Innovative Test Equipment for the Radio Engineer

AFFORDABLE ☐ DEPENDABLE ☐ PORTABLE

HELPER INSTRUMENTS COMPANY

Helper Instruments specializes in producing practical, affordable test equipment for the land mobile industry. Helper Instruments was founded by Bill Detwiler in 1975 and began as a modest, one-product entity with the idea in mind that test instrumentation can be made to perform in the field in concert with the needs of the service engineer. This meant that Helper's equipment had to go anywhere the service engineer did — no matter whether it was hot, wet, dirty or dark. This idea worked and guaranteed Helper a position as a world leader in offering reliable, cost-efficient test equipment to the land mobile industry.

Today Helper Instruments has moved into its second generation of leadership with Susan, Bill's daughter, heading up the company. Susan, who is a graduate of Lees-McRae College in Banner Elk, North Carolina, and the University of Central Florida, is no stranger to the industry. "I have watched my father make test equipment all my life." Then she adds, "I can't remember a time when my father didn't have a test lab in our home." After Susan graduated from the University of Central Florida, she went on to work in the cellular industry. Susan's experience in the cellular industry gives her a special insight. "I'm lucky," she says. "It's rare to get the opportunity to sell the same equipment you once used."

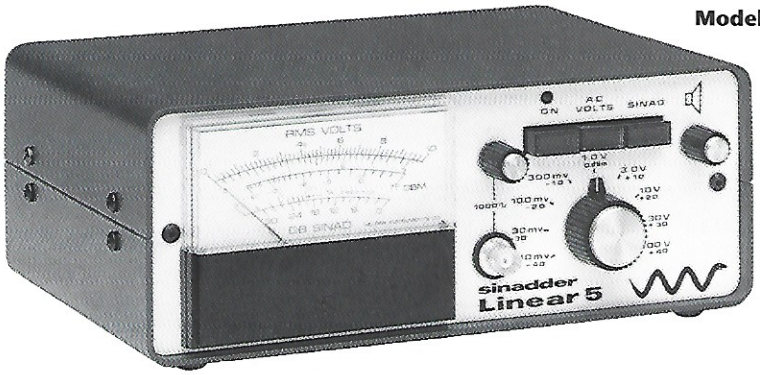
Helper has expanded its technical staff to fill the void left by Bill's passing and will continue to design, develop and manufacture test equipment that will provide the Communications Industry with useful products that reduce the customer's service cost.

Production Procedure

Beginning with the original Sinadder 101, the Sinadder line has been one of Helper's most successful lines. Its users include two-way radio repair shops, servicers of radio receivers, and servicers of cellular telephone equipment. Here at Helper we attribute this success to the unique style and innovation that founder William L. Detwiler offered to the industry. The history of the Sinadder is also testimony to the quality of Helper Instruments' products. Helper's Production facility is located in Indian Harbour Beach, Florida, and maintains a fairly small production staff in comparison to some of the other facilities in the industry. The reason for this, says Susie Herdman, is because, "*People* build test equipment here," and as Helper Instrument's most senior production employee she likes to "keep a close watch on everything that has the name Sinadder on it."

Susie Herdman, Helper's first and longest-standing employee, watches over the Sinadder line with personal pride. She built the first production lot back in 1975.

Model SL-105



Sinadder Linear5™

In the SINAD mode, it's an RMS measuring SINADDER™, the revolutionary automatic distortion meter for real-time measurement of SINAD sensitivity. Simplifies and speeds alignment procedures, saving hours of shop time.

The Linear 5 complies with EIA RS-204C, which specifies RMS type metering and width of the 1,000 Hz notch.

AUDIO SIGNAL TRACER: Use the internal speaker and speaker amp to listen to audio in speech amplifiers and transmitter speech processors while measuring the level. Track down audio distortion, locate defective audio stages.

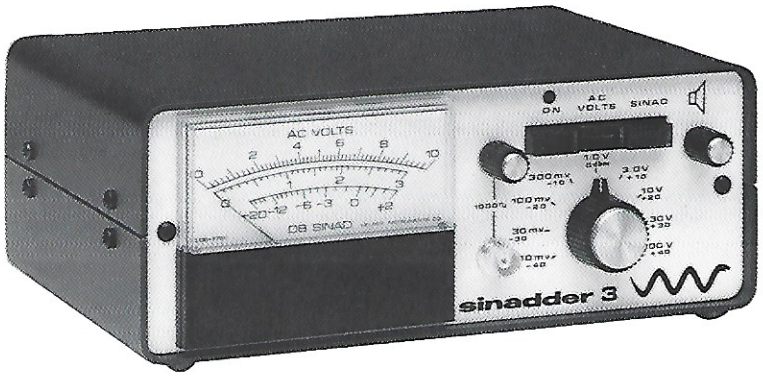
MEASURE 1000 HZ AUDIO DISTORTION in receivers, amplifiers, transmitters, systems, using the new distortion scale.

RMS AUDIO VOLTMETER: Nine ranges from 10 mv full scale to 100 volts full scale. You can check audio circuits all the way down to microphone levels.

Send for your copy of "Everything You Need To Know About SINAD."

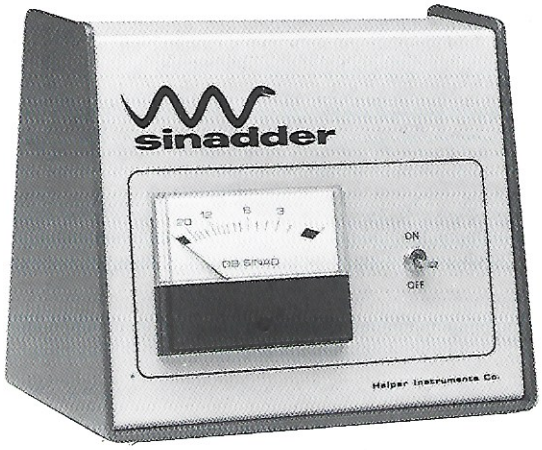
SPECIFICATIONS: (LINEAR 5) Serial #'s above 6000

Panel Controls	*POWER/AC VOLTS/SINAD Switch; RMS VOLTS Range Switch; 1 kHz tone output level control; Internal speaker level control.*
Input	*Permanently affixed shielded test cable w/miniclips.*
SINAD Input Level	*20 mV to 10 Vrms*
SINAD Input Impedance	*100 K ohm*
Notch	*Audio frequency band rejection filter per RS 204C, Paragraph 6.1.1 (a) (b) (c)*
SINAD Accuracy	*± 1 dB @ 12 dB*
SINAD Scale Range	*LINEAR 0 to 32 dB, 12 dB point is located at 60% of full scale*
Distortion Scale Range	*2.5 to 10% (@ 1000Hz)*
AC rms Voltmeter Ranges	*Nine RMS Ranges: 10 mV, 30 mV, 100 mV, 300 mV, 1 V, 3 V, 10 V, 30 V, 100 V full scale*
AC Voltmeter Input Impedance	*1 Megohm*
AC Voltmeter Accuracy	*±3% of full scale ± 0.25 dB, 100 Hz to 20 kHz*
Audio Amplifier	*In SINAD Mode, AGC controlled constant level with volume control.* *In VOLTMETER Mode, range switch and front panel volume control.*
Tone Generator	*0.5 V, 1 kHz ± 1 Hz, low impedance transformer isolated*
Power	*110/120 V or 220/240 V VAC Strap selectable, 50/60 Hz* *13.5 VDC ± 15%*
Dimension	*8.75" S x 3.25" H x 7" D* *22 cm W x 9 cm H x 17.5 cm D*
Weight	*4 lbs. (1.8 kg)*



Sinadder 3™
Same dependable quality and features as the LINEAR 5, with the following exceptions: Metering is by RMS calibrated, average activated circuits. SINAD scale is logarithmic with 12 dB to the left of center. 1,000 Hz output is not transformer isolated. No 1,000 Hz distortion scale. Thousands are in daily use.

Model S-103



Sinadder 1™
The original Sinadder™. It revolutionized receiver test and alignment back in 1975,and is still prominent on thousands of service benches. When ordering specify 117 or 240 VAC.

Model S-101

Sinadder™ for cellular radio
The testing specifications for cellular radio require the use of a noise weighting filter when making SINAD measurements. In the United States, a "C Message Weight Filter" is specified. In Europe a "Psophometric" filter is used.

Models CML-1 (U.S. specs) and PML-1 (European) are adaptations of the Model SL-105 (shown at left). Specifications for the CML-1 and PML-1 are the same as for the model SL-105, except for the addition of the appropriate filter. A front panel switch removes the filter for non-cellular applications. 1000 Hz Audio Distortion can be made with or without filter.

Model CML-1
(with C Message Weight Filter)

Model PML-1
(with Psophometric Filter)

Send for your copy of "Troubleshooting with your Power Supply"

SPECIFICATIONS (PS-250)

Serial numbers above 6436

Output Current ..... *3 Amperes, 50% duty factor*

Output Voltage ..... *0 to 19 VDC output, DC isolated from ground.*

Voltage Regulations .. *@ 19 volts: 0-2.5 amps .1%*
@ 10 volts: 0-3 amps .1%
@ 5 volts: 0-3 amps .2%

Ripple and Noise .... *Less than .2 millivolts RMS measured at 12 volts, 3 amperes.*

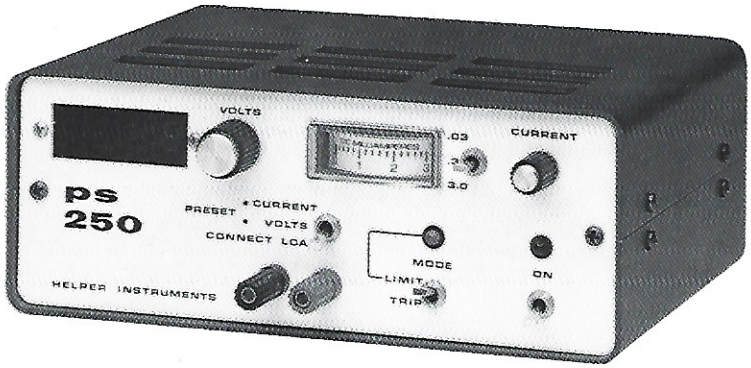
Load Protection ..... *Choice of current limiting or current trip-out. Audible and visual alarm on limit and trip-out. Voltage and current limit can be set prior to connecting output to panel terminals. Low capacitance output.*

Internal Protection .. *Self-limiting circuitry and power devices prevent internal damage.*

Power Requirements *110/120 or 220/240 V, 50/60 Hz, as chosen by transformer taps.*

Dimensions ..... *3-1/2" H x 8-3/4" W x 6-15/16" D (90mm H x 225mm W x 180mm D)*

Weight ..... *6.5 lbs. (3.0 kg)*



The PS-250™ Precision Power Supply

Troubleshooting a portable radio on its own battery is hazardous to the portable. One slip and you can smoke an expensive PC board. The PS-250™ has both current limit and current trip protection. Even though you have your head buried in the job, the PS-250™ will beep you when the current setting is exceeded.

The PS-250™ is more than a power supply. It is an important test instrument! The PS-250™ has a digital voltmeter for accurately determining voltage at which the portable fails. It has an analog current meter for use in PA tuning to obtain optimum power efficiency for good battery life.

SPECIFICATIONS: (DSR-100)

Code Capability ..... *Functions with the popular systems of digitally coded squelch having the following characteristics: 23 Bit continuous code stream. 3 Digit Octal ID Number. Data rate of 134 Bits per second, turn-off code of 134 Hz, such as marketed by Motorola, Ferritronics and E.F. Johnson*

Indication ..... *Three digit LED readout, with turn-off code indicator*

Input Impedance .... *100,000 ohms*

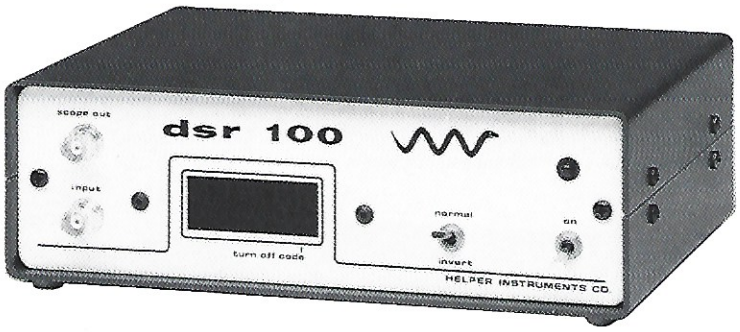
Input Voltage Range *20 millivolts to 4 volts Peak to Peak*

Output ..... *Scope output provided with synchronization pulse for direct viewing of digital pulse train*

Power Requirement .. *110/120 V 220/240 V 5-/60 Hz as chosen by transformer taps or 13.5 VDC*

Dimensions ..... *2-1/8" H x 8-1/4" W x 6-1/8" D (73mm H x 225mm W x 178mm D)*

Weight ..... *2.7 lbs. (1.2 kg)*



Solve digital squelch mysteries with DSR 100™ Digital Squelch Reader

- Decodes digital squelch signals
- Reads out 3 digit code number
- LED indicates turn off code
- Will operate from scanner or Service Monitor Demod jack. Ideal for use with SM-1000 or receiver.

Fast tone measurements with a Toner II™

Frequency errors are the usual cause of tone squelch problems, and accurate measurement of tone frequencies is essential to professional servicing of tone squelch systems.

The measurement accuracy required is about .1 Hz. An ordinary counter takes ten seconds to achieve this resolution. The Toner II™ makes a new measurement and gives a new readout every 1/2 second.

An extremely effective AGC System permits the Toner II™ to operate on inputs anywhere from 5 millivolts to 10 Volts RMS.

The input leads can be connected almost anywhere in the tone system of the radio, and the tone of off-the-air signals can be measured by connecting to the discriminator of any receiver.

Instructions are provided to connect the Toner II™ to scanners. It plugs directly into the scope jack of the SM-1000 Service Monitor, and will operate from the "demod" jack of any Service Monitor.

SPECIFICATIONS: (TONER II™)

Frequency Measurement Range	*50 to 9,999 Hz in three ranges: 50 to 250 Hz, 50 to 999 Hz, 500 to 9,999 Hz*
Accuracy and Resolution	*0.1 Hz or frequencies below 1,000 Hz. 1.0 Hz for frequencies above 1,000 Hz.*
Input Impedance	*100,000 ohms in parallel with test cable capacitance.*
Input Voltage Range	*5 millivolts to 10 volts RMS automatically accommodated by AGC Amplifier voltages.*
Input Filtering	*Six pole low pass filter on the 50 to 250 Hz scale reduces noise and speech interference for measuring CTCSS tones.*
Indication	*Four digit, LCD readout reads frequency directly in Hz.*
Power Requirements	*110/220 V or 220/240 V, 50/60 Hz, as chosen by transformer taps. Also operable from 13.5 V negative ground automotive supply*
Dimensions	*2-7/8" H x 8-3/4" W x 8-7/8" D (73mm H x 225mm W x 178mm D)*
Weight	*2.6 lbs. (1.2 kg)*

Generate and measure tones with the Toner III™

- All of the counter features of the Toner II™ (above)
- PLUS a low distortion tone generator
- Switch selects front panel display of incoming tone or generated tone.
- Continuous adjustment of generated frequency permits testing decoders for proper bandwidth.
- Margin test switch permits momentary reduction of generated level by 6 dB to be sure a decoder isn't just "barely" working.
- Built-in nickel-cadmium battery and charger.
- Squelch tones, "Beep" Tones

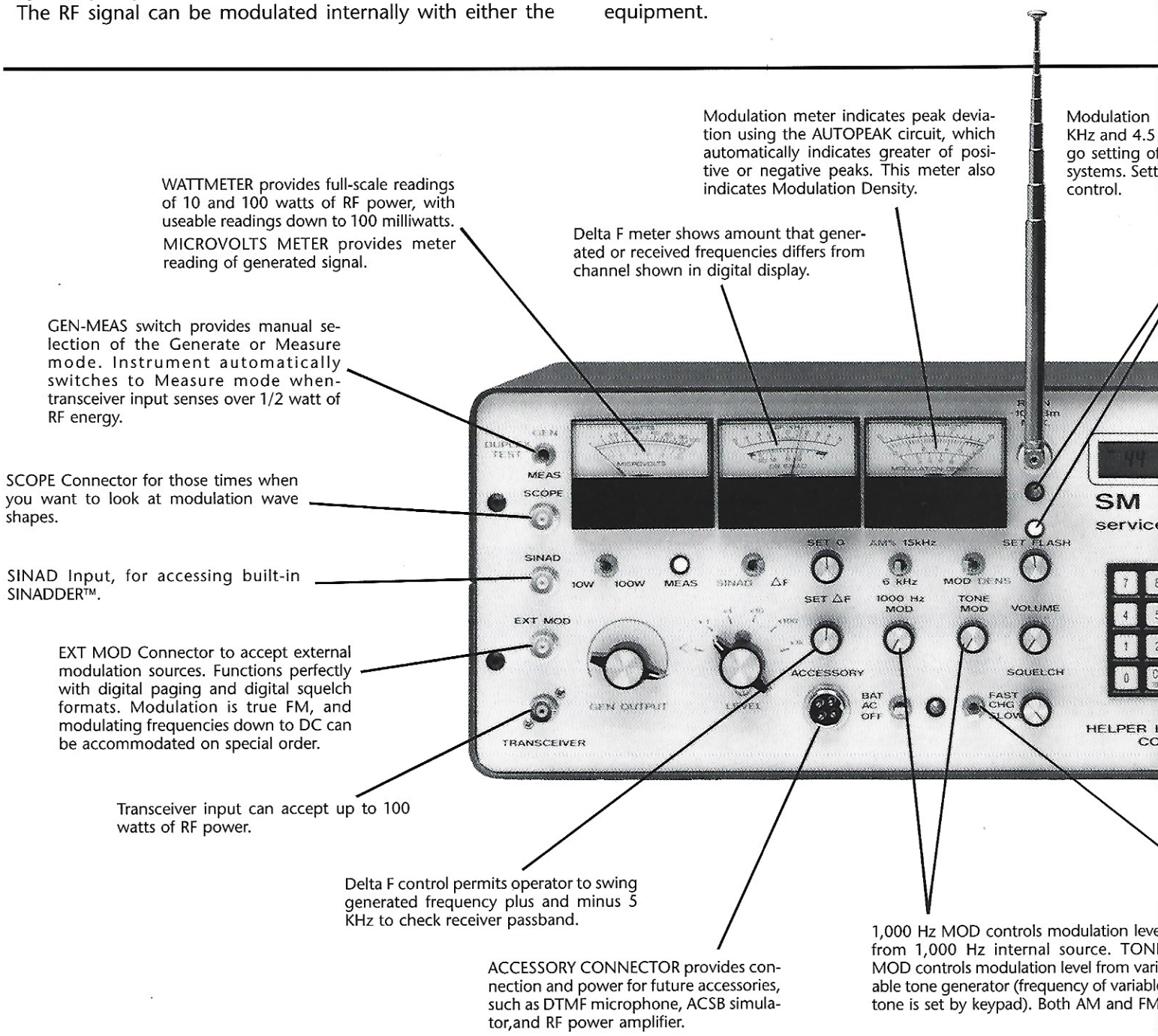
SPECIFICATIONS: (Same as Toner II™, with the following exceptions and additions)

Frequency Generation Range	*50 to 5,000 Hz*
Generate Level	*Up to 1 volt RMS @ 600 ohms*
Generate Accuracy	*Same as Toner II*
Generate Resolution	*Same as Toner II*
Dimensions	*3-1/2" H x 8-3/4" W x 6-7/8" D*
Weight	*4.0 lbs. (1.8 kg)*

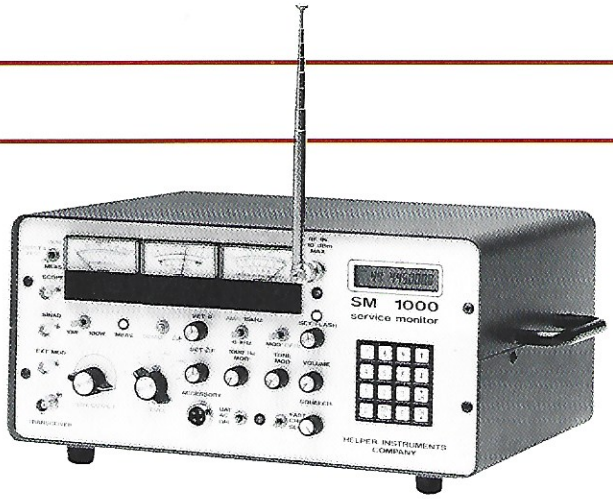
The SM1000 is a complete, full-function service monitor that includes signal generator, modulator, CTCSS and audible tone generator, Sinadder™, 50-Ohm, 100-watt load, power meter, deviation meter, frequency meter and microcomputer controller with a 50-channel memory. The SM1000 includes a battery and battery charger and is completely portable in the carrying case provided.

The signal generator operates from 100 KHz to 1000 MHz and has calibrated output from .1 to 10,000 microvolts for frequencies from 1 MHz to 1000 MHz. The frequency stability is .5 part per million, from 10 to 40 degrees centigrade. The RF signal can be modulated internally with either the 1000 Hz tone generator or the keyboard programmable tone generator, or both can be applied simultaneously. The keyboard-programmable tone generator can be programmed from 40 Hz to 6000 Hz with .1% minimum resolution. Modulation level control is attained with the appropriate front-panel control. In the FM mode, up to 15 KHz deviation can be achieved. The tone frequency can be programmed with RF channel in 50-preset memory locations.

The SM1000 can test receivers completely with the built-in Sinadder™ so that there is no need for additional pieces of equipment.

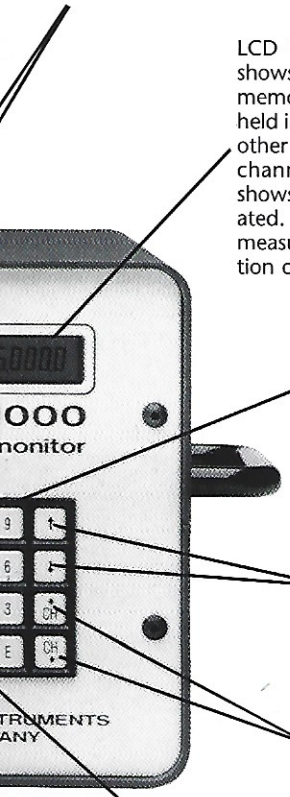


The SM1000 can test transmitters with outputs up to 100 watts with the built-in 50-Ohm load and wattmeter. The frequency meter measures +/- 5 KHz of the frequency on the display and with the step keys the display frequency can be swept in 2.5 KHz steps up or down for locating the signal of interest. The deviation meter displays up to 15 KHz peak and is calibrated in Modulation Density. The modulation meter uses the Autopeak™ circuit to automatically display the larger of the positive or negative modulation. The frequency of the modulation can be displayed on the LCD display. LED lamps can be set to indicate 80% and 100% deviation peaks by setting the flash control.



Built-in 100-watt, 50-Ohm load
Built-in battery and battery charger
Lightweight — only 18 pounds

shers: Normally set at 5
z to provide rapid go-no
eviation control in 5 KHz
adjustable by SET FLASH



LCD CHANNEL FREQUENCY READOUT shows the RF channel in use, with its memory number. 50 Channels may be held in memory along with the CTCSS or other tone frequency associated with the channel. In Generate mode, readout shows the tone frequency being generated. In receive mode, readout shows the measured frequency of any tone modulation on the received channel.

Keypad permits entry of channel frequencies in 500 Hz intervals, and permits entry of associated tone frequencies up to 5,000 Hz, including CTCSS tones. Up to 50 channels and associated tone frequencies can be placed in memory.

Steps channel frequency up or down in 2.5 KHz steps when display is in channel mode. Steps tone frequency up or down in .1 or 1.0 Hz steps when display is in tone mode.

Steps Channel up or down to next channel in memory.

Switches between display of channel or tone frequency.

FAST-SLOW charge selection permits choice of fast battery charge or maintenance charge rate. Internal battery charger functions when unit is plugged into external battery or into AC mains.

SPECIFICATIONS: (SM1000)

Frequency Coverage	*100 KHz to 1,000 MHz*
Generator Output Level	*.1 to 10,000 microvolts above 1 MHz*
Input Sensitive	*.2 microvolts @ 50 ohms 1 MHz to 1,000 MHz*
RF Power Measurement	*Two meter scales cover range from 100 milliwatts to 100 watts of 1 MHz to 1,000 MHz*
Frequency Display	*Liquid crystal displays channel frequency to nearest one-half KHz Display also indicates tone frequency being generated or received.*
Frequency Memory	*Up to 50 channel frequencies, with associated tone frequencies can be held in non-volatile memory.*
Frequency Accuracy	*± .00005% (.5 PPM) from + 10 C to + 40 C*
Channel Frequency Increments	*Channel frequency can be changed by keypad increments of 500 Hz. Analog control permits swinging channel frequency ± 5 KHz from channel center.*
Frequency Modulation	*Up to 15 KHz peak deviation.*
Amplitude Modulation	*Up to 90%*
Internal Modulation	*(1) 1 KHz fixed oscillator with 1 PPM frequency accuracy. (2) Digitally controlled oscillator with .1 Hz increments up to 1,000 Hz and 1 Hz increments up to 6,000 Hz.*
External Modulation Provisions	*Panel connector accepts external modulation source up to 5,000 Hz. Frequency modulation is possible with modulating frequencies down to near zero, permitting use of digital squelch and digital paging formats.*
Peak Modulation Metering	*Analog meter displays FM peak deviation on a 6 KHz range and a 15 KHz range, AM a single 100% range.*
Modulation Density	*Analog meter displays Modulation Density (average modulation).*
FM Peak Flashers	*A red LED flashes on 5 KHz (presettable by operator), and a yellow LED flashes at 90% of preset value.*
RF Power Measurement	*Two scales provide power measurement from .1 watt to 100 watts over a frequency range from 1 MHz to 1,000 MHz.*
SINAD	*Built-in SINADDER™*
Power supply	*(1) 110/220 V or 110/240 V, 50/60 Hz, selectable from rear panel. (2) 13.6 V vehicular, negative grounded vehicular system. (3) Internal battery. Internal battery can be charged from AC line or external battery.*
Dimension	*13.5" W x 6.8" H x 11.5" D (34.3 cm W x 17.3 cm H x 29.3cm D)*
Weight	*18 lbs. (8.2 kg)*
Accessories supplied	*Carrying case, Antenna*

Solve those tricky RF problems with a RF Millivolter™

Helper Instruments Model RF-801 RF Millivolter™ is an excellent tool for the Radio Technician. It allows the technician to measure RF circuit performance and quickly isolate defective circuits. The analog meter allows tuning of circuit components and the handy probe permits on board measurements to be made.

- FULL VOLTAGE RANGE: 300 microvolts to 100 volts
- FULL FREQUENCY RANGE: to beyond 1.6 GHZ
- LESS THAN 2 PICOFARADS circuit loading
- Check receivers from antenna jack to discriminator
- Check transmitters from oscillator to antenna jack
- Check solid state antenna relays

Call Helper for your free copy of "RF Voltmeters"

Now every test bench can have a full range RF voltmeter with traditional Helper quality and service

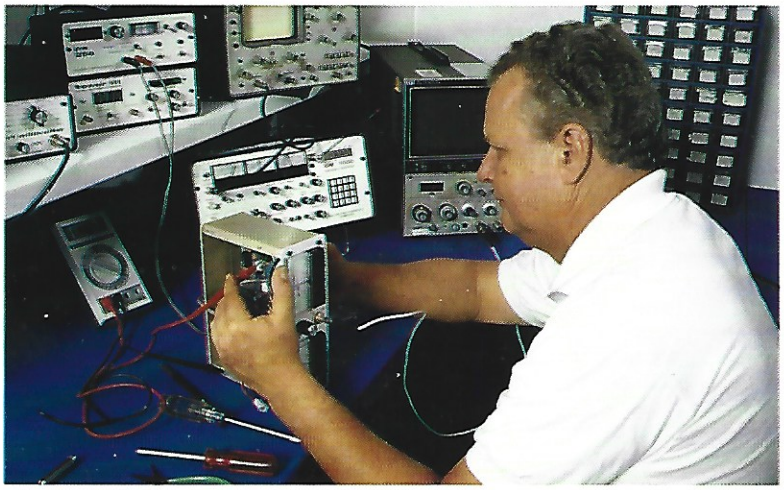
Model RF-801, with accessories
Model RF-UTA, unterminated BNC adapter
Model RF-SP, spare probe and cable, matches probe supplied with instrument if ordered at same time.

SPECIFICATIONS:

Voltage Range	*1 millivolt to 3 volts (full scale). Lowest useful reading 300 microvolts. Measures to 100 volts with 50 dB Attenuator (supplied).*
Accuracy	*(As measured with 50 ohm terminating BNC Adapter)* *20 kHz 520 MHz: 1.0 dB* *520 MHz to 1000 MHz 1.5 dB* *1000 MHz to 1600 MHz 3.0 dB* *Usable as indicator to 3GHz*
Probe Input Impedance	*100,000 ohms. In parallel with 2 pf*
50 dB Adapter Input Impedance	*1.2 pf*
Indication	*Calibrated in RMS volts and dBm. True RMS reading on bottom four scales*
Power Requirements	*110/120 V or 220/240 V, 50/60 Hz as chosen by transformer taps. Also operable from 13.5 V negative ground automotive supply.*
Dimensions	*3" H x 8-1/2" W x 6-1/8" D (76mm H x 216mm W x 175mm D)*
Weight	*4.2 lbs. (1.9 kg)*
Accessories Supplied	*Probe with 4' Cable* *Low inductance grounding probe cap* *50 dB Attenuator* *Teflon™ probe nose extension* *Protective grounding lead* *50 ohm Terminating BNC Adapter* *12 volt plug*
Optional Accessories	*Unterminated BNC Adapter*

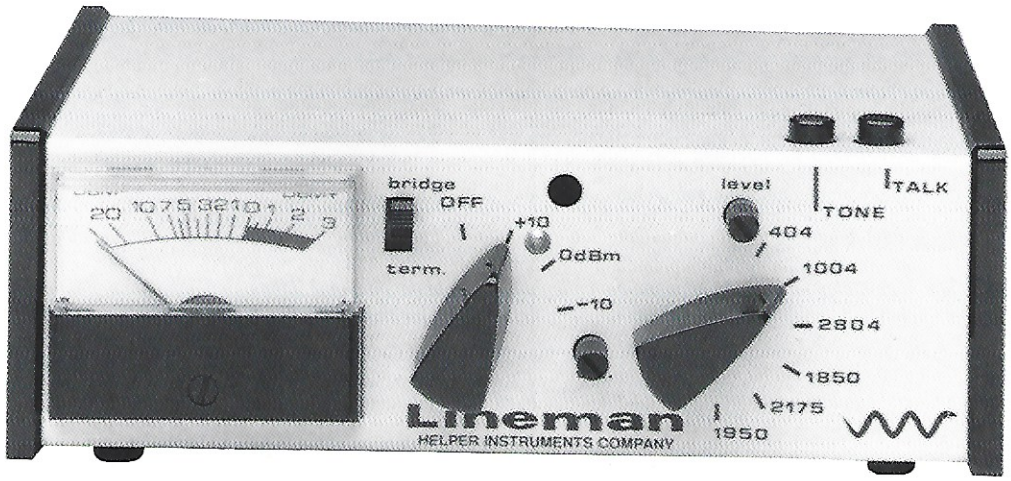
Customer Service

Helper Instruments responds to customer needs both in their timely repair of instruments and the unique customer application modification. It is not uncommon for Helper customers to call for advice on troubleshooting service problems or additional information on how our products fit in with their complete test setup.



John Pennington, one of Helper's head technicians, putting the final touches on the MATCHBOX 800.

Model LM-106 Lineman™



The LINEMAN™ is a low cost, handy instrument for making the following checks.

Tone remote systems can be a headache. A little moisture on the phone lines and the high frequency attenuation goes up even though speech sounds normal. If you have inadequate margin for the high frequency tones the transmitter won't key. It's good practice to record tone levels and see that you have at least 6 dB margin.

- LISTEN TO THE LINE
- COMMUNICATE WITH THE DISPATCHER FROM THE BASE STATION
- MEASURE LINE LEVELS
- MEASURE TONE REMOTE LEVELS
- USE AS A PAIR FINDER

SPECIFICATIONS (LINEMAN™)

Send Tones	*TELCO: 404Hz, 1004 Hz, 2804 Hz TONE REMOTE: 1850 Hz, 2175 Hz (guard) 1950 Hz*
Meter	*Measures send and receive levels from -30 dBm to + 12 dBm, using three scales*
Intercom	*Built-in electret microphone and speaker, adjustable volume*
Line Impedance	*Switchable - bridging or terminating (600 ohm)*
Test Leads	*Permanently attached*
Power	*6 "C" cells (included), battery "on" lamp*
Dimensions	*2 1/2" H x 7 1/4" W x 6 1/2" D 6.4 cm H x 18.4 cm W x 16.5 cm D*
Weight	*3 lbs. (1.4 kg)*

Call Helper for your free copy of "Line Measurements Speed Control System Troubleshooting"

Model MB-800

Match Efficiency Meter, SWR Meter

The MATCHBOX™ provides foolproof, accurate measurements of antennas in the 800 to 1000 MHz frequency range, including Cellular and SMR antennas in vehicles.

Operation of the MATCHBOX™ does not require a transceiver. Simply connect the MB-800 to the connector at the end of the feed line, adjust the MB-800 to the desired frequency, and read off the SWR or Match Efficiency directly, with no computation required. The SWR calibration gives you the traditional measurement, while the Match Efficiency scale tells you directly how much is being lost by an imperfect match.

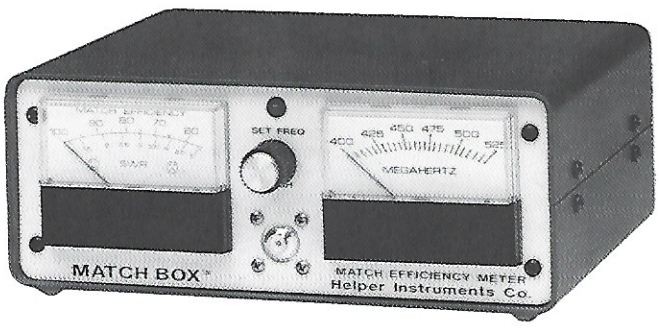
The MATCHBOX ™ generates its own tiny signal; a radio transceiver is not needed for the measurements. Now you can check the antenna performance on the receive channels as well as the transmit channels. With the MB-800, you can be certain that "on-glass" antennas are working over the full band of receive and transmit frequencies.

Helper Instruments is known for its line of innovative, labor-saving test equipment. The MATCHBOX™ has furthered this reputation by making antenna measurements more convenient and meaningful.

SPECIFICATIONS: (MB-800)

Frequency Range .....*775 to 1,025 MHz*
Metering .....*Analog meters for frequency and SWR/ Match Efficiency*
Indicated SWR (VSWR): ...*1.0:1 to 5.0:1*
Indicated Match Efficiency *60% to 100%*
Connectors .....*Universal panel connector with adapters for TNC, BNC, N, and MiniUHF. Others available.**
Power Supply .....*Six "C" Cells*
Construction .....*Rugged metal enclosure*
Size .....*3 H x 8 1/2 W x 6 D (inches) 76 H x 216 W x 175 D (mm)*
Weight .....*4.2 lbs. 1.9 kg*

**Adapters listed above are available from Helper Instruments. Others may be purchased from Unidapt™ distributors.*



The MATCHBOX™ . . . every installer's friend!

The MATCHBOX™ provides foolproof, accurate measurements of antennas in the UHF 400 to 525 MHz frequency range, including UHF conventional and community repeater system antennas on vehicles.

Operation of the MATCHBOX™ does not require a transceiver. Simply connect the MB-450 to the connector at the end of the feed line, adjust the MATCHBOX™ to the desired frequency, and read off the SWR or Match Efficiency directly, with no computation required. The SWR calibration gives you the traditional measurement, while the Match Efficiency scale tells you directly how much is being lost by an imperfect match.

The MATCHBOX™ generates its own tiny signal; a radio transceiver is not needed for the measurements. Now you can check the antenna performance on the receive channels as well as the transmit channels. With the MB-450, you can be certain that the antennas are working over the full band of receive and transmit frequencies.

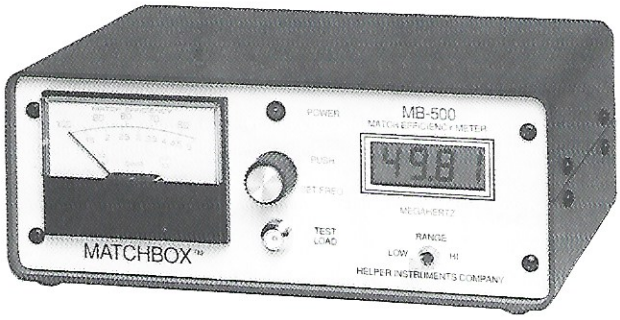
Helper Instruments is known for its line of innovative, labor-saving test equipment. The MATCHBOX™ has furthered this reputation by making antenna measurements more convenient and meaningful.

SPECIFICATIONS: (MB-450)

Frequency Range .....*400 to 525 MHz*
Metering .....*Analog meters for frequency and SWR/ Match Efficiency*
Indicated SWR (VSWR): ...*1.0:1 to 5.0:1*
Indicated Match Efficiency *60% to 100%*
Connectors .....*Universal panel connector with adapters for TNC, BNC, N, and MiniUHF. Others available.**
Power Supply .....*Six "C" Cells*
Construction .....*Rugged metal enclosure*
Size .....*3 H x 8 1/2 W x 6 D (inches) 76 H x 216 W x 175 D (mm)*
Weight .....*4.2 lbs. 1.9 kg*

**Adapters listed above are available from Helper Instruments. Others may be purchased from Unidapt™ distributors.*

Model MB-500



The MB-500 . . . Designed with the installer in mind

This easy-to-use antenna tester is designed with the installer in mind. An internal generator enables the unit to test antennas anywhere in its frequency range without the use of an external transmitter or reflection bridge. Simply press the momentary on-off switch, tune to the desired frequency and read the indicated VSWR or match efficiency directly. The frequency range of the MB-500 was chosen to provide coverage for the HF, VHF and UHF bands. Other models are available for the 800-1000 MHz band and the 400-525 MHz band. Metering for frequency is digital, with 2 bands (2-90 MHz and 80-550 MHz). For SWR/match efficiency metering is analog (1:1-5:1, 100% - 55%). The output signal is 100% AM modulated at approximately 1600 Hz. A universal panel connector allows interchanging the N, BNC, UHF and MiniUHF.

The MB-500 is available with a factory-installed MBACC5. This option offers an on/off switch that allow the MATCHBOX™ to be left on while you make antenna adjustments. The supplied AC adapter recharges the internal NiCad battery while providing power to the MB-500.

SPECIFICATIONS (MB-500)

Frequency Range ....*2.0 - 550.0 MHz*
Metering .....*Frequency — Digital, 2 bands, 2.0 - 90.0 MHz, 80.0 - 550.0 MHz*
SWR/match efficiency - Analog, SWR-1.0:1 to 5.0:1
Match Efficiency — 100% to 55%
Power Output .....*-15 dBm (31 microwatts)*
Output Signal .....*100% AM modulated at Approx. 1600 Hz*
Connectors Supplied *Universal adapter for N, BNC, UHF and MiniUHF.*
Construction .....*Sturdy 13 gauge aluminum cabinet.*
Size .....*3.5 in. (8.89mm) x 8.9 in. (22.61mm) x 6.9 in. (17.53mm)*
Weight .....*4.2 lbs. (1.9 kg) — 3.7 lbs. (1.7 kg) w/option*
Power Supply .....*Six Alkaline "C" cells. (w/o option)*
MBACC5 Option .....*12 volt internal NiCad battery, on-off slide switch, AC wall transformer.*

**Adapters listed above are available from Helper Instruments. Others may be purchased from Unidapt™ distributors.*

Design Innovation

Helper Instruments is known for design of new instruments that meet the radio equipment serviceman's needs. From the first SINADDER™ to the recent MATCHBOX™, our Design Engineers use the latest technology for the most efficient designs. These novel solutions to service and maintenance technicians' problems provide your business with improved efficiencies and lower operating costs.

The new product development starts with the customer's problem and with the selection of approaches to solve that problem. With the use of computer-aided design, theories are examined and real-world solutions are prototyped and tested. Helper Instruments has communications-industry experience to aid it in the design process. Engineering Consultant Carl Hamann has accumulated over 20 years of service with major radio equipment manufacturers as a Designer, Manager, and Director in both Engineering and Quality Assurance functions. He has also served on various trade industry committees in the development of testing procedures and methods for radio equipment. With this unique combination of experience, know-how, and tools, Helper looks forward to the development of more new products that provide innovative solutions to your testing challenges.

Carl Hamann, Engineering Consultant at the company.

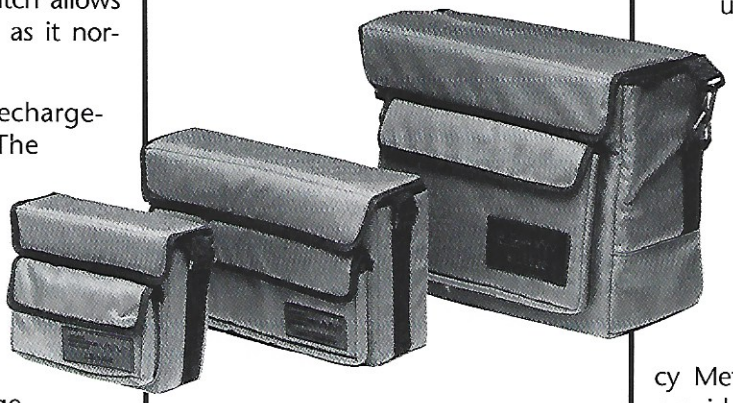
MBACC1 Circuit Panel with NiCad Battery Pack

The MBACC1 is a factory or field installed circuit panel with a NiCad battery panel that adds three new functions to your MATCHBOX™.

The first function is an ON/OFF switch that allows the MATCHBOX™ to be left on while you make antenna adjustments. This switch makes it unnecessary to push in the frequency control while operating the instrument. When in the OFF position the switch allows the MATCHBOX™ to work as it normally would.

The second function is a rechargeable NiCad Battery Pack. The battery pack is automatically charged whenever the wall plug charger is plugged in. It takes about 10 hours to charge the battery to full capacity. It takes about 3 hours to discharge the battery from full charge if you forget to turn off the ON/OFF switch. The charger will always charge the battery even if the MATCHBOX™ is turned off. The green LED on the front of the MATCHBOX™ will no longer light when the battery falls below acceptable operation voltage. The meters will still read under these conditions but calibration may no longer be accurate.

The third function is a frequency divider that provides a frequency output of the operating frequency divided by 1,000,064. This means you can use an external digital frequency counter to count the frequency by plugging an RCA Phono plug cable into the back of the MATCHBOX™. Using a TONER III in the counter function you can display your frequency to 4 digits. For example, if your MATCHBOX™ is operating at 800 MHz the TONER III counter will display 800.0 Hz with the appropriate switches set. As you can see, it is very easy to interpret this reading as a MegaHertz reading.



Carry Cases

Helper Carrying Cases have a compartment for the instrument, a compartment for the accessories, room for the instruction book, and a handy strap that may be adjusted for shoulder comfort. These features allow use of the instrument while in the case and strapped across your shoulder.

Helper offers Carry Cases for the LINEMAN™, SM1000 Service Monitor and the MATCHBOX™ series.

MBACC2

The MBACC2 is a set of calibrated loads and an adapter that allows users of the MATCHBOX™ line of antenna testers to check and recalibrate their VSWR/match efficiency meter.

Included in the kit are calibration loads of 1:1, 2:1, and 3:1 VSWR, which, when used in conjunction with the adapters provided, can quickly check the calibration of the VSWR/match efficiency Meter. A calibration procedure is provided to recalibrate the meter if necessary.

The following application notes are available, free of charge, from Helper:

- ☐ Everything you need to know about SINAD
- ☐ SINAD alignment for optimum performance
- ☐ Line measurements speed control system troubleshooting
- ☐ What the modulation monitor has "missed"
- ☐ Troubleshooting with your power supply
- ☐ RF voltmeters
- ☐ MATCHBOX™ line

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HELPER INSTRUMENTS COMPANY

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