHABLE SECOND IF FILTER/AMPLIFIERS

Note:

When using PM demodulators with either a 10 or 30 kHz bandwidth 2nd IF filter, please specify two-pole filters to avoid false lock. These models are respectively designated as 1121-I(B)(10/2) and 1122-I(B)(30/2) or 1120-I(B)(2)(10/2 & 30/2) with two switchable filters having these bandwidths.

Plug-in units can also be supplied with up to three switch-selected fixed bandwidths. These are designated the 1120-I(B)(-) series. Examples are as follows:

1120-I(B)(2)(50-100) – A two-filter unit with 50 and 100 kHz bandwidths, switch selectable.

1120-I(B)(3)(50-100-500) – A three-filter unit with 50, 100 and 500 kHz bandwidths, switch selectable.

Special Wideband IF Filters

The following Model 1120-LS extra wide bandwidth IF filters are used with 1100-LS receivers only:

1120-LS(10) 10 MHz BW	1120-LS(30) 30 MHz BW
1120-LS(20) 20 MHz BW	1120-LS(36) 36 MHz BW
1120-LS(25) 25 MHz BW	1120-LS(40) 40 MHz BW

FIXED SECOND IF FILTER/AMPLIFIER SPECIFICATIONS

Bandpass Peak-to-Valley Ratio

0.5 dB maximum.

Center Frequency

10.000 MHz.

Selectivity

3.0 to 1 at 60/6 dB bandwidth ratio, 3.5:1 at 60/3 dB bandwidth ratio.

Phase Linearity

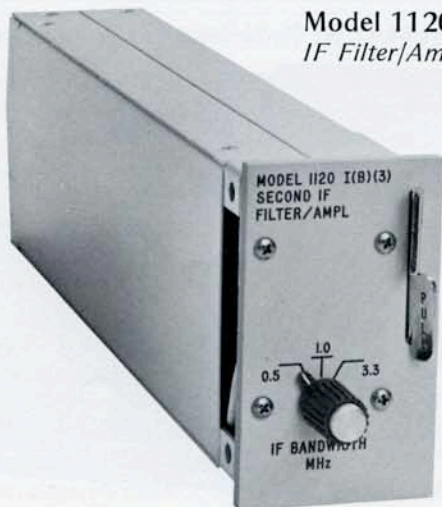
$\pm 8^\circ$ over 80% of the -3 dB bandwidth for bandwidths of 100 kHz or greater; $\pm 10^\circ$ over 80% of the -3 dB bandwidth for bandwidths less than 100 kHz.

NOTE:

$\pm 3^\circ$ phase linear filters for bandwidths of 100 kHz or greater are available on special order.

Symmetry

10% maximum.



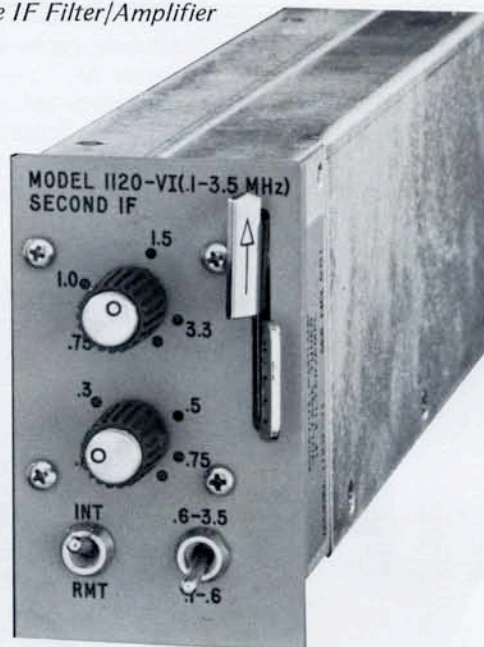
Model 1120-I(B)(3)
IF Filter/Amplifier

VARIABLE BANDWIDTH VOLTAGE TUNED FILTER/AMPLIFIERS – U.S. Patent No. 3633119—Series 1120-VI

These units provide continuous bandwidth selection from 100 to 600 kHz, 600 kHz to 3.5 MHz and 100 kHz to 3.5 MHz and any standard IRIG bandwidth or any other bandwidth within these ranges may be selected. Bandwidth selection is accomplished by a front panel continuously variable control with a calibrated dial.

Remote or computer selection of the desired bandwidth is also possible through the accessory connector located at the rear panel of the receiver. (See Block Diagram.)

Model 1120-VI(.1-3.5)
Variable IF Filter/Amplifier



VARIABLE SECOND IF FILTER/AMPLIFIER SPECIFICATIONS

Center Frequency	10 MHz.
Variable Bandwidth Ranges	Model 1120-VI (0.1 – 0.6) 100 kHz to 600 kHz, Model 1120-VI (0.6 – 3.5) 600 kHz to 3.5 MHz Model 1120-VI (0.1 – 3.5) 100 kHz to 3.5 MHz
Shape Factor	3.8 to 1 (60/3 dB) maximum range over entire bandwidth range.
Symmetry*	10% over 90% of range* 15% maximum

*Defined as percentage of symmetry =

$$\frac{f_1 - f_2}{f_1 + f_2} \times 100$$

where:

f_1 is upper 3 dB point in MHz minus 10 MHz, and f_2 is 10 MHz minus lower 3 dB point in MHz.

Demodulators

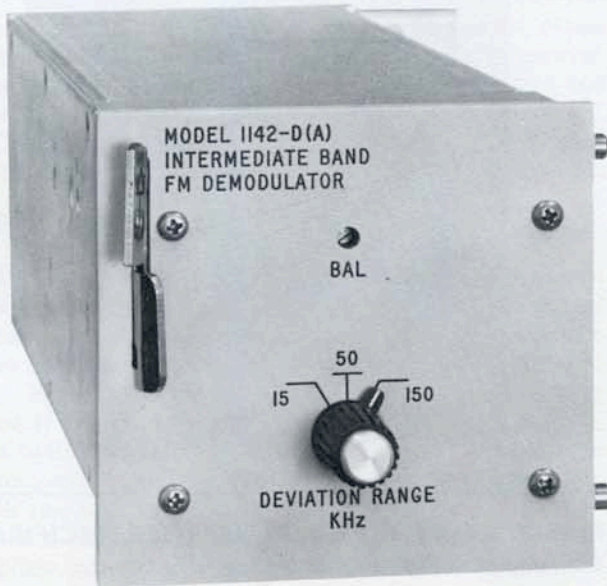
FM DEMODULATORS

Three plug-in FM Demodulator modules cover the entire range of IF bandwidths. Each demodulator utilizes advanced capture techniques which permit excellent operation in a high multipath or adjacent channel interference environment. A second feature is the extremely high limiter overdrive which minimizes data loss on instantaneous signal dropout.

High drift reduction AFC is a standard feature which includes variable automatic search and lock. This function permits continuous signal search after signal loss or dropout until a threshold signal appears in the 2nd IF passband. At this point, receiver carrier lock is automatically accomplished.

The Model 1148-D(70)(B) is a special extra wideband FM demodulator used with Model 1100-LS extra wideband Satellite receivers only.

Model 1142-D(A)
Intermediate Band FM Demodulator



MULTI-RANGE FM DEMODULATORS

In addition to the three discrete range FM demodulators described above, a combination of the intermediate and widebands or all three ranges can be included in a single module. These demodulators are designated Model 1144-D(A) and Model 1144-D(N)(A), respectively, and offer the same high performance capabilities as the single range units. When ordering the 1144-D Series, specify as follows:

- 1144-D(A) Intermediate/Wideband
- 1144-D(N)(A) Narrow/Intermediate/Wideband

Note:

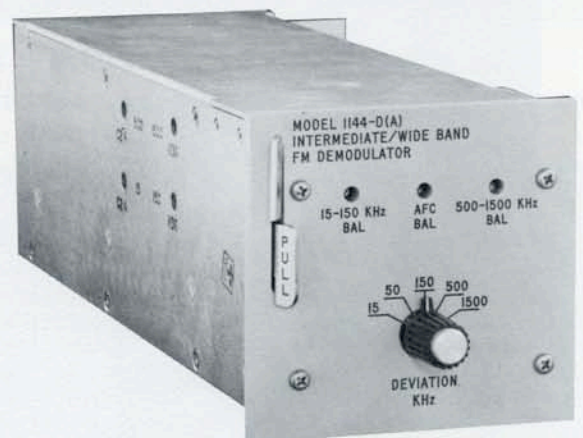
To determine which demodulator bandwidth range is used with what IF Filter/Amplifier(s), consult the FM Demodulator Specifications at top of next column.

FM DEMODULATOR SPECIFICATIONS

Range of IF Bandwidths:

Model No.	Applicable IF Filter Ranges (See Table 3, p. 14)
1141-D(A)	3 kHz to 60 kHz (Narrow BW) with 10 kHz max. FM response.
1142-D(A)	50 kHz to 1 MHz (Intermed. BW) with 350 kHz max. FM response.
1143-D(A)	750 kHz to 6 MHz (Wide BW) with 1.2 MHz max. FM response.
Other Models:	Bandwidths
1144-D(A)	Intermediate & Wideband in Same Module, Switchable.
1144-D(N)(A)	Narrow, Intermediate & Wideband in same Module, Switchable.
1143-D(P)	Wideband, including Pulse AFC Operation.
1145-D(A)	Narrow & Wideband, Phase Locked.
1148-D(70)(B)	10, 20, 25, 30, 36 or 40 MHz Bandwidths with 10 MHz FM response, for 1100-LS Receivers only.
1144-D(N)(B)	Intermediate & Wideband for 2200-R(N)(B) Receivers only.
Limiting	50 dB limiter overdrive.
Linearity:	
1141-D(A)	Less than 2% distortion at 10 kHz peak deviation.
1142-D(A)	1% over ± 200 kHz
1143-D(A)	1% over ± 500 kHz 2% over ± 750 kHz 5% over ± 1.5 MHz
AM Rejection	40 dB typical (50% AM).
Capture Ratio	0.8
Deviation for Rated Video Output:	
1141-D(A)	1.5 kHz minimum
1142-D(A)	15 kHz minimum
1143-D(A)	100 kHz minimum
Deviation Meter Range Selector:	
1141-D(A)	1.5, 5.0, 15 kHz full scale
1142-D(A)	15, 50, 150 kHz full scale
1143-D(A)	150, 500, 1500 kHz full scale

Model 1144-D(A) Multi-Range FM Demodulator



FM PHASE LOCK DEMODULATOR MODEL 1145-D(A)

The Model 1145-D(A) FM Phase Lock Demodulator operates in a short loop mode. It uses a stable 10 MHz voltage controlled oscillator to track the incoming signal for threshold extension performance at low carrier to noise ratios. Two loop bandwidths are selected by the deviation switch for optimum operation with a variety of IF bandwidths and modulation formats. The FM phase lock demodulator operates in conjunction with the receiver's AFC amplifier and supplies a control voltage to the receiver's 60 MHz second local oscillator for AFC applications.

SPECIFICATIONS FOR MODEL 1145-D(A)

Range of IF BW

30 kHz to 500 kHz	Narrow Band
500 kHz to 2 MHz	Wide Band

Frequency Response

DC to 250 kHz	Narrow Band
DC to 500 kHz	Wide Band

Limiting

50 dB limiter overdrive.

Linearity:

Less than 2% distortion over ± 250 kHz.

Deviation for rated video output

2 kHz min.	Narrow Band
10 kHz min.	Wide Band

Deviation Meter Range Selector

15, 50, 150 kHz full scale	Narrow Band
150, 500 kHz full scale	Wide Band

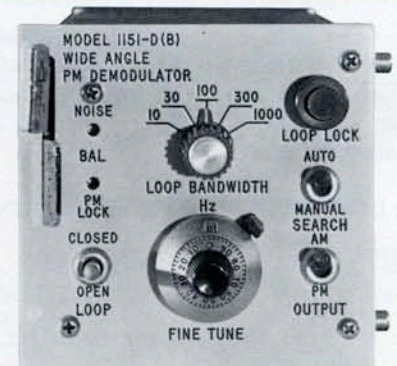
Model 1145-D(A)
FM Phase Lock Demodulator



PHASE DEMODULATORS – Series 1151 and 1152

The 1151 and 1152 series of phase demodulators operate in a long loop mode using a 10 MHz crystal-controlled frequency as a reference. Operating in conjunction with the receiver AFC Amplifier, the demodulator supplies a control voltage to the receiver 60 MHz second local oscillator. An automatic phase lock feature provides essentially the performance characteristics of the APC circuit where the search rate control is determined by the loop bandwidth, thus providing an acquisition probability at threshold at greater than 90% of any given Sweep (range). When a receiver is supplied with a phase demodulator, a rear panel humbucking control is included to minimize power line hum on the APC control line. When the receiver is equipped with a phase demodulator, it must also have a 300-078 AFC Amplifier Module and a 100-089 Calibration/Reference Oscillator Module which are now standard with all receiver base chassis.

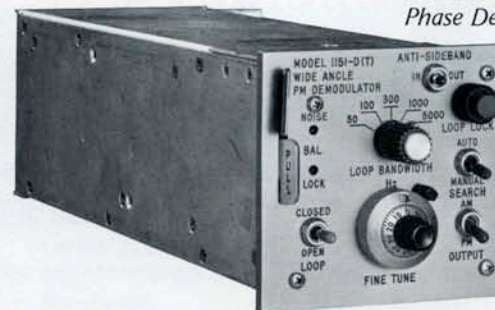
Model 1151-D(B)
Phase Demodulator



Models 1151-D(B), 1151-D(B)(B) and 1151-D(B)(D)

These models are extremely wide angle and are capable of retrieving phase modulated signals having peak deviations of 2.8 radians. All three models provide switch selectable synchronous AM detection. However, a front panel switch on the 1151-D(B)(D) disables the coherent AGC and provides an envelope detected AM output level suitable for simultaneous antenna tracking, provided a 45-1100 simultaneous AM-FM/PM module is employed. The difference in the 1151-D(B)(B) is that this model is equipped with an anti-sideband lock circuit. It is operable in both the automatic and manual search modes and prevents sideband lock with certain data rates. (Consult factory for details.)

Model 1151-D(T)
Phase Demodulator



Model 1151-D(T)

The 1151-D(T) is a slightly altered version of the 1151-D(B), 1151-D(B)(B) and 1151-D(B)(D) phase demodulators. This unit is normally supplied with a different range of loop bandwidths, and features an acquisition time of 100 milliseconds or less and an integral anti-sideband lock circuit suitable for certain data rates. (Consult factory for details.)

Model 1152-D(A) Cosine Phase Demodulator



Demodulators (Cont.)

Model 1152-D(A) Cosine PM Demodulator

The 1152-D(A) demodulator is an extremely stable and reliable unit that employs a cosine phase detector capable of retrieving phase modulation having deviations up to ± 70 degrees. An LED (light-emitting-diode) on the front panel indicates phase lock.

PM DEMODULATOR SPECIFICATIONS

Phase Lock Loop Bandwidth

1151-D(B), 1151-D(B)(B) 1151-D(B)(D) and 1152-D(A)
10, 30, 100, 300, and 1000 kHz.
1151-D(T)
30, 100, 300, 1000, and 5000 Hz. Other loop bandwidths available on special order.

Tracking Range

± 250 kHz minimum.

Fine Tuning Range

± 250 kHz minimum.

Range of IF Bandwidths

10 kHz to 6 MHz (determined by second IF filter/amplifier).

AGC

Coherent AGC supplied by synchronous AM detector circuit when phase locked; envelope AGC supplied when searching.

Residual Phase Noise

Less than 2° RMS for 10 Hz loop bandwidth.

Phase Deviation for Rated Video Output

$\pm 10^\circ$ minimum for 1151 series. $\pm 30^\circ$ minimum for 1152 series.

Synchronous AM

20% AM will produce rated output for 1151 series.
30% AM will produce rated output for 1152 series.

Automatic Search

50 kHz to greater than 250 kHz determined by loop bandwidth control setting.

Locking Threshold

Dependent on IF Bandwidth/Loop Bandwidth Ratio; when using IF filters of less than 100 kHz bandwidth, locking threshold is obtainable with loop bandwidths of 100 Hz or less. Phase lock design threshold is -19 dBm CNR for 1151 units and -15 dB for 1152 units in the IF or $+6$ dB in the phase lock loop (whichever is the higher signal level).

Static Phase Error

10° maximum.

Frequency Response (PM)

To 2.0 MHz for 1151 series and 1.7 MHz for 1152 series. Low frequency roll off determined by selected loop bandwidth.

Frequency Response (Synchronous AM)

5 Hz to 500 kHz, low frequency response may be modified by AGC time constant.

BI-PHASE DEMODULATOR MODEL 1155-D(A)

The Model 1155-D(A) front panel plug-in provides demodulation of $\pm 90^\circ$ PSK, bi-phase modulated carriers at bit

Model 1155-D(A)
Bi-Phase Demodulator



rates between 1 bit and 2 megabits, NRZ. In the receiver, the demodulator is operated in a long-loop mode using a 10 MHz crystal oscillator as a reference. A squaring circuit recovers the carrier to provide phase control to the receiver 60 MHz second local oscillator.

The automatic phase lock feature of the 1155-D(A) provides acquisition of a signal displaced up to ± 150 kHz from 10.000 MHz in less than 100 milliseconds.

BI-PHASE DEMODULATOR SPECIFICATIONS

Phase Lock Loop Bandwidth

30, 100, 300, 1000, and 5000 Hz; switch selectable. Other loop bandwidths are available on special order.

Tracking Range

± 250 kHz minimum (after acquisition).

Fine Tuning Range

± 250 kHz minimum.

Acquisition Range

± 250 kHz or \pm one-half of the IF bandwidth, whichever is the lesser number.

Range of IF Bandwidths

500 kHz to 6 MHz (determined by IF filters).

Bit Rates

1 bit to 2 megabits, NRZ. Higher bit rates available on special order.

Video Bandwidths

DC to 2 MHz at -3 dB points.

Operating Threshold

Operating to specifications for signals providing a $+7$ dB signal-to-noise ratio, or higher, in the predetection (IF) bandwidth.

Carrier Suppression

Operates with signals whose carrier is suppressed 30 dB or greater.

BI-PHASE DEMODULATOR SPECIFICATIONS (Cont.)

Acquisition Time

With loop bandwidths of 1 kHz or greater, the demodulator automatically acquires lock to a signal with a SNR of +7 dB or greater within 100 msec for signals displaced up to ± 150 kHz from center frequency.

IF Bandwidth to Bit Rate Ratio:

IF Bandwidth	Automatic Acquisition	Manual Acquisition
500 kHz 750 kHz and greater	80 kbits, NRZ max. 5 to 1	100 kbits, NRZ max. 3 to 1

AM DEMODULATION

AM demodulation is an integral function of all 1100-AR receivers. The AM data is derived in the AM Detector Module and made available at the rear panel video output connector via the front panel AM-FM/PM VIDEO switch.

Like the FM and PM video, the AM video is routed through the internal video filters and amplified prior to appearing at the output. AGC notch filters are available from Microdyne to adapt the receiver to special tracking system requirements. At the customer's option, the receiver can be

modified to provide simultaneous AM and FM/PM video output for antenna tracking by specifying an internal Model 45-1100 plug-in module.

AM DEMODULATOR SPECIFICATIONS

AM Response	5 Hz to one-half of the IF bandwidth up to 1.6 MHz.
AM Distortion	Less than 3% with 90% modulation at a 1 kHz rate.

Spectrum Display Unit

SPECTRUM DISPLAY UNIT

The Model 1161-S(A) Spectrum Display Unit (SDU) is primarily designed to provide a visual display of the signals centered about a 50 MHz center frequency. However, optional accessory converter modules are available to adapt the display unit to signals of 30 MHz, 10 MHz, and others. In addition, the receiver can be configured to drive a plug-in SDU at 50 MHz as well as an external SDU at 50, 30, or 10 MHz.

The SDU is entirely of solid-state construction, making use of integrated circuitry and subminiature components. As a result, a maximum amount of features is possible with a vertical height of only $1\frac{3}{4}$ inches. The features include a variable sweep width, switchable marker pips, and resolution of separate components as low as 10 kHz. An extremely sharp trace is achieved with a dc-dc high voltage supply for the 2 kV CRT voltage.

The 1161-S(A) contains all of the adjustments necessary to allow operator control over the 50 MHz display unit signal. Internal, equal amplitude markers, spaced at 500 kHz intervals on either side of a center frequency marker, are an integral part of the 1161-S(A). Markers are adjustable over a ± 500 kHz range to permit accurate centering on the vertical graticule. A separate control is included to adjust the amplitude of the markers so that marker level is independent of the RF input level. A toggle switch is provided on the front panel to disable marker circuitry.

Other controls include a display unit on/off switch and intensity, focus, horizontal, and vertical positioning adjustments. An RF gain control is provided which enables RF level control over an 80 dB range. The sweep width is adjustable from 100 kHz to 6 MHz and the sweep rate is 20 Hz.

NOTE:

The receiver must be equipped with a 1st IF filter for display unit operation. (See Block Diagram, page 2.)

SPECTRUM DISPLAY SPECIFICATIONS

Signal Input:

Center Frequency	50 MHz.
Input Impedance	50 ohms.
Bandwidth	Up to 6 MHz.

Video Display:

Sweep Range	100 kHz to 6 MHz.
RF Gain Control	80 dB.
Sweep Rate	Approximately 20 Hz.
Resolution	10 kHz.
Calibration Markers	500 kHz intervals above and below center frequency.

Sensitivity 10 μ V for full-scale deflection.

Power Requirements ± 15 Vdc supplied by the parent unit.

Environmental:

Temperature:	
Operating	0 to 50°C.
Storage	-62° to +65°C.
Pressure:	
Operating	10,000 feet.
Storage	50,000 feet.
Humidity	Up to 95%.

Size:

Height	$1\frac{3}{4}$ inches.
Width	$6\frac{1}{2}$ inches.
Depth	13 inches.

Model 1161-S(A) Spectrum Display Unit



Spectrum Display Unit (Cont.)

External Mounting

The 1161-S(A) is designed for mounting in the 7-inch version of the 1100-AR. For other applications, such as use with a 5-inch receiver, an external Model 2261-S(A) housing assembly will provide power and mounting for one or two 1161-S(A) SDU's.

Model 2261-S(A) *Spectrum Display and Dual Housing Assembly*



Other Standard 1100-AR Features

Audio Monitor

An integral audio circuit included in all 1100-AR receivers is located in the video amplifier module and drives a front panel speaker. A front panel gain control sets the speaker volume. Since this circuit is driven by the video output, it can be used as an aid in tuning or manually acquiring phase lock.

Controls

Front panel controls are grouped logically for ease of operation with concentric knobs and switches used in related areas. Multicolor lamps indicate playback, receive or calibration operating modes, carrier presence and automatic search. Meters display video output level, signal level, tuning error, loop stress and deviation. Calibration controls are located adjacent to each respective meter. Standard low pass video filter ranges from 6.25 to 2,000 kHz are front panel selectable.

Video Filters

The 1100-AR can be equipped with any two of ten standard video filter modules while retaining space for an

additional special filter having a single customer-specified cutoff frequency. The ten standard filter modules contain up to five separate filter circuits; filter selection is made through a front panel switch. Each filter circuit is a four-poled passive linear phase network which exhibits an asymptotic slope of 24 dB per octave.

Model	No.	Bandwidths
300-044	1*	6.25, 12.5, 25, 50, 100 kHz
300-045	2*	250, 400, 750 kHz, 2 MHz
300-168	3	250, 500 kHz, 1 MHz, 1.5 MHz
100-169	4	300, 500, 750 kHz, 1 MHz
300-193	5	250, 500, 750 kHz, 1 MHz, 1.5 MHz
100-170	6	250, 400, 750 kHz, 1 MHz, 1.5 MHz
100-318	7	300, 500, 750 kHz, 1 MHz, 1.5 MHz
100-430	8	250, 500 kHz, 1.0, 1.5, 2.0 MHz
101-696	9	12.5, 25, 50, 100, 250 kHz
101-697	10	500, 750, 1000, 1500, 2000 kHz

Others available on special order.

*Supplied in receiver unless otherwise specified.

Pre-D Converters

MODELS 1171-PR(A), 1172-PR(A), 1181-PP(A) AND SERIES 1182-PP(A)(1-4)

Models 1171-PR(A) and 1172-PR(A) are pre-D down converter (record) modules. Model 1181-PP(A) and Series 1182-PP(A)(1-4) are pre-D up-converter (playback) modules. Each model will plug into the front panel of an 1100-AR receiver. A choice of six switch selectable record or playback video carrier frequencies are available, which, with their associated bandwidths up to 4 MHz, are listed in the specifications and Table 4 on page 21.

Both record converter models will accept a limited or linear 10 MHz IF signal and any one of six video carriers can be switch selected and recorded on the tape. On the other hand, all playback converter models will accept any one of six previously recorded standard video carriers and up convert it to 10 MHz, (see receiver block diagram and explanation on page 4).

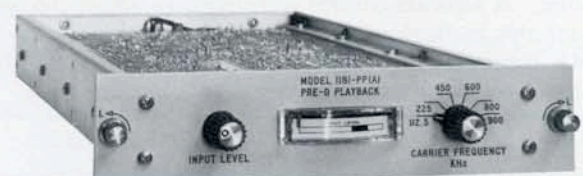
A standard 19" rack mount Model 2281-PP(A) Dual Housing Assembly is also available. It has a built-in power supply and will accommodate any combination of one or two pre-D up or down converter plug-in modules.

Frequency Correction During Pre-D Tape Playback

To compensate for frequency offset, introduced in the record and playback of Pre-D data and the resulting degradation caused by non-symmetrical passage of data

through the second IF filter, the 1100-AR accepts 10 MHz playback data from any Pre-D up converter and translates the spectrum to the first IF frequency rather than the second IF for demodulation. Any error at the 10 MHz input to the receiver is compensated by high drift reduction AFC action and the spectrum is balanced around the receiver center frequency rather than offset by the accumulated error.

Model 1181-PP(A) *Pre-D Playback Module*



DUAL EXTERNAL MOUNTING ASSEMBLIES

Model 2281-PP(A) provides mounting and power for any combination of one 1181-PP(A) or 1182-PP(A) Series Pre-D Playback Converter or one 1171-PR(A) or 1172-PR(A) Pre-D Record Converter listed on next page.

**PRE-D CONVERTER SPECIFICATIONS
RECORD CONVERTERS 1171-PR(A) AND 1172-PR(A)**

Input Frequency
10 MHz.

Input Impedance
50 ohms.

Output Level
4V p-p.

Output Impedance
75 ohms.

Center Frequency
See Table 4 below.

Data Bandwidth
See Table 4 below.

Local Oscillator Stability
±0.005%.

Power Requirements
±15V dc and ±6V dc; supplied from parent unit.

**PLAYBACK CONVERTERS 1181-PP(A), 1182-PP(A) AND
SERIES 1182-PP(A)(1-4)**

Input Frequency
See Table 4 below.

Input Level
0.5 to 10V p-p.

Input Impedance
75 ohms.

Output Frequency
10 MHz.

Output Level
80mV rms into 50 ohms.

Data Bandwidth
See Table 4 below.

Local Oscillator Rejection
40 dB minimum.

Image Rejection
30 dB minimum.

Local Oscillator Stability
±0.005%.

Power Requirements
±15V dc; supplied from parent unit.

SPECIFICATION TABLE 4. INPUT/OUTPUT FREQUENCIES AND DATA BANDWIDTH

MODEL	Freq. kHz	BW kHz	Freq. kHz	BW kHz	Freq. kHz	BW kHz	Freq. kHz	BW kHz	Freq. kHz	BW kHz	Freq. kHz	BW kHz
1171-PR(A)	112.5	150	225	300	450	600	600	800	800	1400	900	1200
1181-PP(A)	112.5	150	225	300	450	600	600	800	800	1400	900	1200
1172-PR(A)	450	600	900	1200	1050	1900	1200	2200	1800	3300	Spare*	4 MHz*
1182-PP(A)	450	600	900	1200	1050	1900	1200	2200	1800	3300	Spare*	4 MHz*
1182-PP(A)(1)	200	240	600	720	1000	1200	1400	1680	1800	2160	3200	3840
1182-PP(A)(2)	125	150	250	300	500	600	750	900	1000	1200	1500	1800
1182-PP(A)(3)	350	420	650	780	950	1140	1250	1500	1550	1860	1850	2220
1182-PP(A)(4)	2640	3280	2940	3520	3240	3520	3540	2920	3840	2320	4140	1720

*Optional Extra: The spare position requires crystal installation and circuit alignment to customers requirements; contact the factory for permissible center frequencies and data bandwidths.

**MODEL 1175-PR PRE-D RECORD CONVERTER FOR RF
DATA ANALYSIS**

A Model 1175-PR Pre-D record converter can also be plugged into an 1100-AR or Model 2281-PP(A) external mounting assembly. It is used with the Model 1185-T(D) RF Data Analysis Tuner listed on page 10 to downconvert 10 kHz to 10 MHz prerecorded signals through the receiver's 10 MHz

second IF for real time tape monitoring or for rerecording and later analysis. This technique provides eight crystal selected output data center frequencies from 0 Hz to 3 MHz. Corresponding output data frequency ranges are from 50 Hz to 6 MHz. Either an internal or an external LO can be used. Detailed 1175-PR specifications are available upon request.

Internal Pre-D Converters

SERIES 100-117, 10-1100, 20-1100

The Model 100-117 is a 10 to 50 MHz Playback Converter only. The Model 20-1100 is a single frequency playback converter and the Model 10-1100 is a single frequency record converter. The latter two are available with one standard car-

rier frequency at 112.5, 225, 450, 600, 800 or 900 kHz. Others are available on special order. All are described under the Predetection paragraphs of the Block Diagram on page 4.

Additional Accessories

First IF Filters

These modules are internal plug-in subassemblies that provide steep skirted filtering to the 50 MHz first IF output of RF tuners. In addition to reducing adjacent channel interference, an appropriate bandwidth filter must be used to provide a 50 MHz output whenever a Spectrum Display Unit is used. Also, the bandwidth selected must be greater than the widest 2nd IF filter/amplifier bandwidth employed.

Five standard single filter bandwidths plus one dual bandwidth filter are available. Switching between appropriate bandwidths of the dual filter is an automatic function of the second IF filter/amplifier selected. If required, one of the following filters should be specified at the time of order:

Filter Model	Bandwidth
100-229	600 kHz
100-051	1.2 MHz
100-158	1.2/4.0 MHz
100-159	4.0 MHz
100-302	7.0 MHz
101-750	9.0 MHz

CENTER FREQUENCY OFFSET AND AUXILIARY AGC OUTPUT MODULES

An optional center frequency offset (CFO) and auxiliary AGC output module (Model 44-1100) is available for the 1100-AR. The center frequency offset function provides a dc voltage output proportional to the frequency offset of the received signal in relation to the receiver IF center frequency. This circuitry is operable in all receiver modes and is used to measure Doppler effect and accumulated frequency errors.

The auxiliary AGC output function provides a buffered AGC voltage output for driving external recorders, diversity combiners or to record signal levels. The output ranges from 0 to 8 Vdc and can be of either positive or negative polarity depending on requirements. Included are slope and zero adjustments for setting the AGC output to match the input requirements of external equipments. Additionally, the CFO and auxiliary AGC output capabilities can be included separately or they can be combined in a single module as follows:

MODEL	CAPABILITIES
41-1100	CFO output only. Unless otherwise specified, the sensitivity is factory set to 100 kHz/volts with a 2V p-p maximum output.
42-1100	Auxiliary AGC output only; 0 to -8Vdc output range.
43-1100	Auxiliary AGC output only; 0 to +8Vdc range.
44-1100	CFO and auxiliary AGC inputs. Unless otherwise specified the CFO sensitivity is to 100 kHz/volt with a 2V p-p maximum output. The AGC output ranges from 0 to -8Vdc; the polarity can also be set to provide a 0 to +8Vdc range if specified at the time of order.
45-1100	Auxiliary Video Amplifier. See page 5.

VCXO-Optional Second Local Oscillator

The VCXO 2nd local Oscillator (Model 101-342) is an optional module which replaces the standard VCO 2nd LO with a voltage controlled crystal oscillator. When used in conjunction with phase demodulators, lower residual phase noise performance is achieved. With the VCXO, phase demodulators can be provided with lower loop bandwidths and narrower IF bandwidths, such as 2.5 kHz. The VCXO center frequency is 60 MHz; the control range is greater than ± 100 kHz and the stability is $\pm 0.01\%$ from 0 to 50°C. Please consult factory to determine if VCXO is applicable to proposed receiver configuration.

CRYSTALS AND CRYSTAL OVENS

See RF Tuner Specifications, Table 1.

TEST ACCESSORY KIT

A test accessory kit, specifically for the 1100-AR Series and 1100-LS, should be an integral part of any receiver purchase. This kit, designated TAK-100-475, contains one each of the following test accessories and it is sold only as a complete kit:

200-396	PC Extractor Tool
200-452	RF Tuner RF Extender Cable
200-453	RF Tuner IF/Power Extender Cable
200-493	Demodulator Extender Cable
200-494	2nd IF Extender Cable
300-355	Shielded Module Extender for DB-13 connectors.
300-356	Shielded Module Extender for DD-24 connectors.
300-423	PC Board Extender

50 MHz TO 30 MHz DOWN CONVERTER 100-116

This converter is used with 30 MHz accessories such as older spectrum display units or as a buffered output for noise figure measurements.

RACK SLIDES

The 1100-AR can be equipped with rack slides (RSA-11) at the customer's request and additional charge. When slides are ordered, the fixed portions are mounted on the receiver and the slide portions packaged separately.

OPERATION AND MAINTENANCE MANUALS

One set of operation maintenance manuals is supplied with each receiver. These manuals reflect the respective receiver configuration only and are supplied at no charge. Additional copies may be ordered for a nominal cost.

115/230VAC OPERATION

Unless otherwise specified at the time of order, all 1100-AR receivers are wired for operation at 115 Vac. Instructions for converting to 230 Vac operation in the field are included in the O & M manual.

Special Purpose Receivers

WIDEBAND SATELLITE DATA RECEIVER

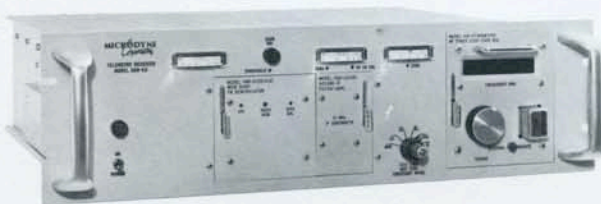
The Model 1100-LS has an extremely broadband response and is designed for wideband applications such as Landsat (MSS/RBV), special wideband meteorological satellites, and TV reception from satellites, aircraft and RPV's. It is ideally suited for broadband FM video as well as for analog or digital data where either FM/FM or PCM/FM high-data rates are used.

Special 1120-LS Series IF Filters, a Model 1148-D(70)(B) Wideband FM Demodulator and 1100-VT(W)(70) Series Wideband RF Tuners must be used with this 5¼" high panel receiver. Voltage tuned, plug-in tuner modules cover P, L, Upper L and S Bands. Other tuning ranges up to 4.8 GHz can be supplied on special order. Optional synthesized tuners with keyboard entry and digital displays covering the same frequency bands in step frequencies of 500 kHz (smaller increments on special order tuners) are available.

Tuning and other receiver functions can be controlled locally, remotely or by computer generated BCD/TTL logic signals.

The standard 20 MHz IF Filter/Amplifier accommodates deviations of up to ±6 MHz with data rates up to 10 MHz. PCM/FM data rates up to 15 megabits per second, NRZ, can be handled. For higher data rates, IF bandwidths up to 40 MHz are available. For additional information, request an 1100-LS brochure. Also refer to Landsat (MSS/RBV) Chart on following page.

Model 1100-LS
Wideband Receiver



MODEL 550-AR TELEMETRY DATA AND TRACKING RECEIVER

Designed for both telemetry data and antenna tracking applications, the Model 550-AR is a very compact receiver that is particularly well suited to limited space requirements such as aircraft and shipboard installations. Two 550-AR receivers, for example, can be mounted side-by-side in a standard 19" rack and occupy a panel height of only 5¼" when using a Model DRA-55 rack adapter.

This receiver accepts any standard 1100 Series RF tuner used in 1100-AR Series receivers and includes provisions for local, remote or computer controlled operation. When synthesized 1100(SYN) Series RF tuners are employed,

a Model RPC-550 Remote Control Module can be used with interface shielded cables which are available in 50, 100 and 250 ft. lengths. A Model RSM-500 Remote Scan Module is also available with synthesized tuners which provides, in conjunction with the RPC-550, remote control scanning in 1 MHz steps and the scanning of four preset frequencies.

The standard 550-AR accommodates one internal 2nd IF Filter/Amplifier with a 1.0 MHz bandwidth, one intermediate bandwidth FM Demodulator, and one Video Filter Amplifier. All circuits are essentially the same as those used in the 1100-AR but are repackaged to accommodate limited space requirements. Other IF and FM demodulator bandwidths are available on special order.

Model 550-AR
Receiver & RPC-550
Remote Control Module



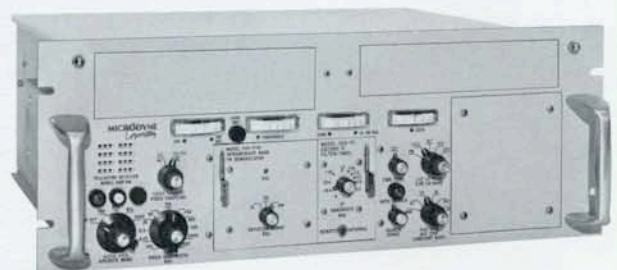
SATELLITE COMMUNICATIONS RECEIVER MODEL 1100-AR(70)

This receiver is designed to accept signals that have already been down converted to 70 MHz by the user's equipment. Down conversion to 70 MHz at the antenna for transmission to the receiver's 70 MHz input minimizes cable loss. Any standard front panel 1100 Series plug-in IF Filter/Amplifier and Demodulator designed for the basic 1100-AR Series receivers can be employed.

NOTE

Separate brochures describing the 1100-LS and 550-AR receivers in detail are available upon request.

Model 1100-AR(70)
70 MHz Receiver



MET Satellite Receiver Configurations

CONFIGURATION FOR TYPICAL METEOROLOGICAL TERMINALS USING A MODEL 1100-AR OR 1100-AR(5) BASE RECEIVER. FOR SATELLITE RECEIVER CONFIGURATIONS NOT LISTED BELOW PLEASE CONTACT MICRODYNE.

NOTE: Since meteorological satellites seldom pass over terminals at the same time, all satellite formats listed in this section can be received with one basic receiver by simply changing a few plug-in modules and/or crystals. Also note that all down link frequencies listed below can be down converted to P-Band (285 - 410 MHz) so that only one 1113-VT(-)(4) RF Tuner is required to receive all formats listed in the first section below.

RECEIVER APPLICATION	REQUIRED FRONT PANEL PLUG-IN MODULES			OPTIONS AND ADDITIONAL ITEMS NEEDED**
	RF TUNER MODEL*	DEMODULATOR MODEL	IF FILTER MODEL	
VHRR/NOAA 4 & 5 (1697.5 MHz Down Link) TIROS-N AVHRR/HRPT (1698.0 & 1707.0 MHz Down Links)	1113-VT(A)(4) ₅ 1116-VT(A)(N)(4) ₇ Other options _{3,4}	1143-D(A) (VHRR only - wideband FM) 1151-D(B)(D) (AVHRR only wideband PM)	1128-I(B) (1.0 MHz) For VHRR 1120-I(B)(2) (3.3 & 5.0 MHz) For AVHRR	1113-VT(-): See Notes B,C,F,G,J,K 1113-VT(-)(4): See Notes C,F,G,H, J,K 1116-VT(-)(N): See Notes B,C,F,G,K 1116-VT(-)(N)(4): See Notes C,F,G, H,K
STRETCHED VISSR (1687.1 MHz Down Link)	1113-VT(A) ₅ 1116-VT(A)(N) ₇ Other options _{3,4}	1155-D(A) (Bi-Phase PM)	1135-I(B) (6.0 MHz)	1113-VT(-): See Notes B,C,G,J,K 1113-VT(-)(4): See Notes C,G,H,J,K 1116-VT(-)(N): See Notes B,C,G,K 1116-VT(-)(N)(4): See Notes C,G, H,K
DMSP (2207.5 & 2252.5 MHz Down Links)	1113-VT(A)(4) ₅ 1115-VT(A)(4) ₆ Other options _{3,4}	1155-D(A) (Bi-Phase PM)	1130-I(B) (3.3 MHz)	1113-VT(-): See Notes B,C,D,F,G,K 1113-VT(-)(4): See Notes C,D,F,G H,K 1115-VT(-): See Notes B,C,F,G,K 1115-VT(-)(4): See Notes C,F,G,H,K
NIMBUS-G/HCMM (2273.5 & 2211 MHz Down Links)	1113-VT(A)(4) ₅ 1115-VT(A)(4) ₆ Other options _{3,4}	1151-D(B)(D) Wide Angle PM Demodulator	1137-I(B) (2.0 MHz) For Nimbus-G 1139-I(B) (5.0 MHz) For HCMM	1113-VT(-): See Notes B,C,D,F,G,I,K,M,N 1113-VT(-)(4): See Notes C,D,F,G,H, K,M,N 1115-VT(-): See Notes B,C,E,F,G,M,N 1115-VT(-)(4): See Notes C,E,F,G,H,M,N
METEOSAT (1691.0 MHz Down Link)	1113-VT(A) ₅ 1116-VT(A)(N) ₇ Other options _{3,4}	1151-D(B)(D) (Wideband PM)	1120-I(B)(2) (1.0 & 3.3 MHz)	1113-VT(-): See Notes B,C,E,F,G,J 1113-VT(-)(4): See Notes C,E,F,G,H,J 1116-VT(-)(N): See Notes B,C,E,F,G 1116-VT(-)(N)(4): See Notes C,E,F,G,H
LANDSAT USB TRACKING AND DATA (2287.5 MHz Down Link) Companion unit to MSS/RBV Receiver	1113-VT(A)(4) ₅ 1115-VT(A)(4) ₆ Other options _{3,4}	1151-D(B)(D) (Wideband PM)	1120-I(B)(2) (1.0 & 3.3 MHz)	1113-VT(-): See Notes B,C,D,E,F,G 1113-VT(-)(4): See Notes C,D,E,F,G,H 1115-VT(-): See Notes B,C,E,F,G 1115-VT(-)(4): See Notes C,E,F,G,H

CONFIGURATION FOR TYPICAL LANDSAT TERMINALS USING A MODEL 1100-LS BASE RECEIVER

RECEIVER APPLICATION	REQUIRED FRONT PANEL PLUG-IN MODULES			OPTIONS AND ADDITIONAL ITEMS NEEDED**
	RF TUNER MODEL*	DEMODULATOR MODEL	IF FILTER MODEL	
LANDSAT (MSS/RBV) (2265.5 & 2229.5 MHz Down Links) NOTE: Two receivers are needed for simultaneous MSS/RBV reception.	1113-VT(W)(70) ₁ 1115-VT(W)(70) ₂ 1115-VT(W)(70) ₂ (R) ₃ Other options ₄	1148-D(70)(B) (Extra wideband FM)	1120-LS(20) (20 MHz)	1113-VT(W)(70): See Notes A,C,D 1115-VT(W)(70): See Notes B,C 1115-VT(W)(70)(R): See Notes B,C

*Refer to RF Tuner Option Notes (Page 26) as indicated by the respective subscript number following a Tuner Model No.

**Refer to Options and Additional Items Needed (Page 26) as indicated by Lettered Note references.

CONFIGURATION FOR MDS-APT, TIROS-N/TIP, GOES/WEFAX, GMS AND GMS/MDUS TERMINALS

NOTE: APT, TIP and WEFAX modes can all be received with one basic receiver and one 1111-VT(A) Tuner, provided a 1691.0 to 136.0 MHz Down Converter is used for WEFAX, plus appropriate demodulators and crystals for each mode.

REQUIRED FRONT PANEL PLUG-IN MODULES

MET RECEIVER APPLICATIONS	RF TUNER MODEL*	DEMODULATOR MODEL	IF FILTER MODEL	OPTIONS AND ADDITIONAL ITEMS NEEDED**
TIROS-N/APT and MDS/APT 137.5 & 137.62 MHz Down Links	1111-VT(A)(4)	1141-D(A) Narrowband FM	1120-I(B)(2) (30 & 50 kHz, Switchable)	1111-VT(-)(4) See Notes C,E,G,H Note: If antenna auto-tracking is used, add note F to above.
TIROS-N/TIP 136.77 & 137.77 MHz Down Links	1111-VT(A)(4)	1151-D(B)(D) Wide Angle PM	1120-I(B)(2) (30 & 50 kHz, Switchable)	1111-VT(-)(4) See Notes C,E,G,H Note: If antenna auto-tracking is used, add note F to above.
GOES/WEFAX and Japanese GMS (Low Resolution 1691.0 MHz Down Link)	1116-VT(A)(N) or 1116-VT(A)(N)(4) or 1111-VT(A)(4) ₈ (Latter used w/down converter)	1141-D(A) Narrowband FM (for 30 kHz IF) 1142-D(A) (Intermediate Band FM (for 300 kHz IF)	1120-I(B)(2) (30 & 300 kHz, Switchable)	1116-VT(-)(N) See Notes B,C,E,G 1116-VT(-)(N)(4) See Notes C,E, G,H 1111-VT(-)(4) See Notes C,E,G,H,L
Japanese GMS/MDUS (High Resolution) 1687.1 MHz Down Link	1116-VT(A)(N) or 1116-VT(A)(N)(4) or 1111-VT(A)(4) ₈ (Latter used w/down converter)	1142-D(A) Intermediate Band FM for GMS/MDUS or 1144-D(N)(A) for GMS & GMS/MDUS	1128-I(B) (1.0 MHz) for GMS/MDUS or 1120-I(B)(3) 30, 300 & 1,000 kHz for GMS & GMS/MDUS	1116-VT(-)(N) See Notes B,C,E,G 1116-VT(-)(4) See Notes C,E,G,H 1111-VT(-)(4) See Notes C,E,G,H,L

CONFIGURATION FOR RADIOSONDE AND ROCKETSONDE TERMINALS USING A MODEL 1100-AR OR 1100-AR(5) BASE RECEIVER

REQUIRED FRONT PANEL PLUG-IN MODULES

RECEIVER APPLICATION	RF TUNER MODEL*	DEMODULATOR MODEL	IF FILTER MODEL	OPTIONS AND ADDITIONAL ITEMS NEEDED**
RADIOSONDE (1660 - 1690 MHz)	1113-VT(A) ₅ 1116-VT(A)(N) ₇ Other options _{3,4}	1142-D(A) (Intermediate bandwidth FM)	1120-I(B)(2) (200 & 500 kHz)	1113-VT(-): See Notes B,C,E,G,J 1113-VT(-)(4): See Notes C,E,G,H,J 1116-VT(-): See Notes B,C,E,G 1116-VT(-)(4): See Notes C,E,G,H
ROCKETSONDE (1660 - 1690 MHz)	1113-VT(A)(K) ₉ 1116-VT(A)(N)(K) ₁₀ Other options ₄	1142-D(A) (Intermediate band- width FM)	1120-I(B)(2) (200 & 500 kHz)	1113-VT(-)(K): See Notes B,C,E,G,J 1116-VT(A)(N)(K): See Notes B,C, E,G

*Refer to RF Tuner Option Notes below as indicated by the respective subscript number following a Tuner Model No.

**Refer to Options and Additional Items on the following page as indicated by Lettered Note references.

*NOTES FOR RF TUNER OPTIONS

1. Optional 1113-VT(W)(70) tuner with two switch selectable, internal crystal controlled frequencies (311.0 & 347.0 MHz) is used if an S-Band to P-Band down converter is employed (see option Note "D").
2. Optional 1115-VT(W)(70) tuner is used if S-Band down link frequencies are to be received direct and cable losses are not prohibitive.
3. Optional Tuners with the suffix "(R)" added to the model number are used if the tuner is to be remote controlled and mounted in a weatherproof housing at the antenna for down conversion to 70 MHz to minimize cable losses. Also consult factory regarding a remote digital frequency display and control panel for this purpose.
4. To specify a frequency synthesizer with keyboard entry and digital display, a digital display only or a frequency calibrated ribbon dial, please include the following applicable letters with the tuner model number:
 - a. Add "(SYN)" next to "VT" or in place of "(-)" or "(A)" to indicate a frequency synthesizer with keyboard entry and a digital frequency display. (Examples: 1115-VT(SYN)(W)(70) or 1116-VT(SYN)(N)). This model cannot be used with PM Demodulators.
 - b. Add "(D)" after "VT" or in place of "(-)" or "(A)" to indicate a digital display only.
 - c. No letter added after "VT" or the letter "(A)" in place of "(-)" indicates a ribbon dial.
5. Optional 1113-VT(A) or 1113-VT(A)(4) tuner is used if an appropriate L-Band or S-Band to P-Band Pre-Amp/Down Converter is employed. The 1113-VT(A)(4) tuner has four internal crystal positions, switch selectable.
6. Optional 1115-VT(A) or 1115-VT(A)(4) tuner is used if S-Band down link frequency is to be received direct and cable losses are not prohibitive. The 1115-VT(A)(4) has four internal switch selectable crystal positions.
7. Optional 1116-VT(A)(N) or 1116-VT(A)(N)(4) tuner may be used to receive L-Band frequencies direct provided cable losses are not prohibitive. The 1116-VT(A)(N)(4) has four internal switch selectable crystal positions.
8. Optional 1111-VT(A) or 1111-VT(A)(4) is used to receive APT data direct and WEFAX data through an L-Band to 136.0 MHz down converter (see Note "L").

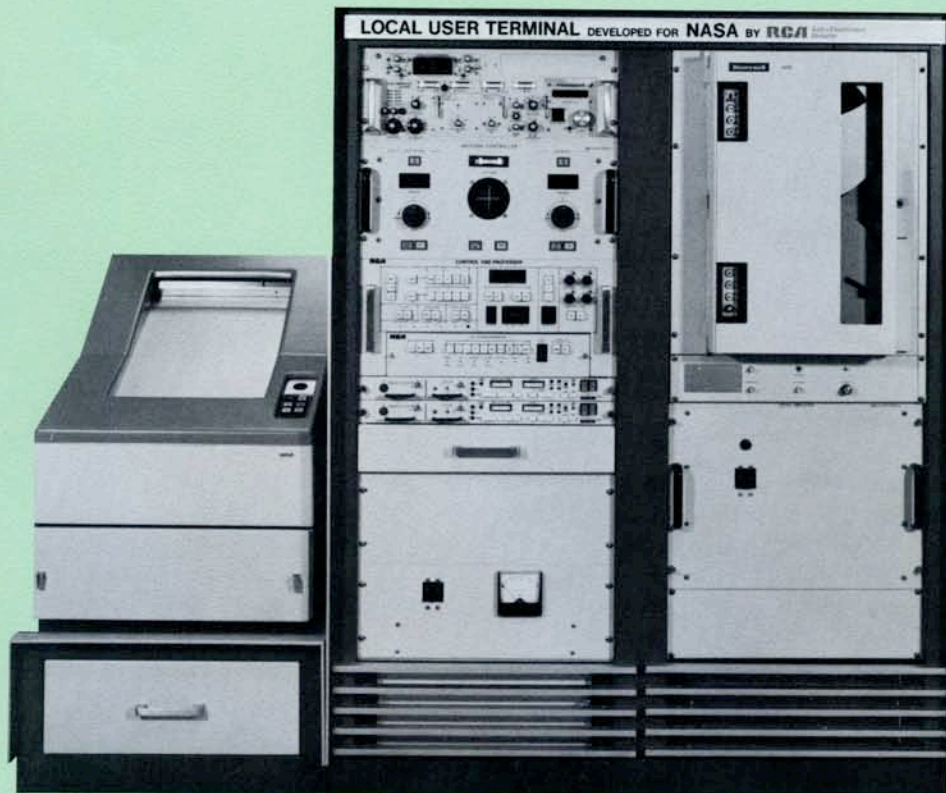
**NOTES FOR OPTIONS AND ADDITIONAL ITEMS REQUIRED

- A. Two each switch selectable CR-75/U crystals and type 100-001 crystal ovens are required with 1113-VT(W)(70) tuners.
- B. One each CR-65/U crystal and type 100-001 crystal oven is required for each frequency used. (Please specify.)
- C. One each type RSA-11 Rack Slides is required for rack mounting the receiver.
- D. An S-Band to P-Band Pre-Amp/Down Converter is required with 1113-VT Series RF Tuners.
- E. One each type 100-159 4.0 MHz 1st IF Filter.
- F. One each type 45-1100 Simultaneous AM-FM/PM Output Module.
- G. Optional Model 1161-S(A) Spectrum Display Unit. Used as plug-in with 1100-AR only.
- H. One each CR-52A/U crystal is required for each frequency used. (Please specify.)
- I. One each type 200-070 Crystal Adapter is required for each CR-52A/U crystal used. (Please specify.)
- J. An L-Band to P-Band pre-amp/down converter is required.
- K. One each type 100-302 7.0 MHz 1st IF Filter.
- L. One each 1691.0 to 136.0 MHz preamp/down converter is required.
- M. One each video filter #8 (#100-430) is required for HCMM in place of standard #2, (#300-045).
- N. One each 101-750, 9 MHz 1st IF Filter is required for HCMM.

Other Special Applications

Due to the wide variety of plug-in modules available, it is likely that any new satellite or other RF Telemetry receiver configuration not already listed can be readily accommodated at minimum cost including FDM and single channel per carrier satellite communications receivers. It should also be noted

that this flexibility means that only minor modifications are usually needed to meet many specialized applications which would otherwise require a completely new and expensive receiver design. Therefore, before any make or buy decision, it should be to your advantage to contact Microdyne first.



ITOS-VHRR/TIROS-N AVHRR Earth Terminal System developed and used by NASA Goddard. The System incorporates a Microdyne Model 1100-AR receiver which accepts both VHRR and AVHRR data simply by plugging in the appropriate front panel FM or PM demodulator module. A second NASA installation incorporates the Landsat MSS/RBV 1100-LS receiver and the Landsat USB 1100-AR receiver configurations shown on page 24.

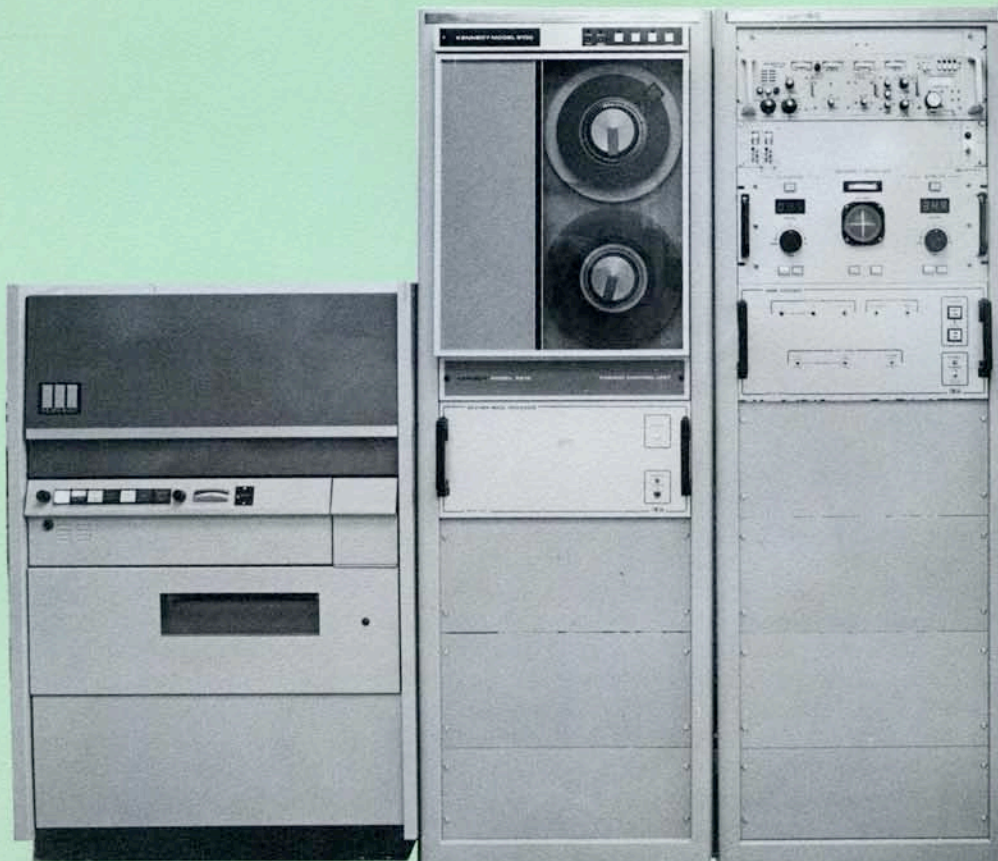
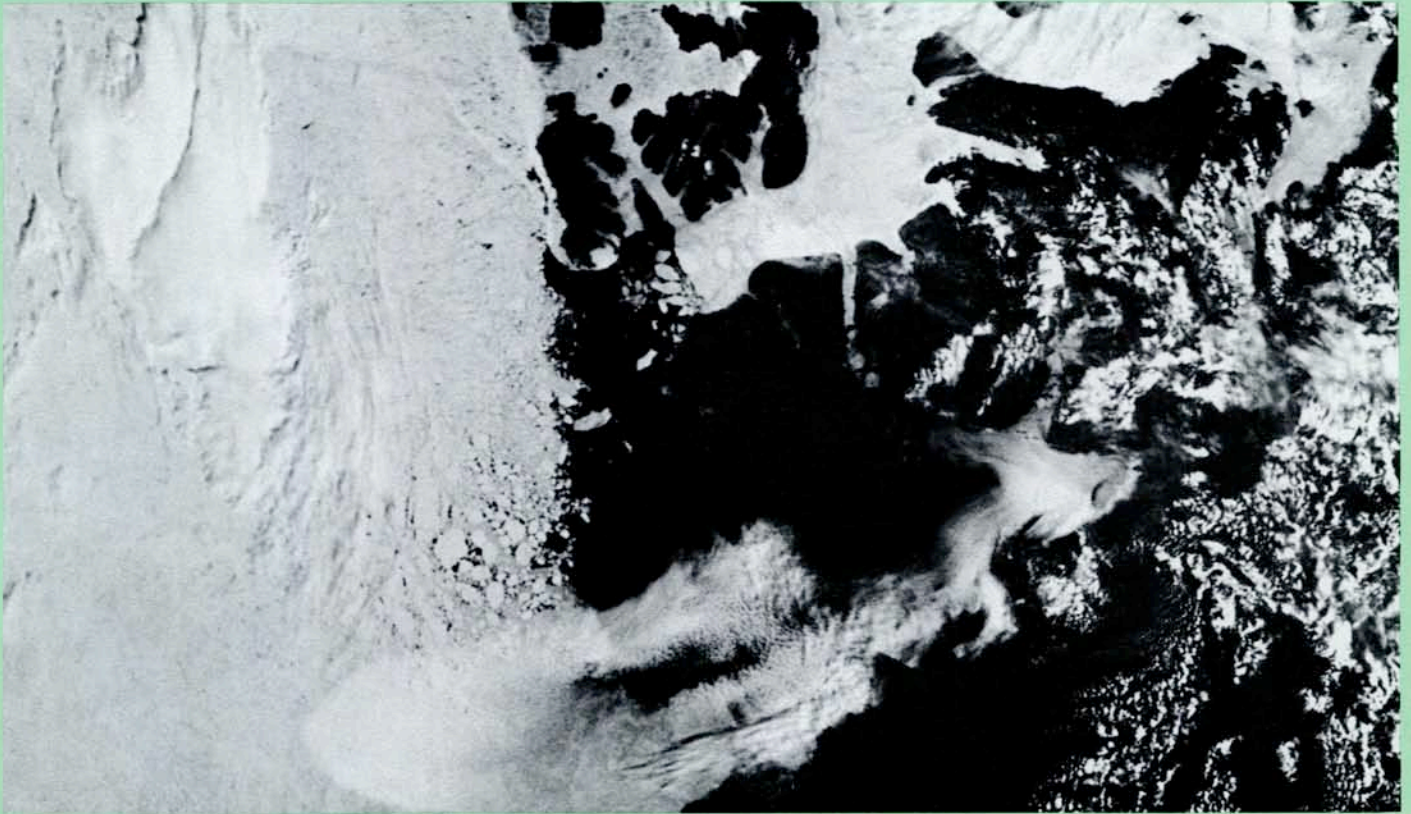
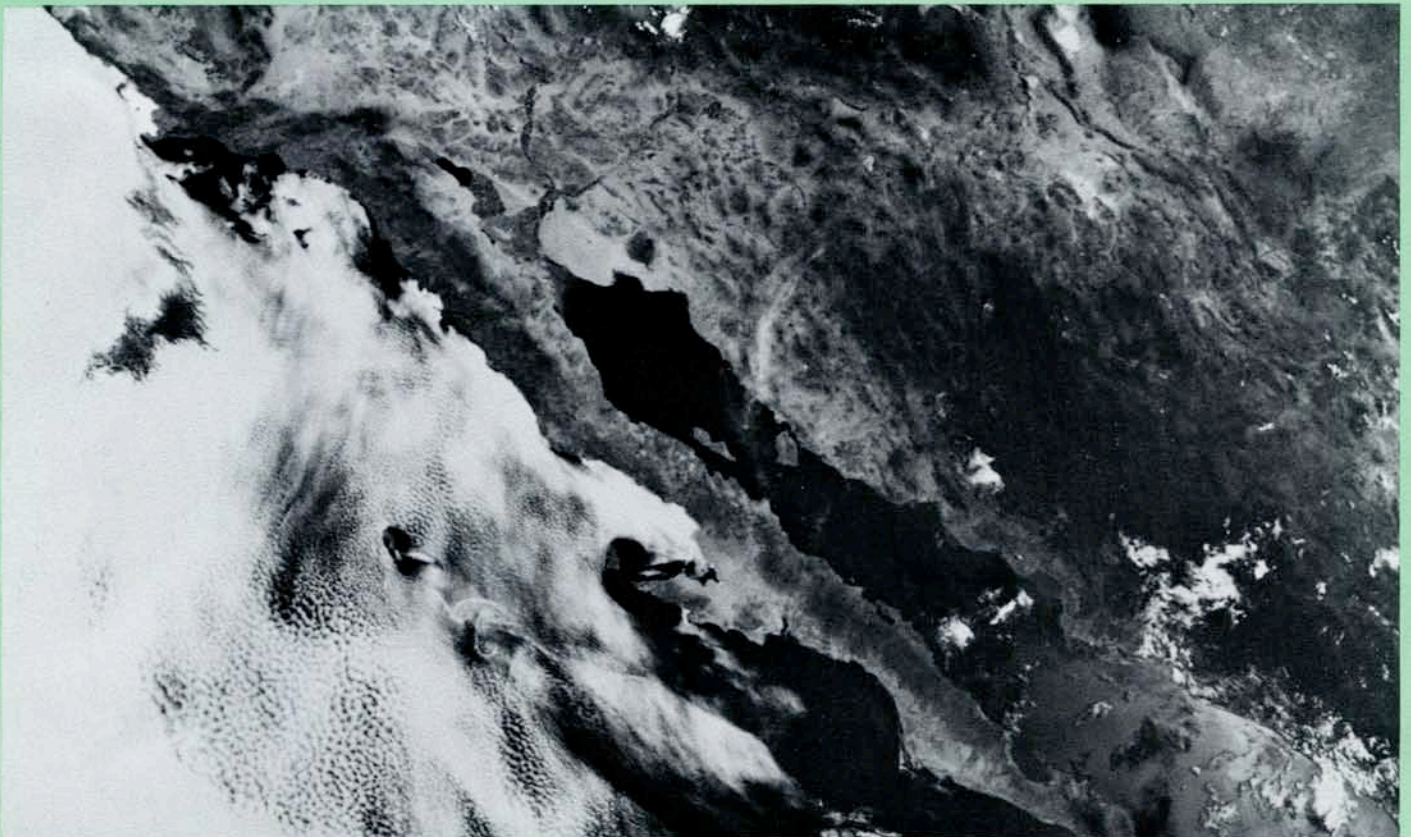


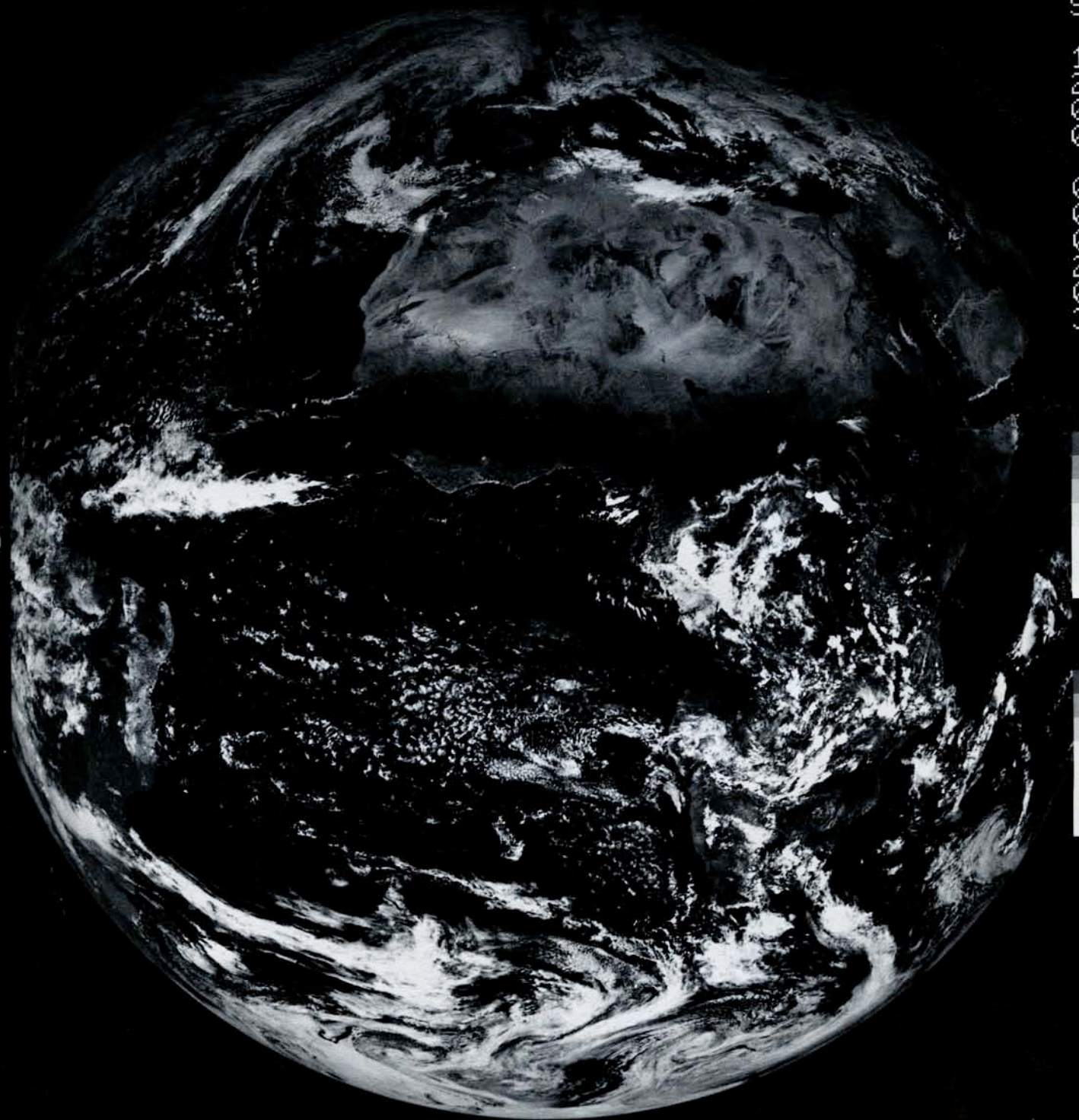
Photo shows MDA's Weather Image Processing System (WIPS). Microdyne's 1100-AR receiver installed here can be configured for Tiros-N/AVHRR/TIP/APT, Stretched VISSR, DMSP, Nimbus-G/HCMM, Meteosat, Landsat USB, MDS/APT, GOES/WEFAX, Japanese GMS and GMS/MDUS MET satellites simply by changing appropriate plug-in modules and/or crystals. Pages 24 & 25.



This Arctic Image is an enhanced visible VHRR frame showing the Beaufort Sea Area of the Western Arctic. Ice is clearly shown in contrast with the land mass. The image was received on an 1100-AR receiver and enhanced on McDonald Dettwiler's Weather Image Processing System.



This image is enhanced visible VHRR taken by a NOAA satellite showing Baja California. Microdyne's 1100-AR receiver and MDA's Weather Image Processing System were employed.



0100 0000 0000 0100

This METEOSAT raw VISSR image, showing the entire African continent, was received on a Microdyne 1100-AR receiver and was enhanced and imaged on a McDonald Dettwiler and Associates, Ltd. Line Scan Processing System.

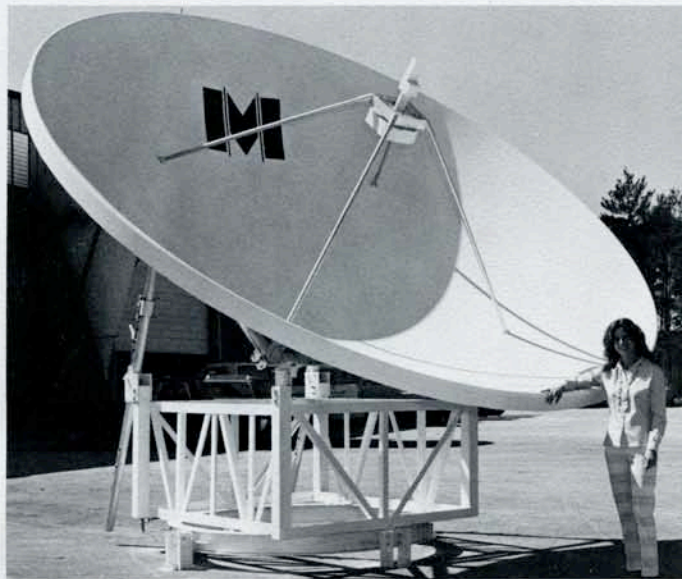
Microdyne Satellite TV System Products



1100-FFC(X1) Satellite Earth Station Receiver



1100-TVR(X12) Satellite Earth Station Receiver



SATRO-5 Five Meter Satellite TVRO Antenna
Contact factory for detailed TV brochures

WARRANTY

All Microdyne Corporation equipment and parts are guaranteed to be free from defects in material and workmanship and to be equal or to exceed applicable published specifications for a period of one year from date of shipment. The liability of Microdyne Corporation is limited to replacing or repairing, at their option, products found to be defective in these respects which are returned with transportation and insurance prepaid by the purchaser. All replaced and repaired items which are within the warranty period and are determined to be defective, will be returned by Microdyne Corporation to the purchaser with transportation and insurance prepaid.



627 LOFSTRAND LANE
POST OFFICE BOX 1527 ROCKVILLE, MD 20850
Telephone (301) 762-8500
TWX 710-828-0477
Cable MICRODYNE Rockville, Maryland USA

NORTHEAST REGIONAL SALES/SERVICE OFFICE
Mr. George Bell
8 High Street, Rochester,
West Wareham, Massachusetts 02576
Telephone: (617) 763-8544 or 763-8759

WESTERN REGIONAL SALES/SERVICE OFFICE
Mr. Richard B. Elsea
357 S. Havenside Avenue
Newbury Park, California 91320
Telephone: (805) 498-1514

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