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Motorola GM300 Information Page

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The GM300 was Motorola's next step in the MaxTrac / Radius mobile product lines. The schematics are remarkably similar. You can even interchange some boards between the GM300 and MaxTrac radios. Like the MaxTrac, the GM300 line has been discontinued by the manufacturer. Throughout this article, reference to MaxTrac radios implies Radius radios as well.

Naturally, you need different programming software (RSS), but if you've ever programmed a MaxTrac, you'll be right at home with the GM300. The radios operate the same, too. See below for more info on the RSS and programming.

GM300 mobile radios cover the VHF (136-174 MHz in two ranges) and UHF (403-520 MHz in four ranges) bands, with 8 or 16 channels, 12.5 or 20/25/30 kHz channel spacing, and 10, 25, and 35-45 watt power levels. They use the same accessories (loudspeakers, microphones, accessory plugs, power cords, mounting brackets, etc.) as the MaxTracs.

The M120 radio is just about the same as a GM300 but has "less features" - this would be the 2-channel version, equivalent to a MaxTrac 50.

Here's a front view photo of a 16-channel MaxTrac, a 16-channel GM300, and a 2-channel MaxTrac:

Model Numbers:

The first six characters are pretty much standard Motorola convention. The IF frequency is usually 45.1 MHz but if you have multiple radios near each other, this can cause interference, so you can optionally order the radio with an alternate IF frequency.

Mount	Power	Band	Series		I.F.
M	0: 01-10w	3: 136-174 MHz	G	M	C: 45.1 MHz
	3: 10-25w	4: 403-520 MHz			R: 45.3 MHz
	4: 25-45w				

The second six characters provide a lot of useful information about the capabilities of the radio and the boards contained within it.

Spacing	# Ch.	Logic Board	Range	Rev.	
0: 12.5 kHz	0: 8	C: Expanded	1: 136-162 MHz	A	_

2: 20/25/30 kHz	9: 16	D: Masked	1: 403-430 MHz		
			2: 146-174 MHz		
			3: 438-470 MHz		
			4: 465-490 MHz		
			5: 490-520 MHz		

A typical model number would be M44GMC09C3A_. This is a 40 watt, UHF radio, 45.1 MHz IF, narrow spacing (12.5 kHz), 16 channels, expanded logic board, 438-470 MHz band.

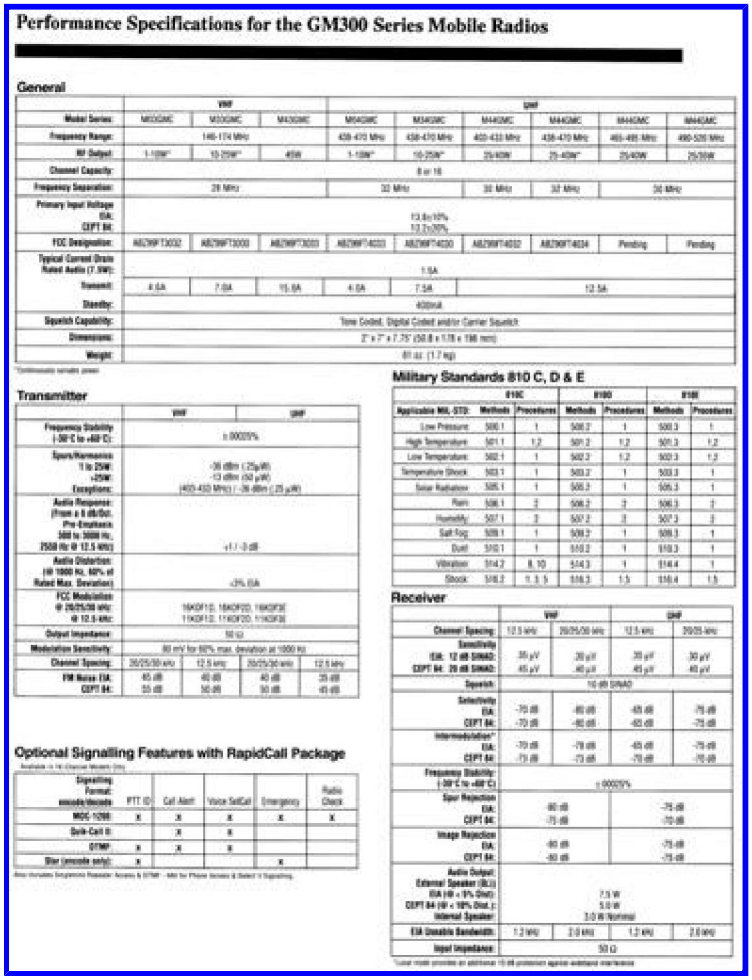
It is rare that the model number includes the specific frequency range the radio is capable of handling (10th character). You don't get that lucky with MaxTracs, Spectras, etc. I wish all the model numbering was so useful.

The expanded logic board has its firmware contained in a socketed EPROM, which can be replaced. The masked logic board has its firmware permanently stored in the soldered-in microprocessor IC. I have heard that the masked logic board is only capable of 8 channels maximum.

It would appear that GM300s are not capable of any form of trunking operation. However they can do G-Star signaling for use with GE radio systems.

Specifications:

Click on the image to enlarge it.



Performance Specifications for the GM300 Series Mobile Radios

General

	VHF			UHF					
Model Series:	M03GMC	M30GMC	M43GMC	M44GMC	M34GMC	M44GMC	M44GMC	M44GMC	M44GMC
Frequency Range:	146-174 MHz			438-470 MHz	438-470 MHz	403-433 MHz	438-470 MHz	465-495 MHz	490-520 MHz
RF Output:	1-10W*	10-25W*	45W	1-10W*	10-25W*	25-40W	25-40W*	25/40W	25/35W
Channel Capacity:	8 or 16								
Frequency Separation:	25 MHz			12 MHz		12 MHz	12 MHz	12 MHz	
Primary Input Voltage EIA: CEPT 84:	13.8v±10% 13.2±30%								
FCC Designation:	AZ396FT3032	AZ396FT3000	AZ396FT3033	AZ396FT4033	AZ396FT4030	AZ396FT4032	AZ396FT4034	Pending	Pending
Typical Current Drain Rated Audio (7.5W):	1.5A								
Transmit:	4.0A	7.0A	11.0A	4.0A	7.5A	12.5A			
Standby:	400mA								
Squelch Capability:	Tone Coded, Digital Coded and/or Carrier Squelch								
Dimensions:	2" x 7" x 7.75" (50.8 x 178 x 196 mm)								
Weight:	61 oz. (1.7 kg)								

*Continuously variable power

Transmitter

	VHF	UHF
Frequency Stability (-30°C to +60°C):	±.00025%	
Spurs/Harmonics: 1 to 25W: >25W: Exceptions:	-36 dBm (.25µW) -13 dBm (50 µW) (403-433 MHz) (-36 dBm (.25 µW)	
Audio Response: (From a 6 dB/Oct. Pre-Emphasis 300 to 3000 Hz, 2500 Hz @ 12.5 kHz)	+1 / -3 dB	
Audio Distortion: (@ 1000 Hz, 60% of Rated Max. Deviation)	<3% EIA	
FCC Modulation: @ 20/25/30 kHz: @ 12.5 kHz:	16K0F1D, 16K0F2D, 16K0F3E 11K0F1D, 11K0F2D, 11K0F3E	
Output Impedance:	50 Ω	
Modulation Sensitivity:	60 mV for 60% max. deviation at 1000 Hz	
Channel Spacing:	20/25/30 kHz	12.5 kHz	20/25/30 kHz	12.5 kHz
FM Noise: EIA: CEPT 84:	45 dB 55 dB	40 dB 50 dB	45 dB 55 dB	35 dB 45 dB

Optional Signalling Features with RapidCall Package

Available in 16 Channel Models Only

Signalling Format: encode/decode	PTT ID	Call Alert	Voice SelCall	Emergency	Radio Check
MDC-1200:	X	X	X	X	X
Quik-Call II:		X	X		
DTMF:	X	X	X		
Star (encode only):	X			X	

Note: Includes Programmable Repeater Access & DTMF – MH for Phone Access & Select 5 Signalling

Military Standards 810 C, D & E

Applicable Mil. STD:	810C Methods	810C Procedures	810D Methods	810D Procedures	810E Methods	810E Procedures
Low Pressure	500.1	1	500.2	1	500.3	1
High Temperature	501.1	1,2	501.2	1,2	501.3	1,2
Low Temperature	502.1	1	502.2	1,2	502.3	1,2
Temperature Shock	503.1	1	503.2	1	503.3	1
Solar Radiation	505.1	1	505.2	1	505.3	1
Rain	506.1	2	506.2	2	506.3	2
Humidity	507.1	2	507.2	2	507.3	2
Salt Fog	509.1	1	509.2	1	509.3	1
Dust	510.1	1	510.2	1	510.3	1
Vibration	514.2	8, 10	514.3	1	514.4	1
Shock	516.2	1, 3, 5	516.3	1,5	516.4	1,5

Receiver

	VHF		UHF	
Channel Spacing:	12.5 kHz	20/25/30 kHz	12.5 kHz	20/25 kHz
Sensitivity EIA: 12 dB SINAD: CEPT 84: 20 dB SINAD:	.30 µV .45 µV	.20 µV .40 µV	.30 µV .45 µV	.30 µV .40 µV
Squelch:	10 dB SINAD			
Selectivity EIA: CEPT 84:	-70 dB -70 dB	-80 dB -80 dB	-65 dB -65 dB	-75 dB -75 dB
Intermodulation* EIA: CEPT 84:	-70 dB -70 dB	-78 dB -73 dB	-65 dB -70 dB	-75 dB -70 dB
Frequency Stability (-30°C to +60°C):	±.00025%			
Spur Rejection EIA: CEPT 84:	-80 dB -70 dB		-75 dB -70 dB	
Image Rejection EIA: CEPT 84:	-80 dB -80 dB		-75 dB -75 dB	
Audio Output: External Speaker (8Ω): EIA (10 < 5% Dist): CEPT 84 (10 < 10% Dist.): Internal Speaker:	7.5 W 5.0 W 3.0 W (Nominal)			
EIA Useable Bandwidth:	1.2 kHz	2.0 kHz	1.2 kHz	2.0 kHz
Input Impedance:	50 Ω			

*Local mode provides an additional 15 dB protection against undesired interference

Note that a revision to the service manual shows two VHF ranges: 136-162 MHz and 146-174 MHz. Also, the power levels are continuously variable throughout the three ranges: 1-10, 10-25, 25-45 watts.

Board Numbers:

This list is sorted alphabetically by Function, then Description.

Board #	Function	Description
HLN8075A	Display Board	
HLN8070A	Logic Board	Expanded, 4-layer
HLN8070D	Logic Board	Expanded, 4-layer
HLN8047E	Logic Board	Masked, 2-layer
HLN8074A	Logic Board	Masked, 2-layer
HLE8385A	UHF Power Amp	403-433 MHz, 01-10 Watts

HLE8275A	UHF Power Amp	403-433 MHz, 25-45 Watts
HLE8267A	UHF Power Amp	438-470 MHz, 01-10 Watts
HLE8034A	UHF Power Amp	438-470 MHz, 10-25 Watts
HLE8271A	UHF Power Amp	438-470 MHz, 25-40 Watts
HLE8284A	UHF Power Amp	465-495 MHz, 25-40 Watts
HLE8269A	UHF Power Amp	490-520 MHz, 25-35 Watts
HLE8229A	UHF RF Board	403-433 MHz, 25 kHz
HLE8230A	UHF RF Board	403-433 MHz, 12.5 kHz
HLE8301A	UHF RF Board	438-470 MHz, 12.5 kHz
HLE8300A	UHF RF Board	438-470 MHz, 25 kHz
HLE8264A	UHF RF Board	465-490 MHz, 12.5 kHz
HLE8263A	UHF RF Board	465-490 MHz, 25 kHz
HLE8228A	UHF RF Board	490-520 MHz, 12.5 kHz
HLE8227A	UHF RF Board	490-520 MHz, 25 kHz
HLD8293A	VHF Power Amp	136-162 MHz, 10-25 Watts
HLD8299A	VHF Power Amp	146-174 MHz, 01-10 Watts
HLD8033A	VHF Power Amp	146-174 MHz, 10-25 Watts
HLD8287A	VHF Power Amp	146-174 MHz, 25-45 Watts
HLD8266A	VHF RF Board	136-162 MHz, 12.5 kHz
HLD8265A	VHF RF Board	136-162 MHz, 25 kHz
HLD8029A	VHF RF Board	146-174 MHz, 12.5 kHz
HLD8031A	VHF RF Board	146-174 MHz, 25 kHz
HLN8071A	Vol/Mic Board	

Logic Board Jumpers:

Click on the image to enlarge it.

Jumper-Selectable Options

Push-on jumpers, located on the logic board, allow the operation of the radio to be customized to specific applications, as explained below. The standard position of each jumper, as shipped from the factory, is indicated in **bold**.

	JU551	POSITION (A)	The receiver audio applied to the accessories connector J3 pin 11 is flat (not de-emphasized) and unmuted.
		POSITION (B)	The receiver audio applied to the accessories connector J3 pin 11 is de-emphasized and muted. Muting is controlled by the RX MUTE output from the microcomputer, as determined by carrier or tone squelch status.
	JU601	**POSITION (A)**	The high-speed receive data path to the microcomputer is filtered to remove audio information below 300 Hz. This is used when decoding signaling data or tones which do not contain low frequency information.
		POSITION (B)	The high-speed receive data path to the microcomputer is essentially flat over the frequency range of less than 1 Hz to 3 kHz. This is used when decoding signaling data which includes very low frequency components.
	JU651	**POSITION (A)**	Selects low microphone audio sensitivity, which is 80 mV rms for 60% of full system deviation.
		POSITION (B)	Selects high microphone audio sensitivity, which is 40 mV rms for 60% of full system deviation. This position is not recommended in applications where high ambient noise is present.
**	JU701	**POSITION (A)**	J3-5 functions as a Flat TX Audio Input which is routed through the limiter. Response is 0.6-3000 Hz. Sensitivity is 180 mV rms for 60% of full system deviation.
		POSITION (B)	J3-5 functions as an External PL Input, bypassing the limiter. Response is 0.7-300 Hz.
**	JU808	**POSITION (A)**	Pin 12 of accessories connector J3 functions as a programmable I/O (input or output) as determined by the RSS.
		POSITION (B)	Pin 12 of accessories connector J3 functions as the SCI + programming line. It is connected directly to the SCI + line on microphone connector J11.
*	JU809	**POSITION (A)**	Allows the use of a remote desk set which is connected to accessories connector J3. Pin 14 functions as the HOOK line. When pulled low, the radio is forced into the monitor (off-hook) position. Note that this is the opposite polarity of the HOOK function on the microphone connector J11.
		POSITION (B)	Allows the use of an HLN3145 Public Address system. Pin 14 of accessories connector J3 functions as the PA ENABLE line. In the public address mode this line is pulled low, inhibiting transmit PTT operation, but leaving all other radio functions unchanged. Note: When a R*I*C*K Repeater adapter is used, the push-on jumper JU809 must be removed entirely.

* Present on 2-layer masked logic board (HLN8074) only.
** Present on 4-layer expanded logic board (HLN8070) only.

These are quite visible on the photo of the GM300 logic board below. Note that some of these jumpers are also present on MaxTracs and have the same functions.

Accessory Connector:

Click on the image to enlarge it.

Instructions for Expanded Accessory Connector

General

The following is a description of the pin functions on the Expanded Accessory Connector for the 8- and 16-channel radios. Refer to Figure 1. for pin locations in the connector housing.

GM300 8-Channel Radios

Pin #	Description
1	External Speaker Negative
2	Microphone Audio 80 mV RMS @ 60% Deviation
3	Microphone PTT
4	External Alarm (not supported)
5	Flat Transmit Audio 150 mV RMS @ 60% Deviation
6	Not Used
7	Ground
8	COR Output-Receiver Unsquelched Indicator (Active Low)
9	Emergency Alert Input (not supported)
10	Ignition Control Input
11	Discriminator Audio Output 600 mV RMS @ 60% Deviation
12	Not Used
13	Switch A + Sense 0.5 Amps Max.
14	Remote Hook Switch Input
15	Internal Speaker Positive
16	External Speaker Positive

GM300 16-Channel Radios

Pin #	Description
1	External Speaker Negative
2	Microphone Audio 80 mV RMS @ 60% Deviation
3	Microphone PTT
4	Programmable Output—See table on next page
5	Flat Transmit Audio 150 mV RMS @ 60% Deviation
6	Programmable Input—See table on next page
7	Ground
8	Programmable Input/Output—See table on next page
9	Programmable Input—See table on next page (Defaults to Emergency Alert Input)
10	Ignition Control Input
11	Discriminator Audio Output 600 mV RMS @ 60% Deviation
12	Programmable Input/Output—See table on next page
13	Switch A + Sense 0.5 Amps Max.
14	Programmable Input/Output—See table on next page
15	Internal Speaker Positive
16	External Speaker Positive

Extracting a Terminal

The extraction tool HLN9491 (shown in Figure 2.) is included in the radio packing carton. To remove a terminal:

1. Insert the extraction tool in the bottom of the opening in the terminal housing at the front (refer to Figure 2.).
2. Pull gently on the wire in the rear end of the terminal housing until it can be removed completely.

Inserting a Pin

1. Crimp the wire which leads to the terminal.
2. Insert the terminal into the desired housing location, with its locking tab facing down toward the strain relief tab. Refer to Figure 1. for pin locations.

IMPORTANT

Make sure that the terminal clicks into place.

NOTE

The following can be ordered through the Radius Division:

- Hardware Kit that includes 16 connector pins, an extra housing, and (9) 8-inch wires with connector pins attached (Kit #HLN9457).
- 3-foot long, 16 conductor cable, with connectors on both ends (Kit #HLN9969).

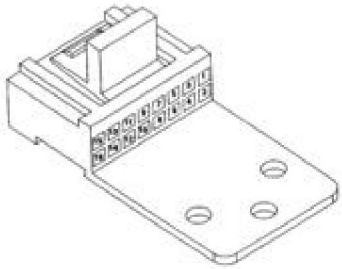


Figure 1. Accessory Connector, Rear View

Note that the 8-channel radio signals are slightly different than the 16-channel radio signals. That may be due to the masked vs. expanded logic board. Fortunately, you **can** use an accessory plug wired for a MaxTrac (7-9, 15-16) in a GM300.

Click on the image to enlarge it.

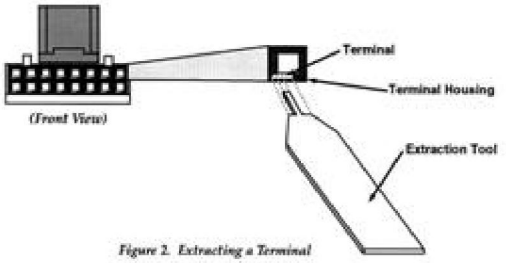


Figure 2. Extracting a Terminal

Table 1. GM300 16-Channel Radio Accessory Connector

Pin	Function
4	External Alarm NULL2 PL/DPL & CSQ Detect CSQ Detect Clear to Send
6,9	NULL1 Emergency Switch Tx PL Inhibit TOC Disable Tx Audio Mute Rx Audio Mute Special Off Hook Channel Select 1-5 Mic Off Hook Auto PTT Request to Send Ext. Call Button
8,12,14	External Alarm (low current drive on these pins) NULL1 PL/DPL & CSQ Detect CSQ Detect Emergency Switch Tx PL Inhibit TOC Disable Tx Audio Mute Clear to Send Rx Audio Mute Special Off Hook Channel Select 1-5 Mic Off Hook Auto PTT Request to Send Ext. Call Button NULL2

The accessory connector and pins are also well-documented in the MaxTrac section.

Note that many accessory pins on the expanded (four-layer) logic board are programmable, whereas you're stuck with the pin assignments on the masked (two-layer) logic board.

Channel Steering:

The 16-channel expanded logic board radios support "channel steering" through the accessory connector. You need to program the general-purpose I/O pins (6, 8, 9, 12, and 14) for "Channel Select". They turn into a binary coded input that allows you to select any of the possible 16 channels by grounding the appropriate input lines (assuming you've programmed the radio for active-low inputs). To select channel 1, ground the "Channel Select 1" line. Channels 1, 2, 4, 8, or 16 may be selected by grounding select line 1, 2, 3, 4, or 5 respectively. All other channels are selected by grounding multiple select lines. If you release all of these lines, the radio reverts to the channel selected by the front panel. If you select a channel that does not exist (i.e. 10 channels programmed and you select channel 16), the radio reverts to the channel selected by the front panel. Channel steering DOES work as expected on radios with more than 16 channels, i.e. you can select anything up to channel 31, as that's all that's possible with five select lines.

This document describes the I/O connector settings and shows one way of handling channel steering.

Pins 4,8,12,14 can be configured for COR. Pins 6,8,9,12,14 can be configured for Channel Select. So you can put COR on pin 4 and CS on the others. The fact that the masked (8-channel) radios and most MaxTrac users selected pin 8 for PL&COR Detect is something that will have to be changed if you want multiple features activated. It's up to the user to choose the desired functionality given the number (six) of programmable I/O lines.

Programming:

The HVN8177 programming software (RSS) programs the M10, M120, M130, and GM300 mobiles, as well as the GR300, GR400, and GR500 desktop repeaters. The latest release is HVN8177F version R05.00.00 dated December 1995. The RSS is shipped on 3.5 inch diskettes and is a DOS-only program.

The microphone connector is exactly the same as on a MaxTrac, and it's also well-documented in the MaxTrac section. The programming cable and RIB setup is the same as what you'd use for a MaxTrac or GTX.

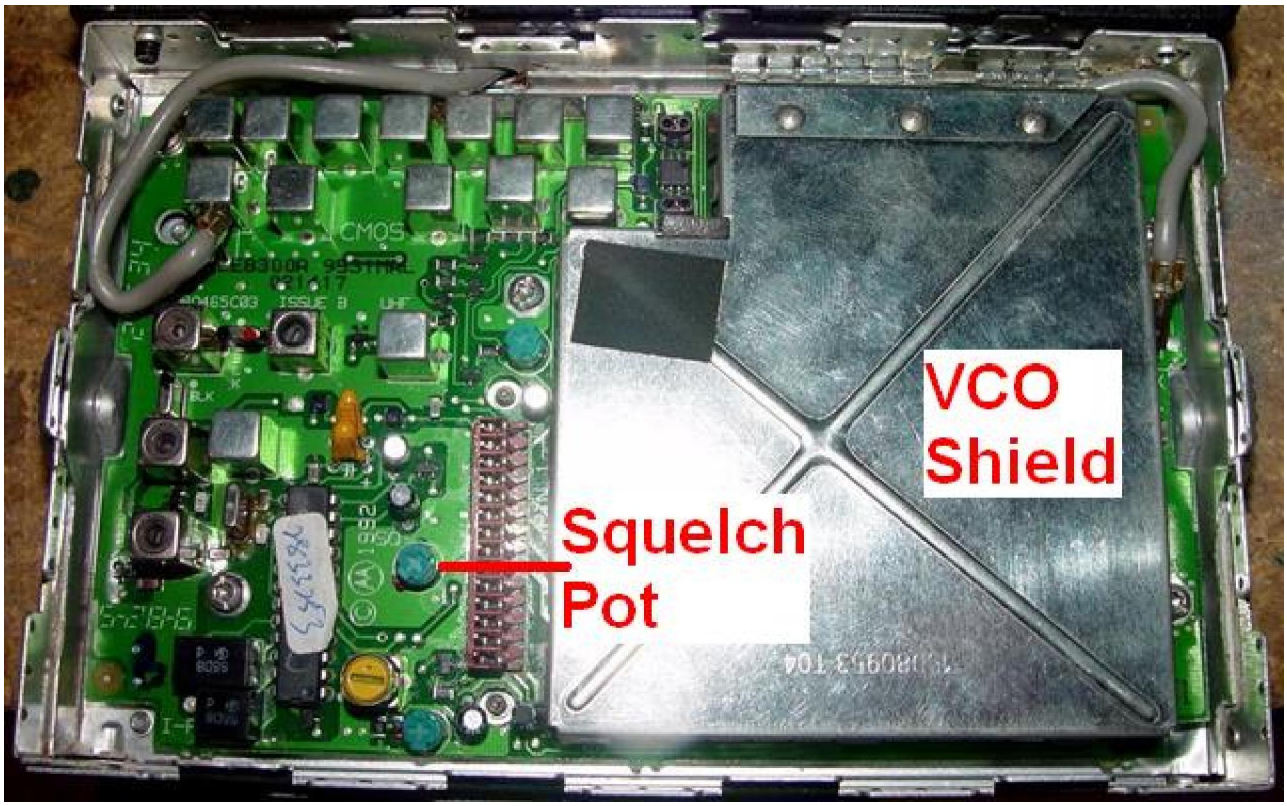
You can hex-edit the MDF file in the RSS to allow an 8-channel radio to take 16 channels. Additional information is available elsewhere on the web and from Colin Lowe G1IVG here.

The GM300 with the expanded logic board supports the same common signaling modes as a MaxTrac (PL, DPL, MDC, etc.).

Differences from a MaxTrac:

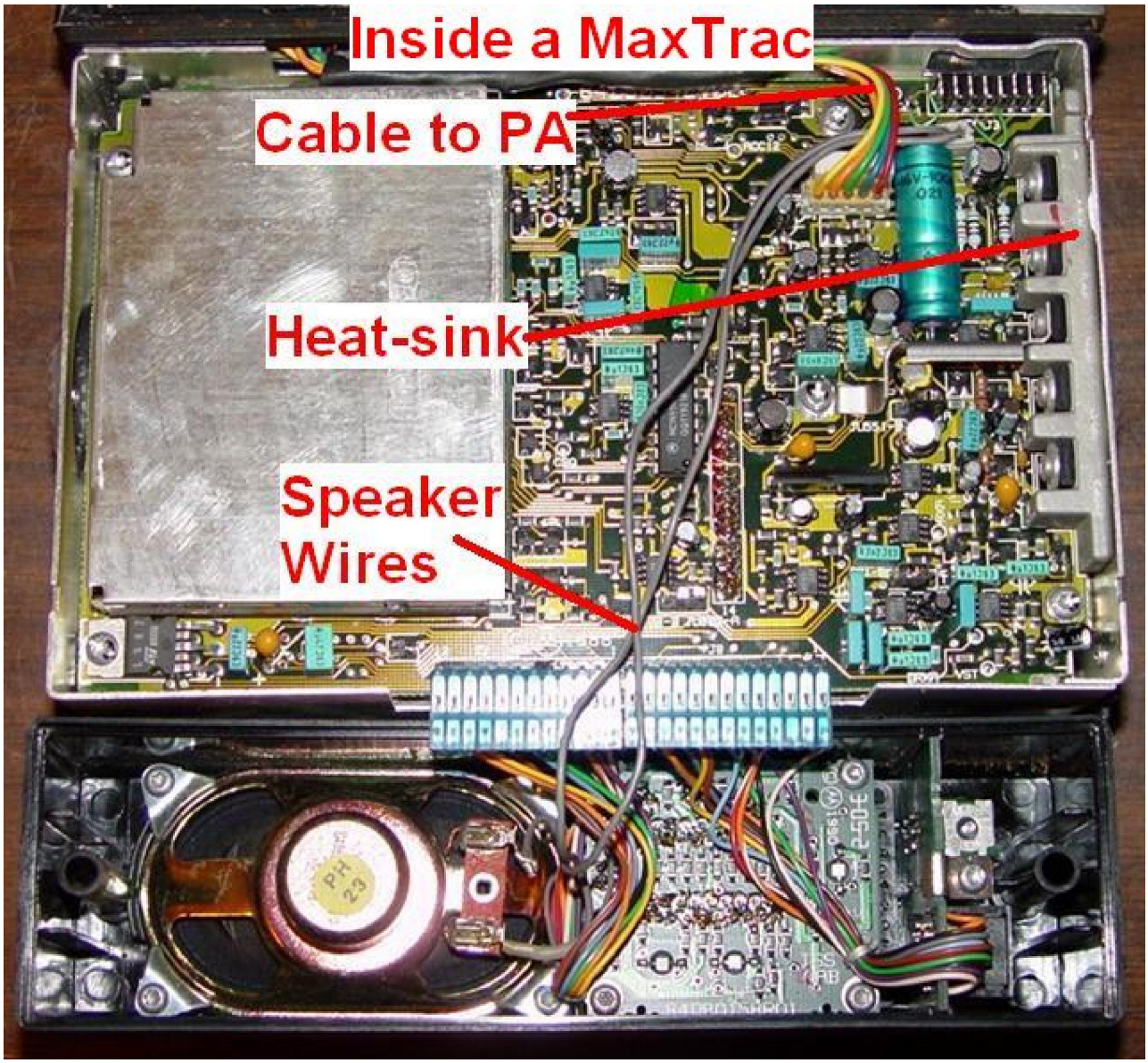
The GM300 has models that fully cover the 144-148 MHz and 440-450 MHz amateur bands. Some MaxTracs will go that low if you adjust the VCO and hex-edit the RSS.

The GM300 RF boards have a local/distant attenuator in the receiver front end. This reduces the gain of the receiver and improves intermod rejection by 10dB. You can put a GM300 RF board into a MaxTrac, but there will be no control of the local/DX circuit, and the radio will have poor sensitivity. The circuit can be activated by soldering a small jumper on the RF board. The GM300 RSS and logic boards know how to control this circuitry; the MaxTrac RSS and logic boards do not.

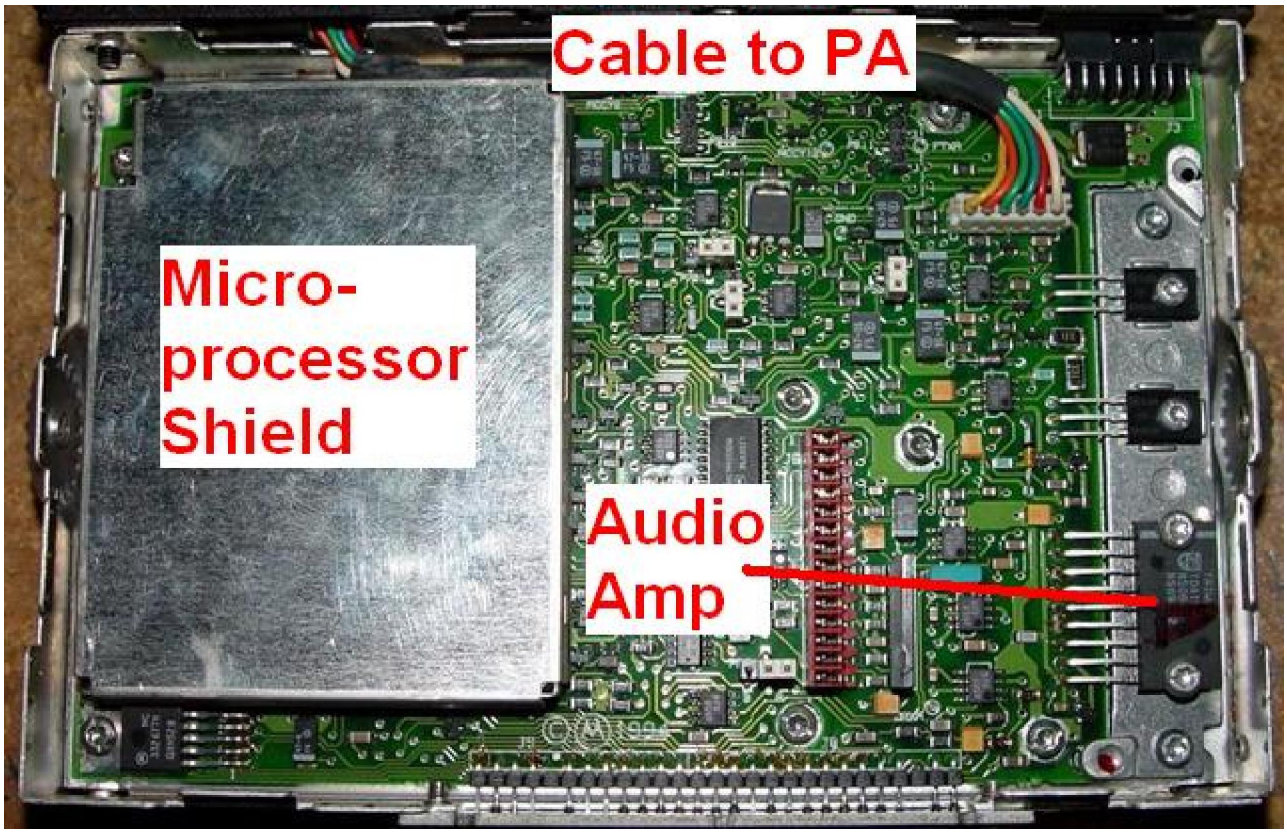


The GM300 control head is quite similar to the MaxTrac. There is an additional circuit board, soldered to the logic board pins, that the control head connectors plug into, that provides some RF filtering and Zener diodes to protect from excessive voltage. Also, the internal speaker now connects through the control head cables, rather than on its own 2-wire cable. This makes it easier to remote-mount a GM300. There are kits available for this purpose.

For comparison, here's the inside view of a MaxTrac. Notice the lack of shielding and no filter board between the logic board and control head.



The GM300 logic board is significantly different from the MaxTrac logic board. It can control the RF board's local/DX circuit. The audio power amplifier is one single IC rather than discrete transistors. The heat-sink is considerably different and mounts only to the bottom of the chassis - no more T8 flat-head screws through the side of the chassis. There are far fewer components on the board too. All GM300 logic boards have a 16-pin accessory connector. A full metal shield covers the entire logic board, just like they have for the RF board; the MaxTrac only shields the microprocessor area. This further reduces spurious emissions.



The GM300 audio amplifier drives both sides of the loudspeaker. Therefore you must NOT ground either pin 1 or pin 16 of the accessory connector. You must run two wires to an external speaker. The same circuit design and components are used on the Spectra radios and they suffer from the same restriction. Grounding either speaker lead may let out the chip's lifetime supply of smoke.

The internal loudspeaker for the GM300 (and MaxTrac/Radius) radios is p/n 5080085D03, however this part number has been replaced by p/n 5004639J01. This is a 22 ohm, 5 watt speaker that retails for around $7US in early 2009.

The GM300 power amplifier has a thermistor mounted near the final transistor, so it actually senses the heat-sink temperature. The logic board uses this to control the output power in a more reasonable way; the power will be reduced if/when the power amplifier gets hot enough, not when the microprocessor "thinks" it's getting hot from extended use. This makes GM300 radios more suitable for repeater transmitter usage. (They still need adequate forced-air cooling.) This extra signal requires a 6-wire cable and connector between the PA and the logic board (the MaxTracs only have a 5-wire cable and connector). I have heard that you can use a GM300 PA in a MaxTrac by snipping the temperature sensor wire off the connector, but I personally would not butcher either the radio or the cable that way.

Blanking the Radio:

There doesn't seem to be a lab version of RSS for the GM300. You can fool RSS into thinking the radio is blank by manually erasing the serial number (filling it with spaces) using the bit-banging facility available in the MaxTrac lab RSS program. After that, you should be able to initialize the radio using the GM300 RSS. That procedure is similar to, if not exactly the same as, the steps you'd do for a MaxTrac: set the radio model number, frequency range, signaling features, serial number, key in the crystal data

and 9.6V reading, and align the power amplifier and deviation circuits.

Note: people have used the MaxTrac lab RSS to blank GM300 radios. They then install a MaxTrac EPROM, make some changes to the logic board, and turn the radio into a MaxTrac, including the model number. Then they initialize it with MaxTrac RSS. This procedure is not recommended.

To blank the radio, you need to deposit the following data at the locations shown. These values came directly from a factory-fresh blank board. This data will go directly into the radio's memory. You may want to write down the contents of these locations first, incase something goes terribly wrong. I found this info on the web and have not tried it because I don't own a GM300. Use it at your own risk. All values are hexadecimal.

Loc	Data	Usage
600	20	Serial #
601	20	Serial #
602	20	Serial #
603	20	Serial #
604	20	Serial #
605	20	Serial #
606	20	Serial #
607	20	Serial #
608	20	Serial #
609	20	Serial #
60A	FF	Panel #
60B	FF	Index #
60C	1B	Index #
60D	FF	SW Ver.
60E	FF	? ? ?
60F	4F	Checksum

After setting the memory to these values, the radio will appear blanked to the GM300 RSS, and you'll have to go through the blank board replacement procedure and either align the radio, or fill in the various fields with data that was previously there.

By the way, the RSS knows about only one "panel number" for these radios: 5, and it covers the Radius GM300 product and models MxxGMC00D2xx and MxxGMC20D2xx.

The above table values are supposed to work with a GM300. For an M120, change the value at 60C from 1B to 20, and change the value at 60F from 4F to 54.

Common Problems:

For some reason, GM300s seem to be prone to losing receive sensitivity. Whether this is due to nearby excessive transmitter power or operator error, the eventual cause seems to be either shorted protection diodes across the receiver's input, or a dead first RF amplifier transistor. All of these components require removal of the RF board to access them, but replacement is quite easy. They're surface-mount, of course.

These radios often go way off frequency, to the point that the warp adjustment will not get it back where it belongs. The cause is most often dirty interconnection pins inside the radio. These are between the RF board and the logic board. On the MaxTrac, they are attached to the logic board; on the GM300 the strip of pins is mounted on the chassis and both boards plug into it. Remove both boards, clean these pins, and reinstall the boards. While the radio is apart, clean the front panel connectors too. These same connectors get dirty on MaxTracs as well, but for some reason they don't often cause serious problems like they do on the GM300.

To remove the logic board, you need to remove about a dozen screws, including all the ones on the components mounted to the heatsink. I found it easier to remove the RF board first, then flip the radio over and pull the logic board and the interconnect pin assembly together, then remove the interconnect from the logic board.

Reference Oscillator Coarse Adjustment Procedure:

Rather than type this paragraph, here it is directly from the service manual. This same procedure (with different part references) could also be used with MaxTrac radios.

1.4.3 Reference Oscillator

The reference oscillator is a Colpitts design using a 14.4 MHz crystal element. Each crystal has a unique 8-digit temperature coefficient code which must be keyed into the radio during chassis auto tune. The reference oscillator is warped to the desired range by adjusting L151 while supplying 5.2 $\pm$0.01V DC at J6-9. Further frequency warp adjustment is done electronically by changing the control voltage applied to varactors CR151 and CR152 by the logic board.

Manuals and RSS:

- GM300 8-channel Operator's Card, 6880902Z26
- GM300 16-channel Operator's Card, 6880902Z41
- GM300 Owner's Manual, 6880902Z09
- GM300 Service Manual, 6880902Z32

- GM300 RSS, HVN8177F
- GM300 RSS Manual, 6880902Z36

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