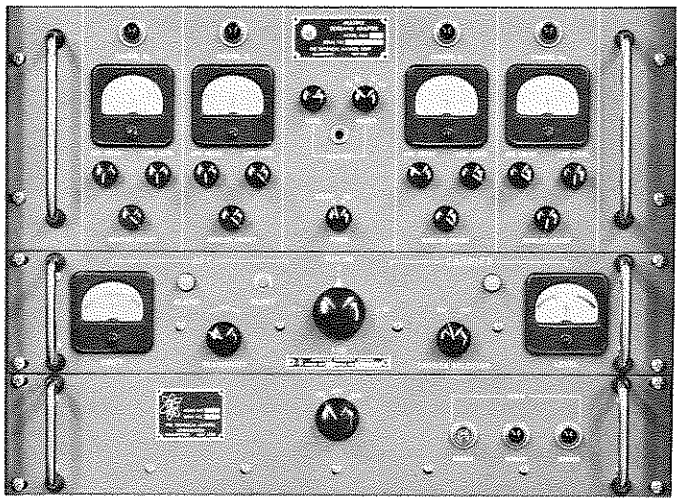
TECHNICAL BULLETIN NUMBER 4004A

Four Channel Independent AGC System
TMC Model MSG()-1



- Four channel ISB reception
- 60 db AGC action within each demultiplexed IF channel
- Diversity or single receiver
- AFC for pilot carrier reception

The Four Channel Independent AGC System, TMC Model MSG()-1, was designed to fulfill the ever-increasing requirements of rapid speaker-to-listener commercial telephone quality voice communications via long distance radio circuits.

In the early days of independent sideband transmission, one sideband was allocated as a voice order wire/telephone channel and the other channel was used for multiple tone telegraph. The increased stability of sideband transmitters and receivers has made possible the use of audio translation equipment, thus providing four 3 kc channels for use on a single transmission circuit. For those who are not familiar with voice translation techniques, this is accomplished by a heterodyning process whereby two separate 3 kc intelligence channels are created within 6 kc of spectrum space. By this means, four distinctly separate circuits, which may be used for voice, multiple tone telegraph, data, etc., are transmitted by a single transmitter.

The quality of each of the four 3 kc channels must be maintained at commercial quality, if military command and control personnel are to recognize the voices on the other end of the circuit. This factor can only be accomplished by uniform gain and response controlled *independently within each* 3 kc channel.

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This is accomplished in TMC Model MSG( )-1, Independent AGC Sideband Adapter, by providing 60 db of AGC that maintains constant and usable commercial quality audio outputs from each of the four channels for voice, multiple tone teletype, data, and other types of intelligence.

This system is flexible enough to be adapted to many non-sideband communcations receivers, with optional automatic frequency control that will maintain the residual audio outputs to within one cycle of the transmitted intelligence, thus overcoming transmitter and receiver instability.

A brief functional description of the components of the system follows. A functional block diagram appears on the back page.

Multiple Sideband Adapter, Model MSA-1, accepts a 1.75 mc input from its associated DDR-5 RF tuner, or a 455 kc IF input from any standard communication receiver. Conversion frequencies are provided from one of three sources: the HFS-1 synthesizer, the AFC, automatic frequency control unit, or the multiplex carrier generator, Model MCG-1. Complete processing of the signal from its composite IF level to four discrete audio output channels is accomplished in this unit. Demultiplexing of each independent sideband signal is accomplished by injection frequencies provided by the multiplex carrier generator, Model MCG-1. Coaxial connections on the rear panel are provided to connect both the tunable notch filters and the audio filters if desired by the customer.

Multiplex Carrier Generator, Model MCG-1, contains a secondary standard with a frequency stability of at least 1 part in 10^7 for the ISB demultiplexing frequencies. For emergency operation, the unit also contains oven control crystals with a stability of at least 1 part in 10^6 for IF translation frequencies. Two outputs are provided for each crystal so that this unit may be used to control two multiple sideband groups operating in a diversity receiver combination.

Automatic Frequency Control Unit, Models AFC, accept a 1.75 mc (or 455 kc) IF input signal and provide automatic frequency control with up to 25 db carrier suppression. The AFC is optional in this system and is priced separately.

TECHNICAL SPECIFICATIONS, MODEL MSA-1

INPUT FREQUENCY:	1.75 mc or 455 kc.
INPUT IMPEDANCE:	50 ohms nominal.
CARRIER REINSERTION:	1. Oven controlled crystal oscillator. 2. Reconstructed carrier from AFC. 3. From HFS-1 synthesizer.
INPUT VOLTAGE RANGE:	0.3 to 300 millivolts.
UNWANTED SIDEBAND REJECTION:	Undesired sideband, removed more than 250 cps from the carrier, are suppressed a minimum of 60 db.

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.
SELECTIVITY:	No less than 20 db of attenuation to the carrier frequency as a result of sideband selection filters.
IF BANDWIDTHS:	Nominal 3 kc.
STABILITY:	Stability is a function of the operating modes as follows: 1. Synthesized operation — 1 part in 10^8. 2. AFC operation — resultant audio output within 1 cycle of transmitted intelligence. 3. Crystal control — at least 1 part in 10^6.
AGC CHARACTERISTICS:	Fast attack time; the decay time is variable from 1 to 10 seconds by front panel control on each channel.
MONITORING:	A monitoring circuit is provided to permit headphone monitoring of any audio channel without affecting the audio output (line) circuits.
AUDIO OUTPUTS:	0 to 10 milliwatts into balanced and center tapped 600 ohm audio per channel.
AUDIO RESPONSE:	The amplitude response of each audio channel is ± 1.5 db over the frequency range of 50 to 10,000 cps.
METERING:	Independent VU meters are provided to monitor each 600 ohm audio channel.
AF DISTORTION:	Intermodulation products better than 50 db below full output through the audio channel.
HUM LEVEL:	−50 db below full audio output.
ENVIRONMENT:	Designed for continuous duty with a temperature range of 0 to 50° C and any value of humidity up to 90%.
ORIENTATION:	Any.
INPUT POWER:	340 watts from HFP-1 or MFP-1 Power Supply.
SIZE:	7″ h × 19″ w × 17″ d.
INSTALLED WEIGHT:	Approximately 25 lbs.
COMPONENTS AND CONSTRUCTION:	All equipment manufactured in accordance with JAN/MIL specifications wherever practicable.

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TECHNICAL SPECIFICATIONS, MODEL MCG-1

CRYSTALS:	DEMULTIPLEXING Assembly containing crystal in secondary standard oven that provides stability of at least 1 part in 10^7 per day after aging. IFO FREQUENCIES 1 CR-27/U 1 CR-47/U Oven controlled, mimimum stability 1 part in 10^6.
OUTPUT:	1 volt rms into 50 ohms nominal (2 outputs for each crystal frequency).
INPUT POWER:	100 watts from HFP-1 or MFP-1 Power Supply. 28 volt DC to operate secondary standard obtained from MPS-1 Power Supply.
SIZE:	3½″ h × 19″ w × 12″ d.
INSTALLED WEIGHT:	8 lbs.

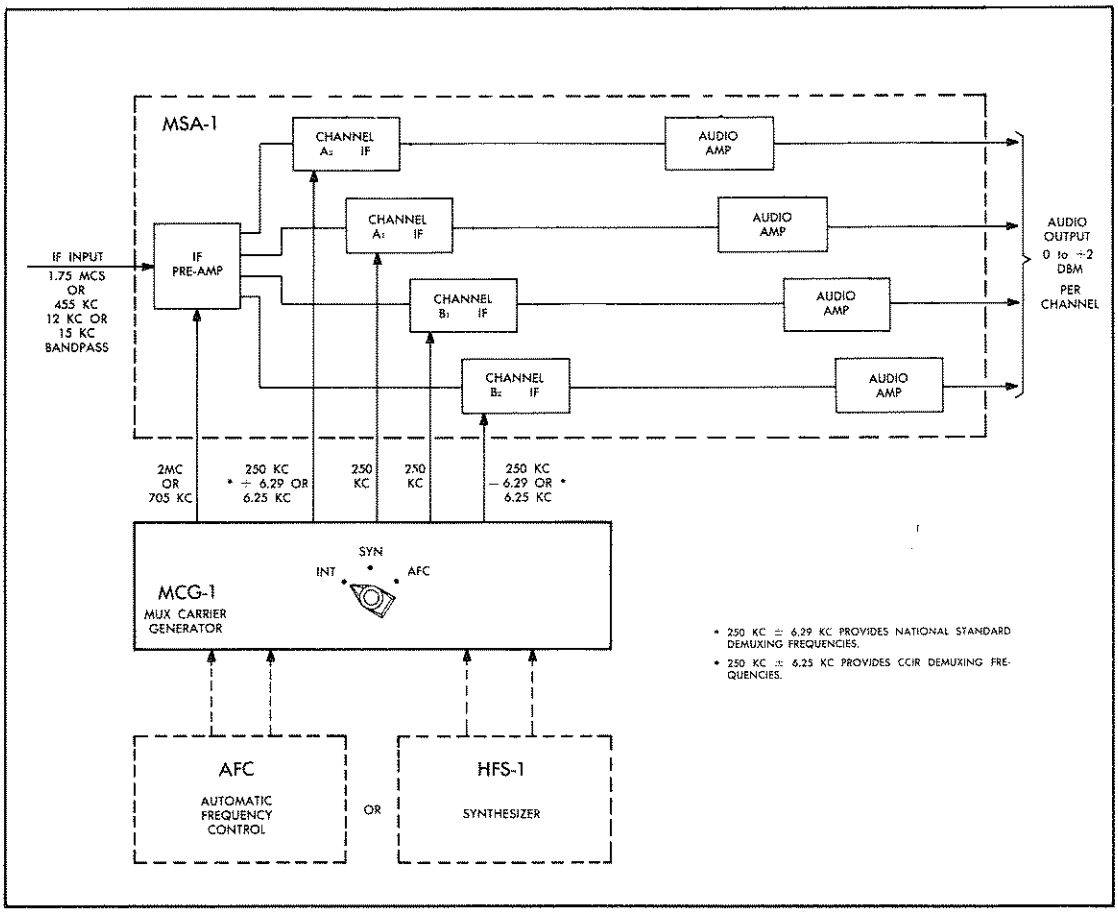
TECHNICAL SPECIFICATIONS, MODELS AFC

CARRIER SUPPRESSION:	0 db to −25 db.
CARRIER INSERTION:	Reconstructed or local carrier output to MSA-1.
INPUT TUNING RANGE:	± 3 kc electrical bandspread tuning is provided.
AGC SYSTEM:	Provides AGC for external control voltage derived from the carrier.
ACCURACY:	Less than 1 cycle error over the entire AFC control range.
AFC CHARACTERISTICS:	The AFC system synchronizes with 25 db suppressed carrier which has an error of ± 50 cps and follows a maximum drift rate of ± cps/per second. The system remains synchronized over a minimum frequency range of ± 750 cps from the center frequency.
AFC CORRECTION:	The AFC circuit maintains accurate frequency control so that the audio output of the associated units will have a residual error of less than 1 cycle of the transmitted intelligence.
DRIFT ALARM:	A drift alarm light indicates when the carrier error is greater than ± 750 cps.

FADE ALARM:	A fade alarm circuit is incorporated which provides a visual indication of carrier interruption or fading below a predetermined level. Connections for a remote fade alarm indicator are available on rear apron.
THRESHOLD:	A continuously adjustable threshold control is provided on the front panel to reduce the system sensitivity when excess noise is encountered.
METERING:	A. AFC drift indicator B. Carrier level indicator
TEMPERATURE & HUMIDITY:	Models AFC are designed for continuous duty within a temperature range of 0 to 50° C and any value of humidity up to 90%.
ORIENTATION:	Any.
INPUT POWER:	120 watts from HFP-1 or MFP-1 Power Supply.
SIZE:	3½" h × 19" w × 17" d.
INSTALLED WEIGHT:	16 lbs.
SHIPPING WEIGHT & CUBE: (Approximate)	28 lbs., 1.3 cu. ft.
COMPONENTS AND CONSTRUCTION:	All equipment manufactured in accordance with JAN/MIL specifications wherever practicable.

ANCILLARY EQUIPMENT

MODEL MNF-1	Multple Notch Filter. Provides up to four plug-in filters, each filter being tunable across one individual 3 kc channel. Each notch filter provides at least 50 db attenuation at 20 cycles to an interfering signal appearing within the passband of its IF channel.
MODEL MAF-1	Multiple Audio Filter. Passive filter device with four separate plug-in drawers to provide audio bandpass in steps of 100, 250, 500, 1000 and 2500 cycles to each of the four individual audio output channels. Facilities are available on the front panel of Model MAF-1 to bypass the filter.



FUNCTIONAL BLOCK DIAGRAM MSG()-1

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