

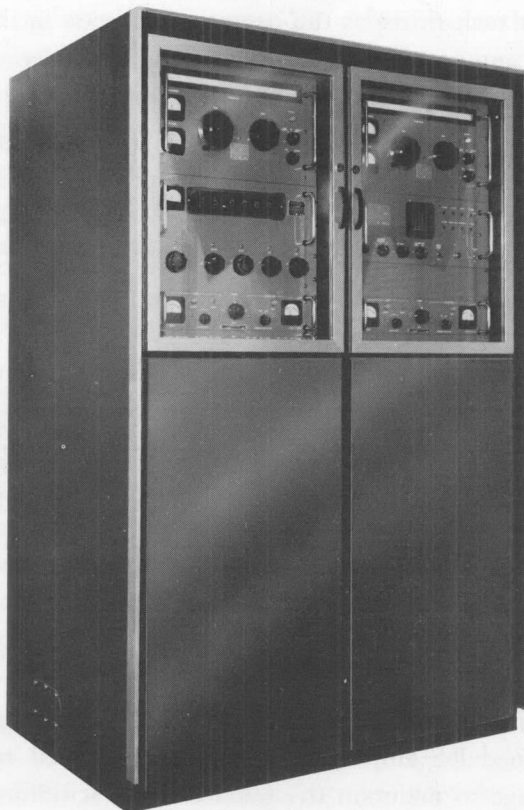


TECHNICAL BULLETIN NUMBER 3001

General Purpose Communication Receivers

TMC Model DDR-5

AN/FFR-60 (v)



DDR-5 DIVERSITY RECEIVER

TMC Models DDR-5 are receiving systems covering the frequency range of 2-32 mcs for the reception of SSB, ISB, AM, AM equivalent, FSK, FAX, CW, MCW, Pulse or Phase signals. Models DDR-5 are constructed from modular components to meet a wide variety of customer requirements for high performance receivers used on point-to-point, ground-to-air and mobile circuits. The versatility of the modules provides many options such as continuous tuned, fixed tuned, diversity, non-diversity, synthesized and non-synthesized receivers. Other options include automatic frequency control, variations in IF bandpass filters, tunable notch filters, variable audio filtering, visual monitoring facilities and automated tuning.

The input dynamic range of the DDR-5 has been carefully correlated with optimum sensitivity, selectivity, image rejection, unwanted radiation, cross talk, spurious response and stability to provide a receiver capable of accepting input variations of 70 db without AGC and at least 100 db with AGC without affecting technical characteristics. Further, the DDR-5 will continue to provide usable signal output over a 150 db dynamic range. As a result of these factors, the performance of the DDR-5 exceeds that of other multi-channel receivers by its capability to maintain usable circuits for critical communications under severe signal conditions.

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Front panel selection of adjustable AGC voltage which is derived from either channel being received; from the total signal or from the AFC control unit, as well as a wide range of switchable IF bandpass filters, noise limiting, tunable noise rejection filters and superior AFC circuit give the operator ample flexibility to cope with any type of signal and circuit condition.

Human engineering in the positioning of front panel controls as well as the position of the modules within each receiver rack provides the operator with ease in the location and positive indication of the settings of all tuning controls. Special design cabinets and brute force line filters provide at least 70 db attenuation to radiated or power line interference.

A brief functional description of the individual components, which follows, should assist in the selection of a receiver to fit your individual requirement.

Continuous Tuned RF Amplifier, Model HFR-1 (TN-376/UR), provides coverage from 2-32 mcs in eight bands and displays the tuned frequency on a 14" slide rule dial. This unit will accept a synthesized control voltage from Model HFS-1 Synthesizer for extreme stability. The HFR converts the RF frequency to an IF of 1.75 mcs. The HFR-1 obtains its operating voltage either from the SBS-2 Power Supply or the HFP-1 Power Supply.

Fixed Tuned RF Amplifier, Model HFF-1 (TN-396(P)/FRR), accepts any combination of eight individual modules to operate in the 2-32 mc frequency range and converts the RF signal to an IF frequency of 1.75 mcs. Synthesized control of the fixed tuned RF amplifier may be accomplished by the addition of the HFS-1 Frequency Synthesizer. Model HFF-1 obtains its operating voltages from either the SBS-2 Power Supply, or the HFP-1 Power Supply.

Control Synthesizer and Standard, Model HFS-1 (0-941/UR), monitors the oscillator frequency in the continuous tuned RF amplifier, HFR-1, or the fixed tuned RF amplifier, HFF-1, and provides correction voltage to maintain the free-running oscillators to a stability of 1 part in 10^8 for a 24-hour period. The frequency of the RF incoming signal is displayed on the front panel in 1" high illuminated numerals. Change of frequency in 100 cycle increments is accomplished by means of detented switches. The HFS-1 obtains its operating voltages from the HFP-1.

Automatic Frequency Control Unit, Model AFC-3 (C-4099/FRR-60(v)), operates in conjunction with either the SBS-2, combined IF and AF amplifiers, or the HFI-1, separate IF amplifier, and obtains its operating voltage from either the SBS-2 Power Supply, or the HFP-1 Power Supply. Drift rate and error correction figures are included under Technical Specifications.

IF Amplifier and Mixer, Model HFI-1 (AM-3295/FRR-60(v)), accepts a 1.75 mc input signal from the continuous tuned RF amplifier, HFR-1, or the fixed tuned RF amplifier, HFF-1, processes this signal through front panel selectable bandpass filters and converts this signal to 250 kc for further demodulation in the HFA-1, Audio Amplifier. Rear panel facilities are provided for connection to the HNF-1, Notch Filter. This unit obtains its operating voltages from the HFP-1 Power Supply.

Tunable IF Notch Filter, Model HNF-1 (F-711/FRR-60(v)), accepts a 250 kc input signal from the IF amplifier and provides 60 db of attenuation for 20 cycles of any one interfering signal over the entire passband of the IF signal. Once the interfering signal has been rejected, the notch

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filter returns the signal to the IF amplifier for further demodulation. The notch filter obtains its operating voltages from the HFP-1 Power Supply.

Sideband Selector, Model SBS-2 (CV-1293/FRR-60(v)), is a combined IF and AF amplifier that will operate with its own built-in power supply or the HFP-1 Power Supply. It accepts a 1.75 mc signal from either the continuous tuned RF amplifier or the fixed tuned RF amplifier and provides dual audio channel output. Front panel selection of four IF filters gives ample flexibility to intended operating modes. This unit will operate in conjunction with the AFC-3 Automatic Frequency Control Unit for non-synthesized operation or may be synthesized by the HFS-1 Synthesizer. The power supply that is contained within the SBS-2 is capable of providing operating voltages to itself, to its associated AFC-3, Automatic Frequency Control Unit, and to either the HFR-1, Continuous Tuned RF Amplifier, or the HFF-1, Fixed Tuned RF Amplifier, but to no other units. On selection of an SBS and a synthesized unit, the power supply in the SBS-2 is deleted and a system power supply, Model HFP-1, is added to provide operating voltages for the complete system.

Audio Amplifier, Model HFA-1 (AM-3296/FRR-60(v)), accepts dual 250 kc input signals from the HFI-1, IF Amplifier, demodulates these signals and provides dual audio channel outputs. Facilities are incorporated on the rear panel to provide input to a passive dual audio filter. This unit accepts its operating voltages from Model HFP-1 Power Supply.

Audio Filter, Model HAF-1 (F-712/FRR-60(v)), requires no operating voltages other than the signal fed to it. It accepts dual audio signals from the HFA-1, Audio Amplifier, and is adjustable by front panel control to vary the upper and lower frequency cut-off point of each audio filter to suit operational requirements.

Power Supply, Model HFP-1 (PP-3341/FRR-60(v)), provides regulated B+, regulated bias voltages, and filament voltages to one complete rack of DDR-5 components.

TECHNICAL SPECIFICATIONS

- | | |
|---------------------|--|
| FREQUENCY RANGE: | <ol style="list-style-type: none">1. 2-32 mcs in 100 cycle steps.2. 2-32 mcs continuous coverage in eight bands: 2-3, 3-4, 4-6, 6-8, 8-12, 12-16, 16-24, or 24-32 mcs.3. 2-32 mcs fixed tuned. |
| MODES OF OPERATION: | SSB, ISB, AM, AM Equivalent, CW, MCW, FSK, FAX, Pulse, and Phase. |
| STABILITY: | <ol style="list-style-type: none">1. Synthesized stability of 1 part in 10^8 for 24 hours for a change in ambient of 15° C within the limits of 0 to 50° C.2. 20 to 50 parts in 10^6 without AFC.3. With AFC the residual audio output will remain within 1 cycle of the transmitted intelligence. |

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INPUT IMPEDANCE:	Nominal 50 ohms, unbalanced.																
NOISE FIGURE AND SENSITIVITY:	<ol style="list-style-type: none">1. 6 db or better over the band, i.e., with a 1 microvolt signal and a 7.5 kc bandwidth, the output signal to noise ratio is 15 db or better (for continuous tuned receivers).2. Better than 3 db for all fixed tuned RF modules. 1 microvolt for 1 watt signal output at full gain, when used with appropriate IF and AF amplifiers.																
TUNING:	<ol style="list-style-type: none">1. Synthesizer tuning is accomplished by means of 5 detented switches and the RF frequency is displayed on the front by means of digital illuminated numerals 1" high.2. The frequency that the HFR is tuned to is displayed on a 14" slide rule dial in any one of the 8 bands indicated under the frequency ranges listed above.3. Any combination of eight of the following fixed tuned heads, selectable by front panel switch:<table><tr><td>HFFD-1</td><td>2-3 megacycles</td></tr><tr><td>HFFD-2</td><td>3-4 megacycles</td></tr><tr><td>HFFD-3</td><td>4-6 megacycles</td></tr><tr><td>HFFD-4</td><td>6-8 megacycles</td></tr><tr><td>HFFD-5</td><td>8-12 megacycles</td></tr><tr><td>HFFD-6</td><td>12-16 megacycles</td></tr><tr><td>HFFD-7</td><td>16-24 megacycles</td></tr><tr><td>HFFD-8</td><td>24-32 megacycles</td></tr></table>	HFFD-1	2-3 megacycles	HFFD-2	3-4 megacycles	HFFD-3	4-6 megacycles	HFFD-4	6-8 megacycles	HFFD-5	8-12 megacycles	HFFD-6	12-16 megacycles	HFFD-7	16-24 megacycles	HFFD-8	24-32 megacycles
HFFD-1	2-3 megacycles																
HFFD-2	3-4 megacycles																
HFFD-3	4-6 megacycles																
HFFD-4	6-8 megacycles																
HFFD-5	8-12 megacycles																
HFFD-6	12-16 megacycles																
HFFD-7	16-24 megacycles																
HFFD-8	24-32 megacycles																
INTERMODULATION:	Intermodulation products are down 60 db from the maximum tone in the desired sideband as a result of two signals in the unwanted sideband.																
IMAGE RATIO:	80 db referenced to 1 microvolt input signal.																
SPURIOUS RESPONSE: (As defined by CCIR)	Better than 120 db referenced to 1 uv. (For synthesized operation, all spurious will be no greater than .01 uv when referred to the antenna.)																
IF REJECTION:	Better than 80 db average.																
CALIBRATION:	The input frequency is displayed on a large 14" slide rule dial to give minimum resettable error and maximum tuning ease. An internally generated alignment signal is provided for routine receiver sensitivity checks and field alignment.																

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PEAK NOISE LIMITER:

The noise limiter is an improved "Lamb" type which mutes the receiver during impulse type of noise.

AFC CHARACTERISTICS: (With AFC-3)

Automatically synchronizes to a received signal ± 50 cps and suppressed 30 db at 1 microvolt above noise threshold and will remain synchronized for ± 1000 cps of drift at a maximum drift rate of 10 cps/per second. Memory circuit will maintain tuning position during signal fades or momentary outages.

IF SELECTIVITY: (With HFI-1)

Seven optional bandwidths selected from the following:

1. 250 to 7500 cps USB ± 1.5 db
2. 250 to 7500 cps LSB ± 1.5 db
3. 250 to 3500 cps USB ± 1.5 db
4. 250 to 3500 cps LSB ± 1.5 db
5. 250 to 6000 cps USB ± 1.5 db
6. 250 to 6000 cps LSB ± 1.5 db
7. 1 kc symmetrical ± 1.5 db
8. 6 kc symmetrical ± 1.5 db
9. 15 kc symmetrical ± 1.5 db

SELECTIVITY: (With SBS-2)

1. 250 to 7500 cps USB ± 1.5 db
2. 250 to 7500 cps LSB ± 1.5 db
3. 250 to 3500 cps USB ± 1.5 db
4. 250 to 3500 cps LSB ± 1.5 db
5. Any four of the nine listed under IF Selectivity.

TUNABLE IF REJECTION FILTER: (With HNF-1)

Notch rejection with ± 82 cycles at the 1 db points, ± 10 cycles at the 60 db points and tunable across the complete IF of 15 kc.

AGC:

Output remains within ± 1.5 db for 100 db change in input within the input voltage range of 1 microvolt to .1 volt. The AGC circuit has a fast attack time and a front panel adjustable decay time from 1 to 10 seconds. The AGC voltage is derived from the strongest of 2 IF channel signals.

PHASE DISTORTION:

System is capable of receiving pulse or phase information without seriously degrading intelligence when the 15 kc IF amplifier is used in a synthesized receiver.

AUDIO AMPLIFIER RESPONSE:

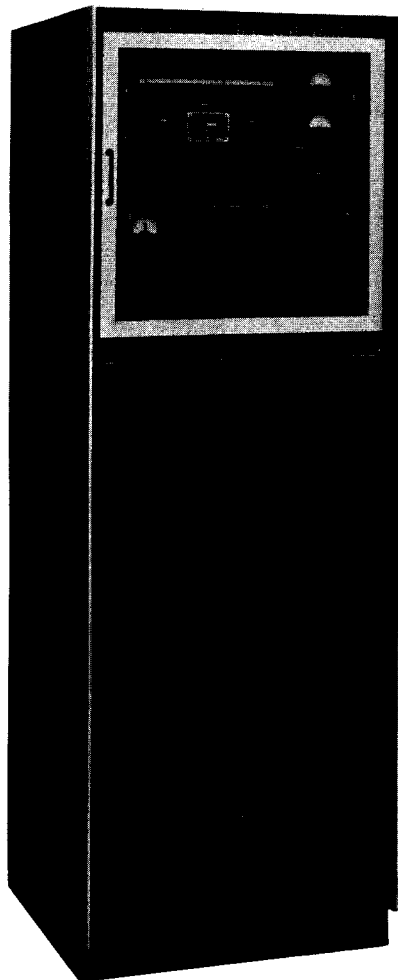
± 1.5 db 20 cps to 20,000 cps. Bandpass dependent on the filter selected. Output adjustable from 0 to 1 watt.

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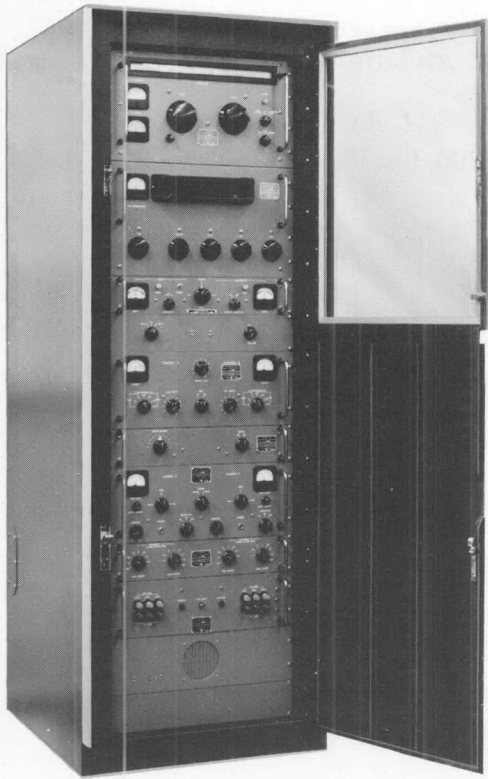
AF DISTORTION: (With HFA-1 or SBS-2)	Intermodulation products are down at least 40 db through the audio channels.
ADJUSTABLE AUDIO FILTERS: (With HAF-1)	Passive audio filters provide adjustable low pass and high pass cut off points at 100 cycles 250 cycles 500 cycles 1000 cycles 2.5 kc 5 kc 10 kc
OUTPUT:	Separate filtering is provided for each audio channel. <ol style="list-style-type: none">Four 600 ohm balanced and centertapped output terminals per receiver channel.<ol style="list-style-type: none">Two independent 0-1 milliwatt outputs.Two independent 0-1 watt outputs.Two 4, 8, or 16 ohm 1 watt outputs.Two IF outputs (unbalanced 50 ohms).
HUM LEVEL:	Minus 50 db at 1 watt of audio output.
METERING:	Input signal to the receiver and all audio outputs are metered. Other meters are: AFC drift, carrier level, IF output and sync lock. (Sync lock meter for synthesized models only.)
POWER SUPPLY:	115/230 volts at 48 to 62 cps, 1 phase; maximum power at 115v approximately 1500 watts for diversity receiver and 750 watts for single receiver.
POWER SUPPLY REGULATION:	<ol style="list-style-type: none">B+ and B- maintained within 1% from no load to full load and with $\pm 10\%$ line voltage variation.B+ ripple does not exceed 100 millivolts. B- ripple does not exceed 5 millivolts.
FUSING: (HFP-1)	All voltage outputs separately fused using blown fuse indicator type holders.
TEMPERATURE & HUMIDITY:	0° to 50° C, 90% humidity.
INSTALLATION DATA: (Maximum Configuration)	Diversity Receiver 69" h \times 46" w \times 30" d, 1100 lbs. Single Receiver 69" h \times 24½" w \times 30" d, 700 lbs.

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SHIPPING WEIGHT & CUBE: (Maximum Configuration)	Diversity Receiver 1911 lbs., 95 cu. ft. Single Receiver 1200 lbs., 52 cu. ft.
SIZE OF LARGEST CONTAINER:	Diversity Receiver 74 $\frac{5}{8}$ " x 49 $\frac{1}{8}$ " x 35" Single Receiver 74 $\frac{5}{8}$ " x 27 $\frac{5}{8}$ " x 35"
SPECIAL FEATURES:	Electronically shielded cabinet with "Screen-Room" type of line filter gives a minimum attenuation of 70 db from the receiver to the power line.
MILITARY NOMENCLATURE:	AN/FRR-60(v)
LOOSE ITEMS:	Mating plugs and hardware for signal inputs and outputs, power connections, etc., as well as instruction books are furnished as loose items.
COMPONENTS AND CONSTRUCTION:	All equipment manufactured in accordance with JAN/MIL specifications wherever practicable.

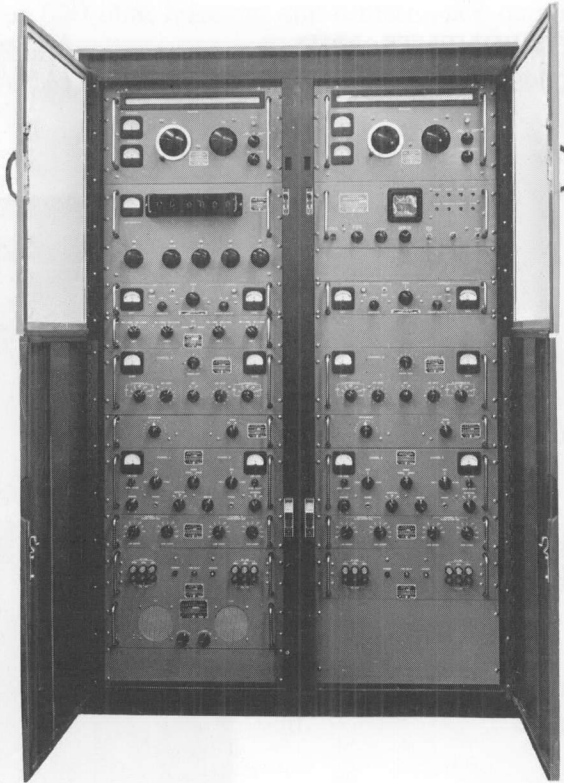


SINGLE RECEIVER
FIXED TUNED
SYNTHESIZED



CONTINUOUS TUNED
SYNTHESIZED RECEIVER
WITH AFC, NOTCH FILTER
AND AUDIO FILTERS

DIVERSITY CONTINUOUS
TUNED RECEIVER SYNTHESIZED,
WITH AFC, DIVERSITY VISUAL
MONITORING, NOTCH FILTERS
DUAL AUDIO FILTERS, SPEAKERS
AND AUDIO CONTROL PANEL



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