Larry McGee Co.
COMMUNICATION AND CONTROL SYSTEMS

VHF/UHF Antenna Tester

Model 77-97003

User's Manual, P/N 77-97003

LARRY McGEE
Division of ***Miller Ingenuity***
Communication and Control Systems
1155 E 8th St, Winona MN 55987
Phone: 507-452-2461

Foreword
The Larry McGee Company's VHF/UHF Antenna Tester is designed to provide a quick & reliable method of testing the antennas of the UHF Head-of-Train radio and VHF voice radio in a locomotive. It is built in a handy and rugged plastic carrying case and includes the extender cables required for most situations.
The Tester uses a built-in 2-Watt UHF radio to test the Head-of-Train (UHF) radio antenna and uses the locomotive's own VHF voice radio to provide rf power used in the test of the VHF antenna. Power for the Tester's circuits and UHF radio is provided by a rechargeable 12 volt gel cell battery. A charger is included with the Tester.

Manual Sections

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1. Introduction: Description & Applications

The Larry McGee Company's VHF/UHF Antenna Tester, Model 77-97003, provides a method of quickly testing VHF and UHF antennas. In particular, it is designed to test the VHF antenna of a locomotive's voice radio and the UHF antenna of a locomotive's Head-of-Train and Distributed Power radios. In these applications, the Tester uses the RF from the locomotive's VHF radio for the antenna test and it uses a built-in UHF radio for the HOT antenna test. Jumper cables are provided to facilitate testing antennas typically found on locomotives. The Antenna Tester can also be used to test antennas other than those on a locomotive. Figure 1, "Block Diagram", illustrates the operation of the Antenna Tester and describes how the device analyzes the forward and reflected signal to determine Standing Wave Ratio.

2. Setting Up and Using the VHF/UHF Antenna Tester

CHARGING THE BATTERY:

Before using the Antenna Tester, ensure its internal battery is fully charged. The Antenna Tester contains an internal 12-volt "gel cell" battery. Use the Model (PST-3P10-12VB) Charger to charge the battery. This charger "fast charges" a low battery then automatically shifts to "float" once the battery has been fully charged. LEDs on the Charger indicate the charge state of the battery (Red = Charging, Green = Charged/Float, Green Flashing = Finishing Charge, Red and Green Flashing Alternately = Reverse Polarity or Short Circuit). The Tester cannot be used while the charger is plugged in.

The "GOOD", the "MARGINAL" and the "FAILED"

The VHF/UHF Antenna Tester measures and compares forward and reflected RF power (i.e., SWR) in the antenna system being tested. The "Test" LED illuminates green if the antenna system checks out "Good", yellow if it checks out "Marginal" and red if it checks out "Bad". An antenna checking out as "Marginal" can be considered acceptable, but its condition should be noted for future reference. The SWR (Standing Wave Ratio) is computed thus:

$$SWR = (V_{fwd} + V_{ref})/(V_{fwd} - V_{ref})$$

Jumpers on the bottom of the DC Amp Board allow changing of the "Good", Marginal" and "Failed" test points, according to the following chart:

"MARGINAL"	"FAIL"	JB1A	JB1B
1.5 – 2.0	>2.0	IN	IN
2.5 – 3.0	>3.0	OUT	IN
3.5 – 4.0	>4.0	IN	OUT
4.5 – 5.0	>5.0	OUT	OUT

Normally, the Tester is shipped with both jumpers "IN". Upon request, they can be provided at other positions. The jumpers can be repositioned by the user, but it is recommended that only an authorized and trained technician do so.

OPERATION:

The VHF/UHF Antenna Tester tests antenna systems using either the internal 2-Watt UHF radio or an external radio of up to 60 Watts. The internal UHF radio is intended for use with UHF antenna systems, especially those with a transmitter that does not provide a convenient method of transmitting for several seconds during an antenna test.

Using the Internal Radio to test a UHF antenna system –

To use the internal radio, use the following cable connections:

- Connect cable 85-61017-005 between the "Internal UHF Radio" connector and the "External Radio" connector on the front panel of the Tester.
- Connect the UHF antenna cable being tested to the "Antenna" connector on the front panel of the Tester. If needed, use one of the provided jumper cables between the end of the antenna cable and the "Antenna" connector on the Tester. Cable 85-61017-011 provides an "N" female connector to connect to the antenna cable.

With the cables in place, the antenna can be tested:

- Turn the Tester power switch "on" and verify the "Battery ON/OK" LED is green. If it dims in general or while testing, the battery is to be recharged. If it does not turn on, the battery is below minimum voltage. Disregard any test results if this LED is not illuminated.
- Actuate the "Internal UHF Radio PTT" switch for a few seconds (until the "TEST" LED illuminates steadily). If the "TEST" LED is green, the antenna system is good, if yellow, it is marginal and if red, it failed the test. A flashing red LED indicates an RF overload (i.e., > 60 Watts) or a fault (e.g., hooked the cables to the wrong connectors).

Using an External Radio to test a VHF or UHF antenna system –

To use an external radio, use the following cable connections:

- Connect the radio output to the "External Radio" connector on the front panel. Cable 85-61017-009 is equipped with a "UHF" male connector. Other connectors are available by special order. The external radio output power can be a maximum of 60 Watts. Greater than 60 Watts results in a flashing red Test LED.
- Connect the antenna system directly to the "Antenna" connector on the front panel or, if needed, use one of the jumper cables provided. Cable 85-61017-010 is equipped with a "UHF" female connector.

With the cables in place, the antenna can be tested.

- Turn the power switch "on" and verify the "Battery ON/OK" LED is green. If it dims in general or while testing, the battery is to be recharged. If it does not turn on, the battery is below minimum voltage. Disregard any test results if this LED is not illuminated.
- DO NOT actuate the "Internal UHF Radio PTT" switch. Instead, actuate the PTT of the external radio for a few seconds (until the "TEST" LED illuminates steadily). If the "TEST" LED is green, the antenna system is good, if yellow, it is marginal and if red, it failed the test. A flashing red LED indicates an RF overload (i.e., > 60 Watts) or a fault (e.g., hooked the cables to the wrong connectors).

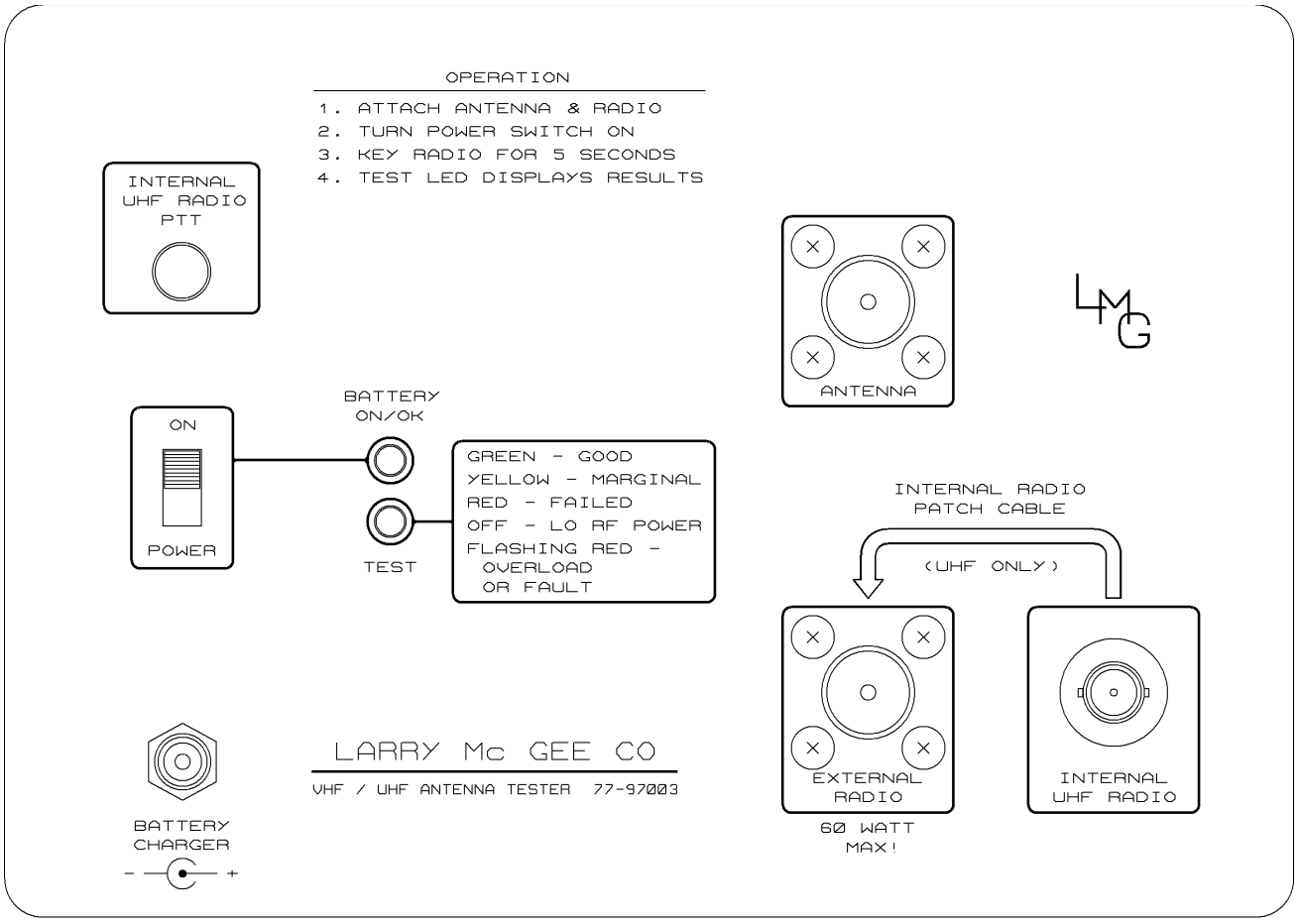


Figure.1 Front Panel of VHF/UHF Antenna Tester

Calibration

The Antenna Tester is calibrated at the factory before being shipped to the customer. The suggested calibration is once every two years. At that time, the gel-cell battery can also be replaced.

3. Specifications and Ordering Information

Size: App. 7 pounds
Weight: 10H x 10W x 7 1/2D
Operating Temperature Range: -20C to +60C

Four forward/reflected power ratio ranges available with internal jumpers. The jumpers are accessible by removing the Tester assembly from the carrying case, then removing the steel cover over the circuit boards.
"Marginal" and "Fail" points are jumper selectable to any of the following SWR values.

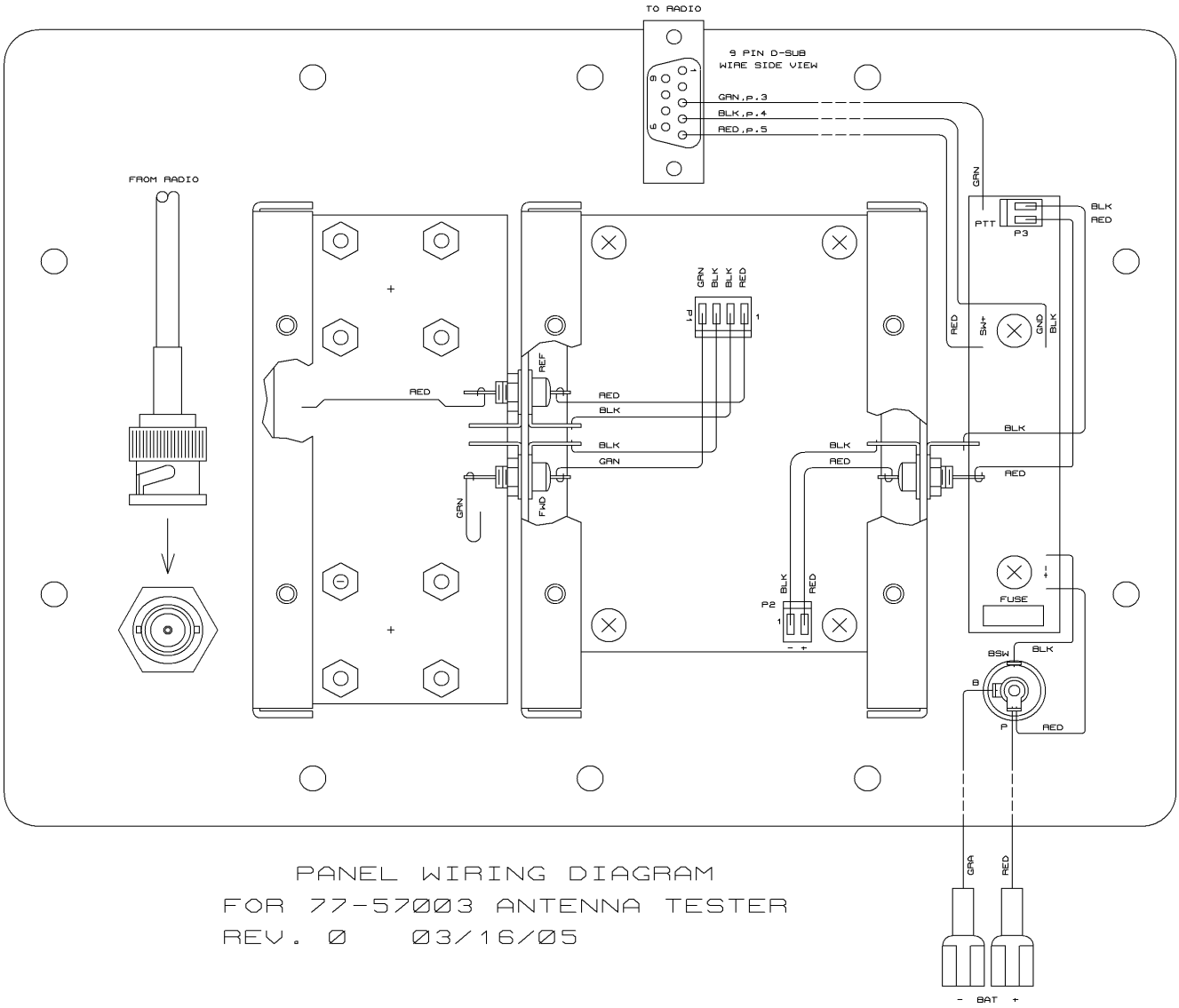
Marginal	Fail	JB1A	JB1B
1.5 – 2	>2	IN	IN
2.5 – 3	>3	OUT	IN
3.5 – 4	>4	IN	OUT
4.5 – 5	>5	OUT	OUT

Power consumption (nominal 12VDC battery power) -
Idle and Testing using external radio: 100 mA or less
Testing, using internal radio: 1,000 mA or less

77-97003	UHF/VHF Antenna Tester

Components of the VHF/UHF Antenna Tester available as replacement parts:

85-61017-005	UHF Radio Antenna for internal radio
85-61017-006	Internal Radio to External Radio Cable
85-61017-009	VHF Radio Cable
85-61017-010	VHF Antenna Cable
85-61017-011	UHF Antenna Cable
PST-3P10-12VB	Battery Charger with Cable
ERX-1006-00	AES 2-Watt UHF Radio, Model 7085-UE
EJX-1003-00	12 V nominal, 2.0 (or better) Amp-hour gel cell battery



PANEL WIRING DIAGRAM
FOR 77-57003 ANTENNA TESTER
REV. 0 03/16/05

Wiring Diagram of VHF/UHF Antenna Tester