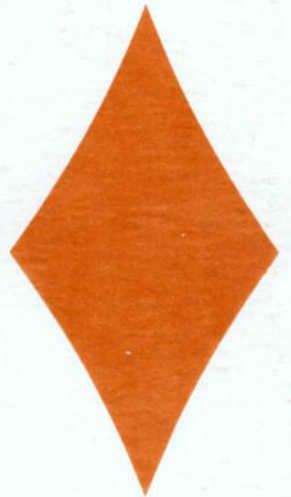
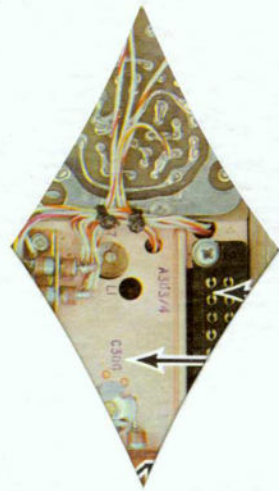




communications



THE INSIDE STORY OF MASTR PROGRESS LINE



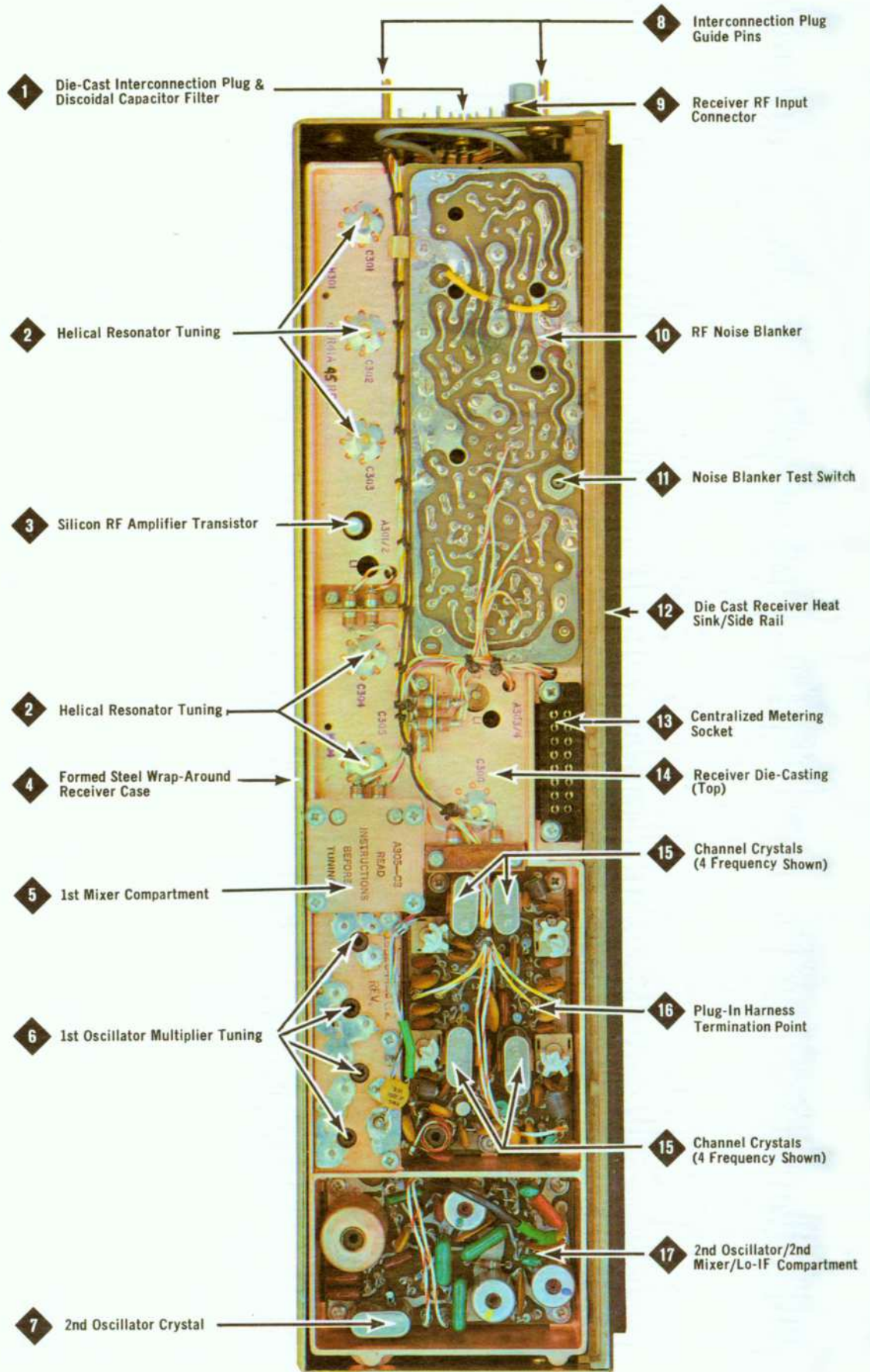
The new
General Electric
two-way radio
you helped
design

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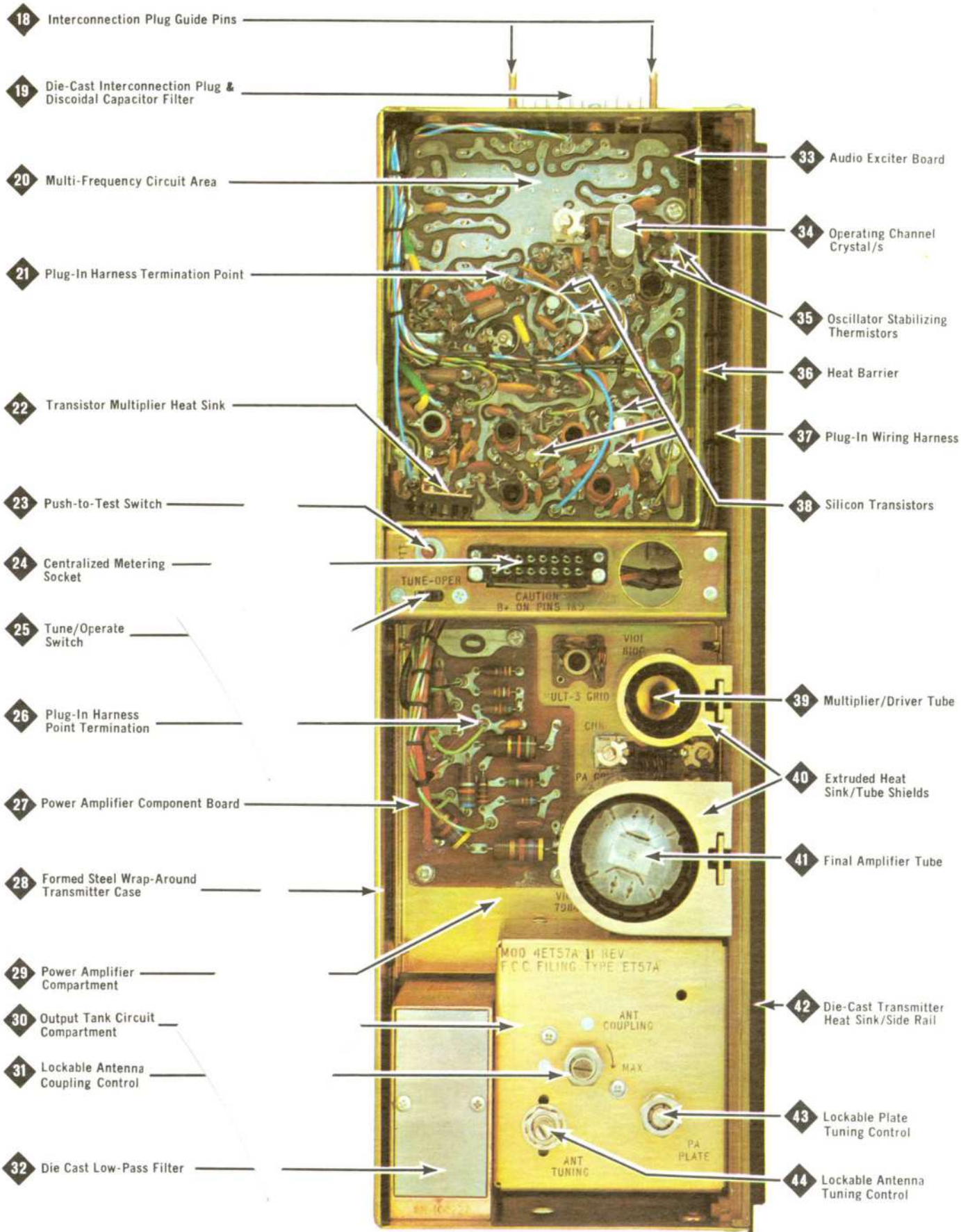
Inside front cover	The MASTR Progress Line transmitter and receiver—check the many features only MASTR can provide.
Pages 2 & 3	MASTR mobiles—how they are built to provide more performance benefits to you.
Pages 4 & 5	MASTR stations equipment—your first choice of a complete line of transistorized models.
Page 6	Silicon transistorization—the most significant solid-state advancement since the introduction of the transistor itself.
Page 7	Interchangeability—identical plug-in transmitter and receiver modules for mobiles and stations.
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Page 15	Selective Calling—new high-capacity, solid-state equipment for selective signaling applications.
Page 16	Portable Test Set—rapid maintenance checks through centralized metering on MASTR units.
Inside back cover	MASTR Progress Line receiver—bottom view showing Audio Squelch and Channel Guard option.

◆ This symbol is used throughout this book when the specific feature being discussed is pictured in the call-outs on the inside front and back covers. The number is your immediate guide to the feature.

Receiver (Top View)



Transmitter



Introduction

MASTR Progress Line . . . the two-way radio line you helped design.

Over the past many years, the use of two-way radio has grown with unbelievable speed. With this growth has come a maturity of application and use.

With this growth has also come your realization that your radio system has certain limitations in application—that your equipment has certain undesirable shortcomings.

General Electric knows this because you talked with our engineers. You told them what you liked best—and least—about your present system. You told us about your problems—like the heat in the trunk of your car in the summer—and you suggested ways to solve them.

You shared your future hopes with us, too. You told us of the more complex system requirements you needed to do a really adequate job.

You challenged us, of course. We didn't know if we could meet your most stringent requirements.

This booklet, therefore, is the story of how General Electric succeeded in translating your requirements into MASTR Progress Line—the finest two-way FM mobile and station radio system equipment available today.

Introduction

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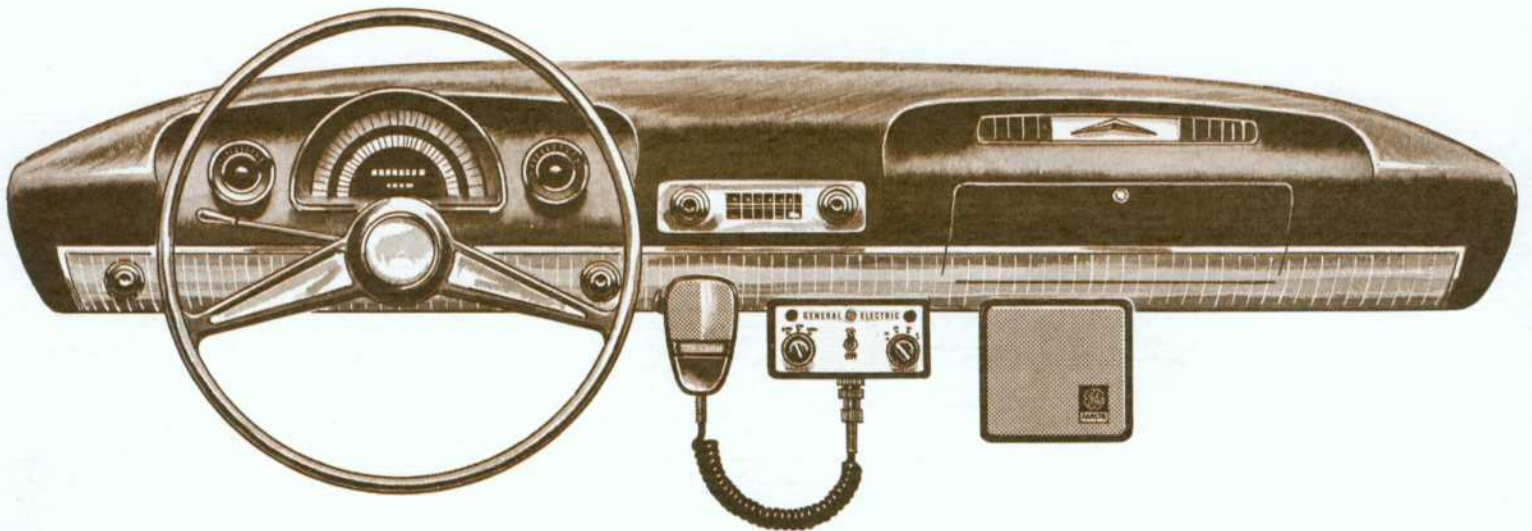


Mobile

MASTR Progress Line provides you with a wider selection of mobile equipment—frequency band, power output, power source, system options—than any other line available today. MASTR mobiles are available in:

Low-Band	25-50 MC	Mid-Band	66-88 MC
	35 & 100 watts		30 watts
High-Band	132-174 MC	UHF-Band	406-420 MC
	30 & 80 watts		& 450-470 MC 35 & 60 watts

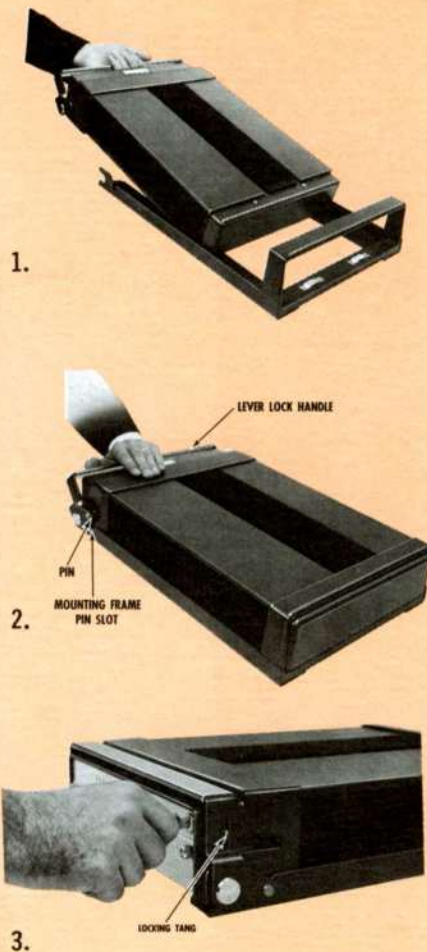
Now with MASTR you can have more new system features and options — such as four frequency operations in all bands, Low and High-Band Noise Blankers, electronic voltage regulation, and even a pilot light dimmer—all without added *special* modification costs.



A completely new mounting method has been engineered for MASTR mobiles which provides a tamperproof frame with maximum mounting rigidity and yet permits the totally enclosed mobile unit to slide in and out of the frame effortlessly.

In action: 1) The complete unit slides along the guide rails until it is in position against the adjustable backstop. 2) When the lever-lock handle is swung to its lock position, a pin, riding on the frame like a follower on a cam, makes the mobile unit and frame one integral unit. 3) The final locking step is accomplished by simply turning your key in the lock. This activates a tang that slides into a matching slot on the handle, double-locking the mobile unit to the frame. Your mobile unit is now actually a part of your vehicle. Three removable plug-in modules—receiver, power supply and transmitter of cast construction—are mounted to a heavy-duty I-beam frame and front casting. This cast construction technique, plus the

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steel mounting frame and the securing action of the lever-lock handle, combine to give the MASTR Progress Line mobile its ability to meet 5G shake test specifications—twice the industry standard.

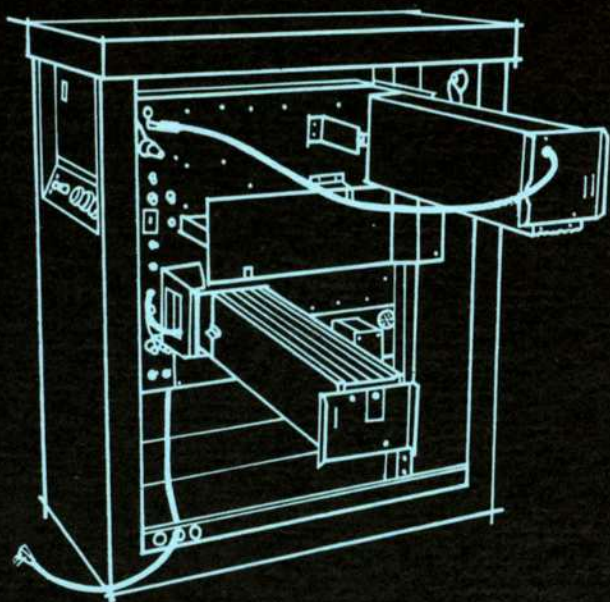
Each module is not only totally enclosed for moisture and dust resistance, but is sealed against unwanted RF energy. Yet, in seconds, you can snap off the individual top covers and make routine maintenance checks from centralized metering plugs.





Base Stations

To match the electrical and mechanical excellence of the MASTR Progress Line mobiles, General Electric engineers designed a complete new series of base stations. Three model styles, seven power series and four operating styles give you forty-six basic models from which to choose. Again, like MASTR mobiles, base stations are available in all four frequency ranges, and power outputs are available from 30 to 330 watts.

All stations, regardless of model style, power series or operating styles, are rated for a continuous duty cycle—including associated power supplies. Since the transmitter and receiver modules are the same closed-case modules used in the mobiles, the cooling system blows air across the heat-sink fins—no dirt is blown over the electrical components. Separate power supplies are available when the second, third or fourth optional receiver is added to your system. And, when your station is equipped as a repeater system, the repeater control panel is silicon-transistorized.



Three basic cabinet styles are offered to satisfy the needs of a system of any complexity. In all stations, transmitter and receiver modules are mounted in a swing-out chassis for easy testing and routine maintenance. Although it is normal procedure to check operating conditions through centralized metering points   with a test meter on Desk Mate and Pole Mount stations, optional permanent test meters can be supplied. Front-panel meters and rotary switches are standard equipment on the Floor Mount models. All models can be equipped with Channel Guard, Noise Blanker, Multi-frequency and other standard station options.

1

The Desk Mate is designed to sit beside your desk. Since the microphone plugs into the back, no bothersome cables clutter the front or the top of your desk. The sloping control panel puts all controls in visual range. Your Desk Mate can be made available for both local and remote operation, or may serve as a repeater station.



2

Should it be necessary for you to place your antenna on the top of a building or on the top of a mountain miles from your base of operation, you may need a Pole Mount station. This all-steel, weatherproof cabinet eliminates the need for special housing—it can hang on a pole unaffected by any climatic condition, or if floor space is at a premium in your headquarters, you may want to hang the station on any convenient wall—indoors or out.



3

In some large systems where additional rack space is needed, the Floor Mount station will be the answer. The doors may be hinged either left or right for easy access. The largest and most utilitarian of all base stations, your Floor Mount has room for future expansion. Although all three styles are available in 100-watts Low-Band, 30-watts Mid-Band, 80-watts High-Band and 35 and 60-watts UHF-Band, Floor Mount stations are also available in 330-watts Low-Band, 330-watts High-Band from 144 to 174 MC and 250-watts UHF-Band between 450-470 MC.





MASTR


*Excellence
Benefits*

Your exacting requirements—resulting in the completely new line of mobile and station equipment known as MASTR Progress Line—led General Electric to incorporate the best features of its existing designs, as well as to add the very latest Space-Age mechanical and electrical innovations.

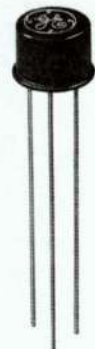
Silicon

HEAT has always been the greatest natural enemy to two-way radio performance and reliability. Heat from soldering during manufacturing and servicing, heat generated during operating periods, or ambient heat can cause outright damage to circuit components, and cause off-frequency operation. This problem must be solved or expensive maintenance and downtime will result.

There are times when we wish it were not so practical to put your radio in the trunk of your car. It is probably one of the worst environments in the world in which to put a precision electronic instrument. Imagine what the ambient temperature of your trunk is after your car has been sitting in the sun for hours on a hot July day!

To lessen the damaging effects of heat—to solve these problems—General Electric uses silicon transistors  in the solid-state receiver and in the transmitter wherever transistors are called for. The silicon transistors in MASTR will keep right on giving full specification performance with a high degree of reliability at temperatures (beyond 140°F) where even you yourself would suffer from heat exhaustion.

The advantages of silicon transistors have proven to be so great for our customers who now own MASTR systems and our other silicon-transistorized Progress Line products, we believe you will soon be demanding them in every piece of communication equipment you purchase.





Interchangeability

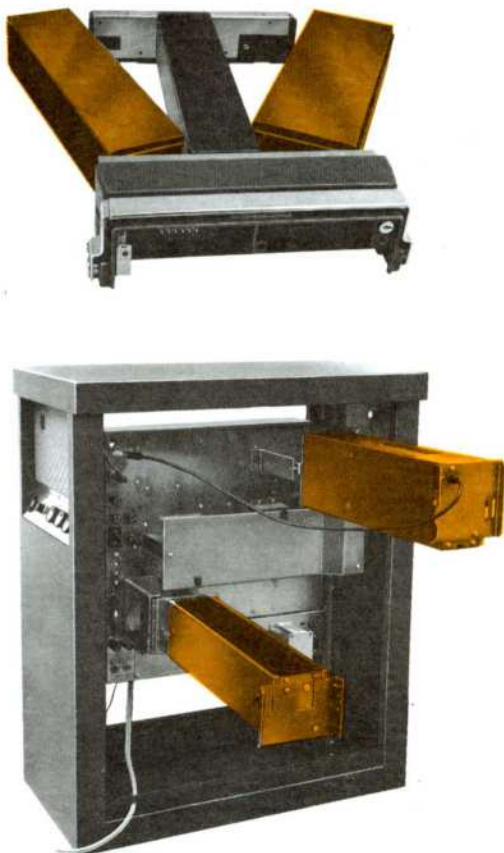
In Nature, no two snow flakes are alike. One simple maple leaf cannot replace another. Unlike Nature, man can control, standardize on, and reproduce in exact dimensions the products he makes. One of the valuable features of the time-tested Progress Line design was its chassis interchangeability. This feature is preserved in the MASTR design.

Each individual transmitter and receiver module can be physically and electrically interchanged with any other like module—mobile to mobile, mobile to station, and station to station.

First, receiver modules are interchangeable not only within their respective frequency bands, but even between different frequency bands.

The transmitter modules are interchangeable mobile to mobile in the same power ratings, and are interchangeable mobile to station or station to station in any power rating.

As an example of how interchangeability can work for you: If a transmitter or receiver module in your base station becomes inoperative, you can immediately replace it, literally in two or three minutes, with a spare; OR, you can get the replacement module from any mobile in your fleet.





MASTR

Excellence Benefits

For centuries man has been curious about the electrical energy generated in the air above him and the compounds created in the earth far below him. He experimented with them, and learned much about their properties. When he put them to work, he discovered their mercurial natures . . . that they were difficult to control.

Voltage Regulation

A widely varying and difficult to control source of energy is the voltage supply in a typical automobile. In just a few blocks of city driving, the electrical system may run the gamut of voltage output from approximately ten to seventeen volts, depending on motor speed, battery charge, generator output and the setting of the voltage regulator.

These sudden, radical variations in supply voltage to certain portions of your transmitter and receiver can cause performance changes of which you may not be aware. They can throw your unit temporarily off frequency, they can cause considerable degradation in your receiver, and cause your transmitter performance to suffer. How did General Electric eliminate this age-old problem from the MASTR design? General Electric engineers designed a power supply incorporating electronic voltage regulating circuits which supply smooth stable voltages to the circuitry that most affects your range performance.

First, the circuitry of MASTR was designed to furnish top performance at a single value of supply voltage. Then, the voltage regulation circuit was applied, where it was needed, to convert, automatically and instantaneously, any widely-varying supply voltage into the one value of voltage at which MASTR operates best.

The result? No matter how high the output of your car's electrical system might soar, MASTR circuits enjoy a constant, steady operating voltage—and MASTR's on-specification performance is assured.

This voltage-regulation circuit is also incorporated in MASTR base-station equipment with the added feature of regulated voltage being applied to transmitter tube filaments. In order to maintain full-specification performance of your station equipment, it is no longer necessary to concern yourself with the exact voltage available from the AC lines—the MASTR design continues to deliver full performance despite normally-experienced variations in supply-line voltage.

Frequency Stability

One of the most stringent demands imposed on two-way radio communication equipment is that it must operate on-frequency within very close tolerances as designated by the FCC. In other words, it must provide its own inherent frequency stability.

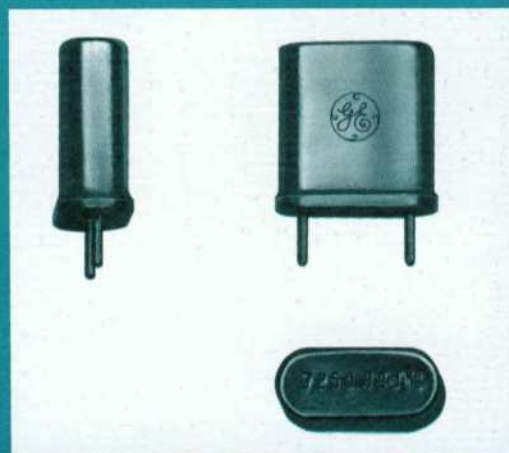
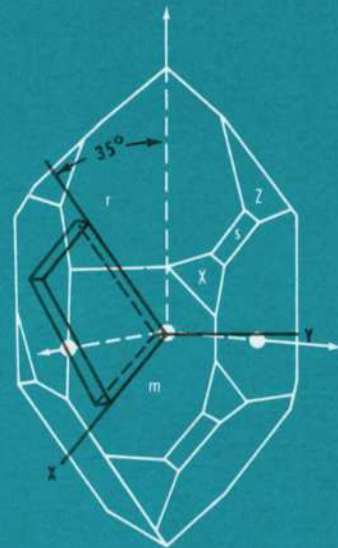
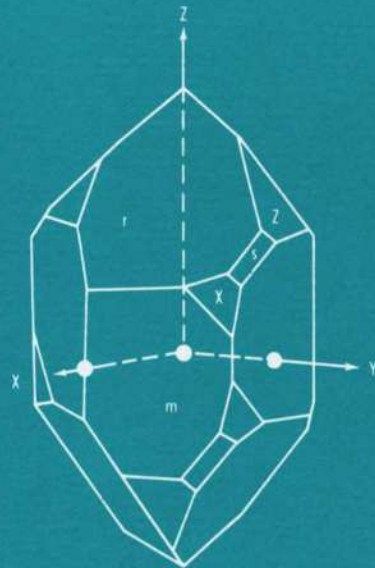
The high order of frequency stability required is obtained with a precision-made quartz crystal. $\diamond 15 \diamond 34$ Two of the most prevalent natural enemies to the proper function of this crystal are variations in voltage and temperature. Wide variations in either cause the quartz crystal to operate off-frequency.

In the MASTR design, General Electric vanquished the first enemy with MASTR's exclusive voltage regulation circuit. This still left temperature as a major design problem. The age-old solution of using an oven to heat the quartz crystal to a high, stable temperature was incompatible with the standards set for the MASTR Progress Line design.

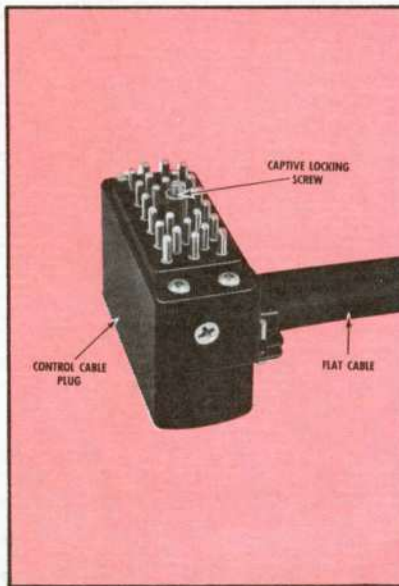
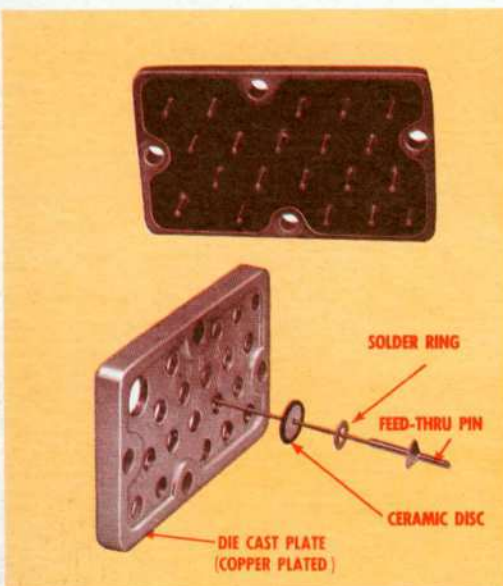
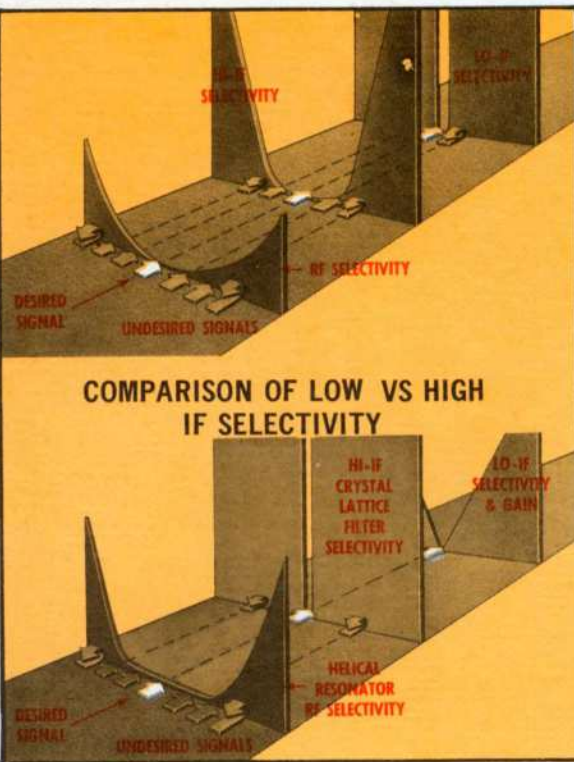
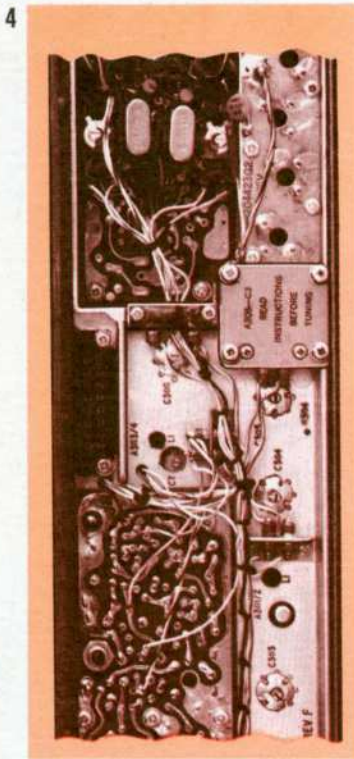
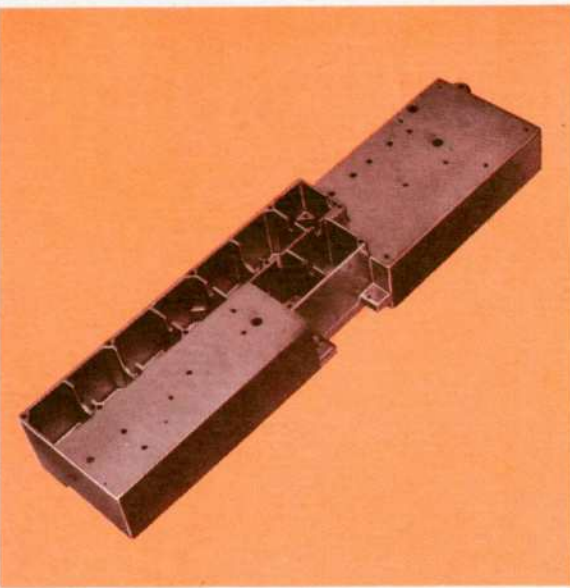
The solution involves using a circuit in which temperature changes defeat themselves. It works like this: 1) sensing elements $\diamond 35$ detect a change in temperature and the amount of the change; then 2) these elements, in the frequency-determining circuit, change their electrical value a precise amount—determined by the amount of temperature change—so that the quartz crystal circuit maintains its precise frequency.

To change the frequency of your MASTR unit, all that is necessary is to plug in a new crystal $\diamond 15 \diamond 34$ and re-tune. It is not necessary to replace an entire module containing the crystal and expensive temperature sensing and frequency compensating elements.

General Electric's MASTR frequency stability circuit is not only an important factor in maintaining full system performance over wide temperature and voltage ranges, but with it you can say MASTR systems are on-frequency the split second you turn the knob to ON . . . (even before you hear the "click").



Other MASTR Features



General Electric engineers—guided by your requirements—added these seven features to MASTR Progress Line to insure the utmost in operating reliability, convenience of operation and application versatility.

1. To gain the lightness and strength of aluminum and the electrical characteristics and solderability of copper, the compartmented receiver chassis and parts of the transmitter chassis are constructed of cast aluminum plated with pure copper. The copper-plated aluminum process is housed in the General Electric plant in Lynchburg, and is one of the largest facilities of its kind in the United States.

2. To achieve the ultimate in adjacent-channel selectivity, MASTR employs an eight-section, crystal lattice filter, **58** hermetically sealed. This selectivity has been moved from the low IF up front to the high IF for maximum protection against desensitization by strong adjacent channel signals.


3. Extraneous RF energy is CONTROLLED—kept *in* and *out* of each chassis. On both the receiver and transmitter terminal pins, discoidal capacitors **1 19 54** (also designed and built in Lynchburg) insure adequate RF by-passing for each lead. The transmitter RF output is fed through a low-pass filter which helps MASTR



MASTR Progress Line

Characteristics

establish the best spurious and harmonic emission specifications in the industry.

4. You no longer have to hunt through your unit, turn it over and over or lift off layers of circuitry to find the tuning points. All centralized metering plugs  and tuning points are in full view on both MASTR transmitters and receivers the second you lift the covers. And, furthermore no netting-switch is required since netting is automatic.

5. You never need to touch the On-Off switch on your control head when you turn your vehicle engine off. Your MASTR unit can be installed for Automatic Ignition Switch Standby. With it, your unit will automatically revert to standby when you turn the key off in your ignition.

6. Now the big lumps and humps under your vehicle floor carpeting are a thing of the past with General Electric's new ribbon-shaped power and control cables. Further, newly designed cable plugs really stay in place with their locked-on clamps.

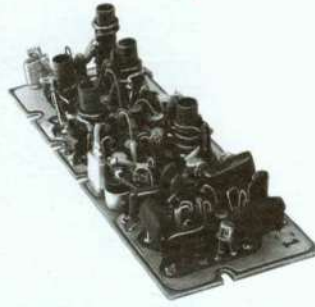
7. You asked us if there wasn't something we could do to retain message "intelligence" in areas of low signal level. MASTR now incorporates a new, improved "flutter-lock" squelch circuit that eliminates message chopping during signal flutter or fading. Once opened, the squelch circuit does not close until the signal has dropped to a completely unintelligible level.

	Low Band	Mid Band	High Band	UHF Band
Frequency Ranges	25-50 MC	66-88 MC	132-174 MC	406-420 and 450-470 MC
Power Output				
Mobiles	35 & 100 w	30 w	30 & 80 w	35 & 60 w
Stations	100 & 330 w	30 w	80 & 330 w	20, 60 & 250 w
Sensitivity				STANDARD RECEIVER
(EIA 12 db SINAD)	0.25 μ v	0.25 μ v	0.35 μ v	0.45 μ v
(20 db Quieting)	0.35 μ v	0.40 μ v	0.50 μ v	0.65 μ v
				ULTRA HIGH SENSITIVITY RECEIVER
				0.30 μ v
				0.40 μ v
Selectivity (EIA 2-channel)	—85 db			
Audio Output Power	Mobile: 2 and 10 watts			
	Station: 2 watts and +18 dbm			
	@ 600 ohms			
Operating Ambient Temperatures	—30°C to +60°C (—22°F to +140°F)			
Number of Tubes—Mobiles	2 or 3—depending on frequency range and power			
Stations	2, 3 or 4—depending on frequency range and power			
Power Sources—Mobiles	±12 v, ±6/12 v or ±12/28 v			
Stations	117 VAC 50/60 cps			

Options

The options that are available with MASTR are designed to satisfy the demands of the most complex system. In fact, your description of the most sophisticated — we might say "elaborate"—system you could think of was used by General Electric engineers as a guide in designing the most complete line of two-way radio options and accessories of the market today.

NOISE BLANKER 10



Now, along with Low-band Noise Blanker, MASTR brings you a High-band RF Noise Blanker. Ignition noise doesn't stop at Low-band frequencies. High-band systems also need the added range and signal clarity that Noise Blankers afford. For the first time, extended range performance and clear message reception in the fringe areas of a 150 MC system is accomplished. Never before has anyone been able to offer you an RF Noise Blanker above 50 MC.

CHANNEL GUARD 47-55

Channel Guard, like the Noise Blanker, is built into the receiver chassis—no external appendages or cables. You can monitor your Channel Guard with a toggle switch on the control head or, if you prefer, a microphone hook-switch can be provided for automatic monitoring.



TELEPHONE HANDSET

To keep your radio conversations personal, a telephone handset rather than a microphone is available with your mobile unit and/or base station. Your handset can be installed to mute the speaker, but you can render your speaker operative by the use of a switch on your control head.



10-WATT AUDIO SYSTEM

If you work in an area of high noise level, you can have a 10-watt audio system rather than the standard 2-watt. Also, your mobile unit can be equipped to operate with an external horn-type speaker with an internal/external speaker selector switch.



CHOICE OF POWER SUPPLIES



MASTR mobile units may be specified to operate from ± 12 -volt, $\pm 6/12$ volt or $\pm 28/12$ volt power sources in all four frequency ranges. High-power



mobiles will operate in any vehicle with a 12-volt battery—plus or minus ground. In addition, medium-power mobiles are available for 6/12 or 28/12-volt operation—plus or minus ground—without the use of external converters.

AC base stations are optionally available for operation from 220 volt, 50/60 cycle power sources.

MULTI-FREQUENCY OPERATION

MASTR is the only line of communication products you can buy today that offers four-frequency transmit and/or receive in four frequency ranges and all power ratings. Two, three or four-frequency   operations are standard options, and all channels will operate within our certified and guaranteed performance specifications regardless of the number of channels as long as all frequencies are within 0.4% of each other in low, mid and high-band, or 0.3% for UHF.



Channel indicator lights—one for each frequency—may be added to the control head as a further optional feature . . . and there is even a channel light dimmer.



SEARCH-LOCK MONITORING

One feature you have always needed in a complex system is the ability to receive two frequencies *at the same time* with one receiver. This is an age-old design problem—a problem of quality as well as quantity—to receive two frequencies simultaneously with the same high quality you would receive a single frequency.

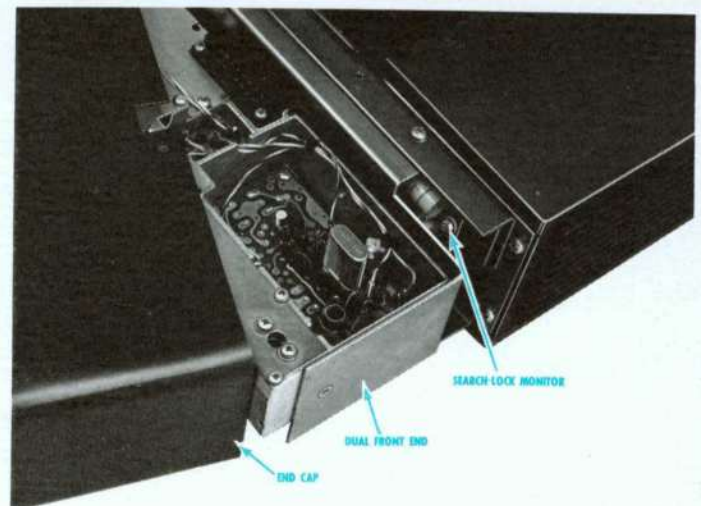
General Electric engineers found the answer in a high-speed sampling procedure called Search-Lock Monitor.

In action, Search-Lock Monitor alternately “listens” in on each of the two frequencies at a high repetition rate. This produces the desired effect of simultaneous monitoring. The moment a signal is heard on one frequency, the searching stops and your receiver locks on that frequency. Even if a stronger signal comes in on the other frequency, your receiver stays on the locked one as long as a signal is present.

There is no degradation of receiver performance since only one of the two frequencies is searched at a time and the other frequency is automatically locked out when a signal is received on either one. A Dual Front End is required only if the two frequencies are not within 0.4%.

DUAL FRONT END

In the event you want Search-Lock Monitor for *any* two frequencies in high-band or low-band and in-band or cross-band regardless of frequency split—Dual Front Ends are the answer. MASTR's Dual Front End, like the MASTR modules, is a complete casting and the only option that extends the length of the total radio unit. Search-Lock Monitor is a standard feature with Dual Front Ends at no additional cost to you.



In your list of requirements for special radio applications, we found that many of you had the need for your radio messages to be amplified loud enough for you to hear even though you were working a considerable distance from your vehicle.

The new General Electric Power Call was our answer. This mobile high-power audio amplifier will amplify the messages being received by your mobile radio through one or two external speakers. A solid-state amplifier for 6, 12 or 28-volt DC operation gives you up to 45 watts of audio power. Also, a simple twist of the selector knob now converts your amplifier to a powerful public address system, using the regular mobile microphone.

For those of you who are authorized to use it, there is a siren option available called the Power Call/Siren. This amplifier with electronic siren provides emergency vehicles with a choice of six operating modes—two for voice and four for siren signals. As with the Power Call itself, either your voice or radio signals can be broadcast, and you have a choice of manual siren, wail, warble or steady tone when using the siren. The siren feature is capable of producing over 100 watts of power.

Power Call and Power Call / Siren



Power Call/Siren

Power Call

Approximate Waveform Outputs

Manual*—Square wave varying from 0 to 1000 cps.
Build-up time, 6 seconds; decay to cut-off,
12 seconds.

Wail—Continuous varying tone from 650 to 1000 cps
at a warble rate of 4 cycles per minute.

Warble—Continuous varying tone from 0 to 1000 cps at
a warble rate of 2 cps.

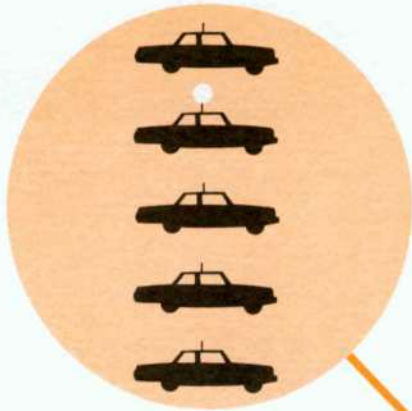
Steady—Continuous tone of 1000 cps.

*Manual siren is actuated by pushing illuminated red
lens of pilot light/switch.

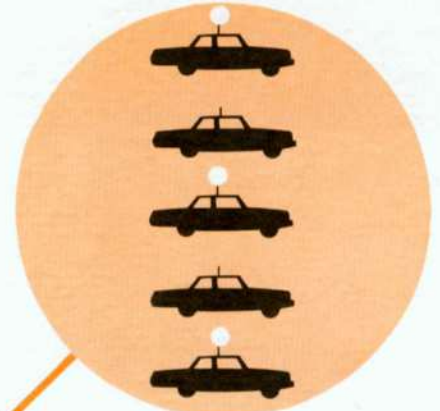
Selective Calling

If your system requirements involve the use of selective calling, the new General Electric selective calling equipment is perfectly suited for use with MASTR Progress Line.

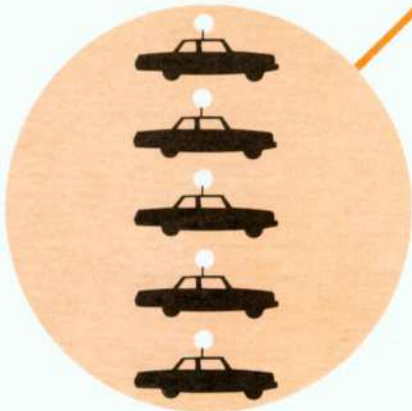
General Electric's selective calling employs any one of three types of base station encoders (depending on the number of units to be called and the configurations you want in your system) and mobile and/or base station decoders. With General Electric's selective calling equipment you can perform any or all of the following three functions in your system.



1. Individual Call lets you transmit a message to the one, and only one, vehicle or base station you want to reach out of a possible nine hundred units. No other unit in your system is alerted.



2. Group Call permits you to subdivide your fleet by function—type of vehicle—or location—and transmit to any one group without disturbing any other group or unit in your organization.



3. Or, with All Call, you may choose to set your system up to call all vehicles and/or stations at one time.

Selective calling eliminates the need for your men or crews to sift through all the transmissions being aired on your channel to find their own. All radios are quiet until the specific message intended for them or their group is transmitted.

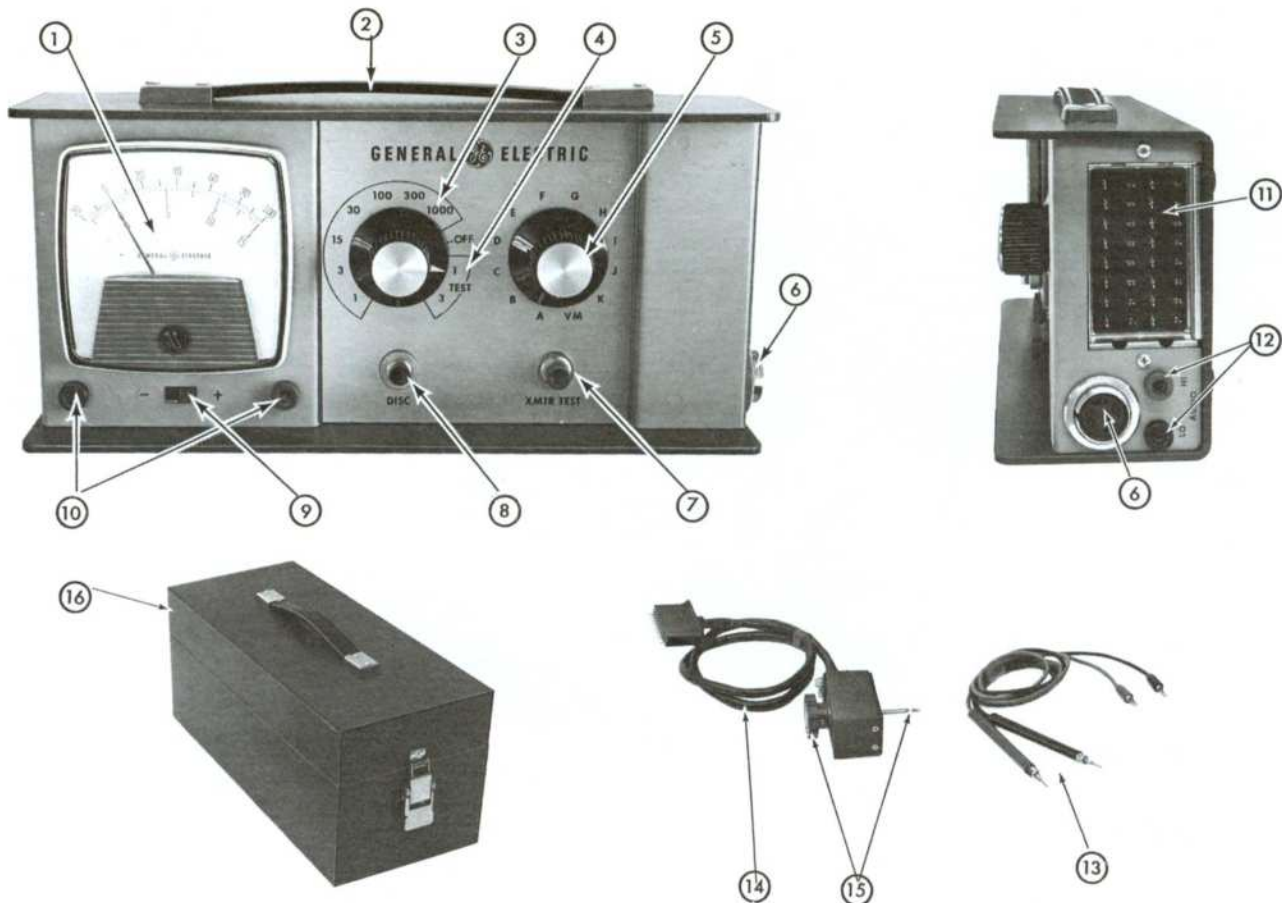
Above and beyond the basic function of your Selective Calling equipment, this device can be used to trigger your horn, turn on your lights or cause any action on your car you choose to notify you that you have had a call, while you were away from your car.

Portable Test Set

The new General Electric EX-3-A Portable Test Set is designed to provide an easy and fast method of tuning and troubleshooting the MASTR Progress Line mobile and station equipment and other General Electric products equipped with centralized metering facilities.

Your EX-3-A will satisfy all routine checks without special meters. You no longer need two meters to speed the job of aligning a receiver. Simply pushing the discriminator revert button instantly switches your meter back to the discriminator position—double duty out of one meter.

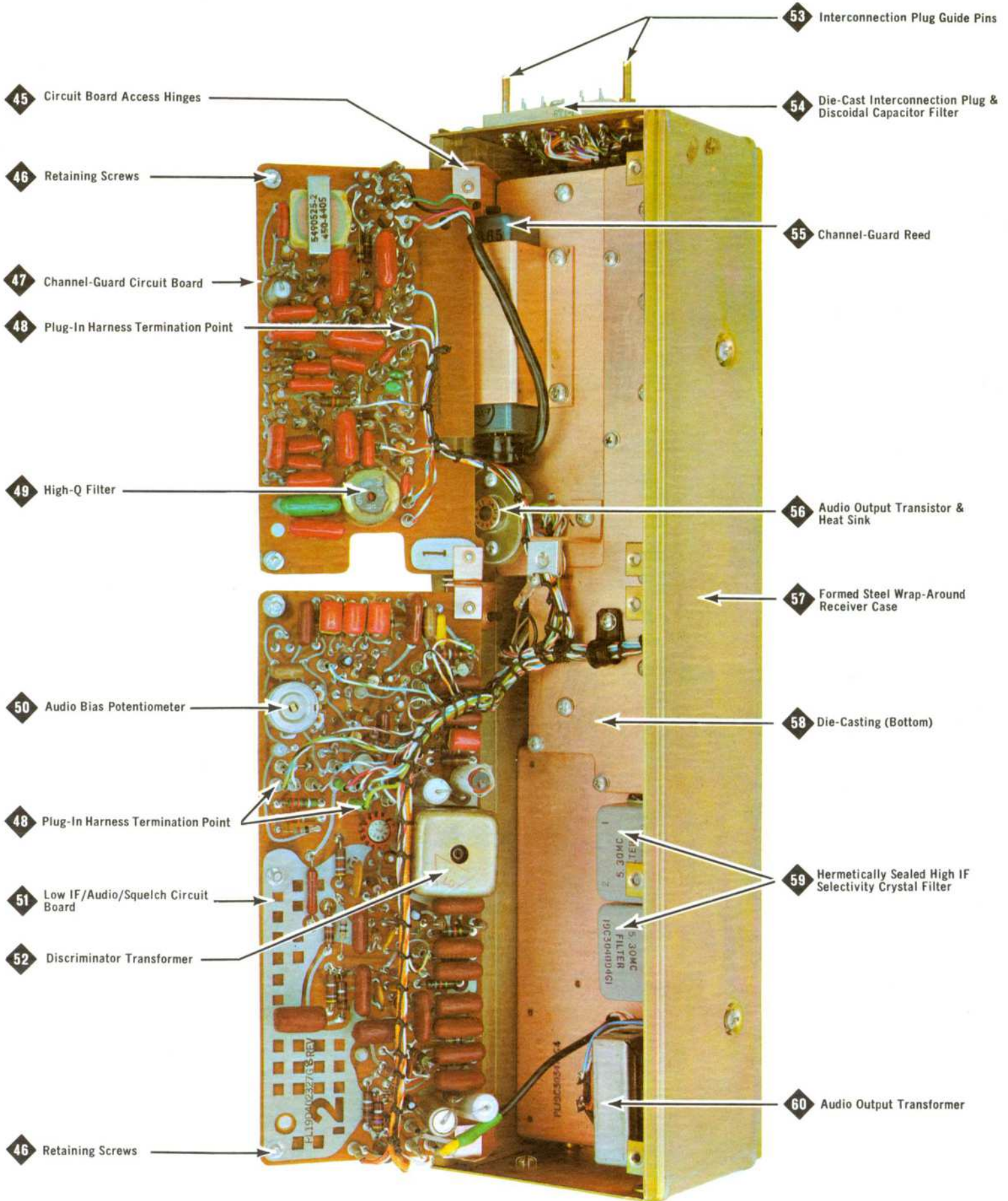
Since this is an off-center zero meter, you have the advantages of a zero-center meter for discriminator measurements while preserving maximum scale lengths, and maximum accuracy for all other measurements. The audio jacks provide a convenient place to connect an audio oscillator for setting up transmitter modulation, and to connect an audio voltmeter or distortion analyzer for quieting or SINAD measurements. The range switch and jacks for external probes allow your EX-3-A to be used as a multi-range voltmeter for general servicing work.



1. 3.5" GE Meter 20,000 ohms/volt. Off-center zero to facilitate system netting.
2. Plastic carrying handle.
3. Voltage range scale—1 thru 1000 volts DC.
4. 1 and 3 volt test range switch.
5. Rotary switch for selection of equipment metering points.
6. Microphone jack.
7. Push to test transmitter switch.
8. Discriminator reverting switch facilitates receiver tune-up.

9. Meter polarity reversing switch.
10. Test probe jacks for additional voltage measurements.
11. Multi-pin cable receptacle.
12. Audio input/output jack.
13. Auxiliary test probes.
14. Molded multi-conductor test cable.
15. Test cable plug retaining screw.
16. Aluminum carrying case.

Receiver (Bottom View)



Progress Is Our Most Important Product

GENERAL  ELECTRIC

COMMUNICATION PRODUCTS DEPARTMENT LYNCHBURG, VIRGINIA

(In Canada, Canadian General Electric Company, Ltd., 830 Lansdowne Rd., Toronto, Ontario)