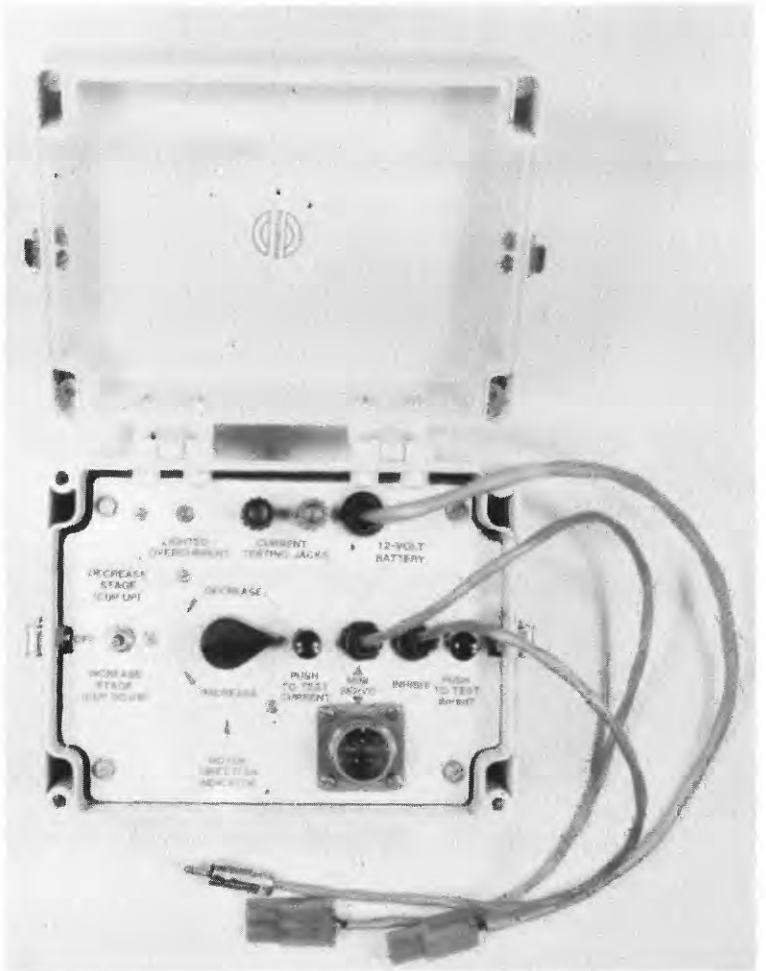
OPERATING MANUAL FOR THE MINISERVO-CONTROL TESTER



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OPERATING MANUAL FOR THE MINISERVO-CONTROL TESTER

By William L. Rapp

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FIGURES

Figures 1-2, Diagrams showing:

1. Connection of miniservo-control tester to miniservo-control unit 4

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1.0 INTRODUCTION

After the implementation of miniservo-control (MSC) units with manometers at U.S. Geological Survey streamflow stations, the need for an effective and efficient MSC tester was paramount among field personnel. A better technique and instrument was needed to test the status of the manometer and MSC. In numerous cases, MSC failures were blamed on battery failures and vice versa. There was no valid instrument to definitively identify the failed unit and properly diagnose the MSC/manometer system. The Geological Survey developed various testers, but none proved capable of doing the complete job required.

In 1983, two MSC testers were developed and fabricated. One was mechanical in operation; the other was electronic. The testers were extensively used and evaluated under a wide range of environmental conditions in Maine, Ohio, Kansas, and Louisiana. The consensus to integrate the best aspects of both testers into one instrument allowed the Survey to provide an effective MSC tester.

Thus, the MSC tester (MSCT) was originated and developed. A few dedicated individuals convinced the Hydrologic Instrumentation Facility's Instrumentation Development Laboratory that such a tester could become a reality if sufficient effort was expended in the proper direction. The Geological Survey acknowledges the concern and initial design efforts of these individuals.

2.0 GENERAL DESCRIPTION

The tester is housed in a Lexan box with a water-resistant, gasket-sealed lid. By using the MSCT, the field technician can determine if the MSC is operating properly. If the MSC is drawing too much current, a red, light-emitting diode (LED) lamp on the MSCT operating panel will light. The MSCT checks all MSC functions and, when used with a milliammeter, reflects the current being drawn by MSC and the manometer system. (See section 4.0.)

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[1] Use of the brand name Lexan in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

3.0 TECHNICAL SPECIFICATIONS

3.1 Mechanical Specifications

Physical dimension of case	Width, 6-3/4 inches Height, 3-5/8 inches Depth, 5 inches Weight, 1.75 pounds
Test box material	Lexan
Connector types	MS3102A14S-5P on operating panel MS3106A14S-5S mating cable connector (on servo cable) 3-way banana plug jacks (on operating panel) Switch craft 3502 phone plug (on tester inhibit cable) USGS HIF 5305022 battery connector (red) on tester miniservo cable USGS HIF 5305018 battery connector (orange) on tester battery cable

3.2 Electrical Specifications

Power	12-V battery
Type of display	Overcurrent light-emitting diode (LED) panel lamp Motor-driven direction knob on motor shaft tester motor
Operating current	0.825 milliamperes (when unit is not connected to miniservo-control)
Ambient temperature operating range	$-40^{\circ}C$ to $+ 65^{\circ}C$
Controls	Toggle and push-type switches

4.0 OPERATION

Connect the test setup as shown in figure 1.

4.1 Indicator Lamp

The red LED lamp on the operating panel of MSCT indicates whether MSC is drawing more or less than 100 microamperes of current. Normally, MSC will indicate less than 5 microamperes of current drain by showing LAMP OUT. However, component tolerances can cause a current drain of up to 100 microamperes, which is considered acceptable. The LED lamp will light (excessive current warning) when MSC current drain exceeds the trip point (approximately 100 microamperes) of MSCT current-detector electronics.

4.2 Miniservo-Control Standby Current Test

In testing MSC standby current, the following conditions must be met:

- o "Increase-decrease" switch in OFF position
- o "Push to test current" switch in OUT position
- o "Push to inhibit" switch in OUT position
- o "Delay" switch on MSC should be in OFF position.

The current meter, if used in conjunction with the MSCT, will indicate NO current drain (zero reading) and the red (overcurrent) LED lamp on the test box panel will NOT be lighted. All conditions to this point are indicative of a properly operating MSC.

When conditions are as stated above, press the "push to test current" switch, read the meter, and release the "push to test" switch. The meter should reflect a value between 0 and 100 microamperes (0.1 milliampere (mA)). If the LED lamp was lighted, the meter should indicate more than 0.1 mA, and the MSC should be considered bad. More than 0.1 mA causes excessive battery current and the expected battery life will be shortened.

4.3 Miniservo-Control Motor Direction and Motor Drive Capability Tests

With the tester, check MSC motor direction by using the following methods:

- o "Increase-decrease" switch on MSCT in decrease stage (CUP UP) position causing motor direction indicator to rotate in a counterclockwise direction (direction of DECREASE arrow), and
- o "Increase-decrease" switch on MSCT in increase stage (CUP DOWN) position causing motor direction indicator to rotate in a clockwise direction (direction of INCREASE arrow).

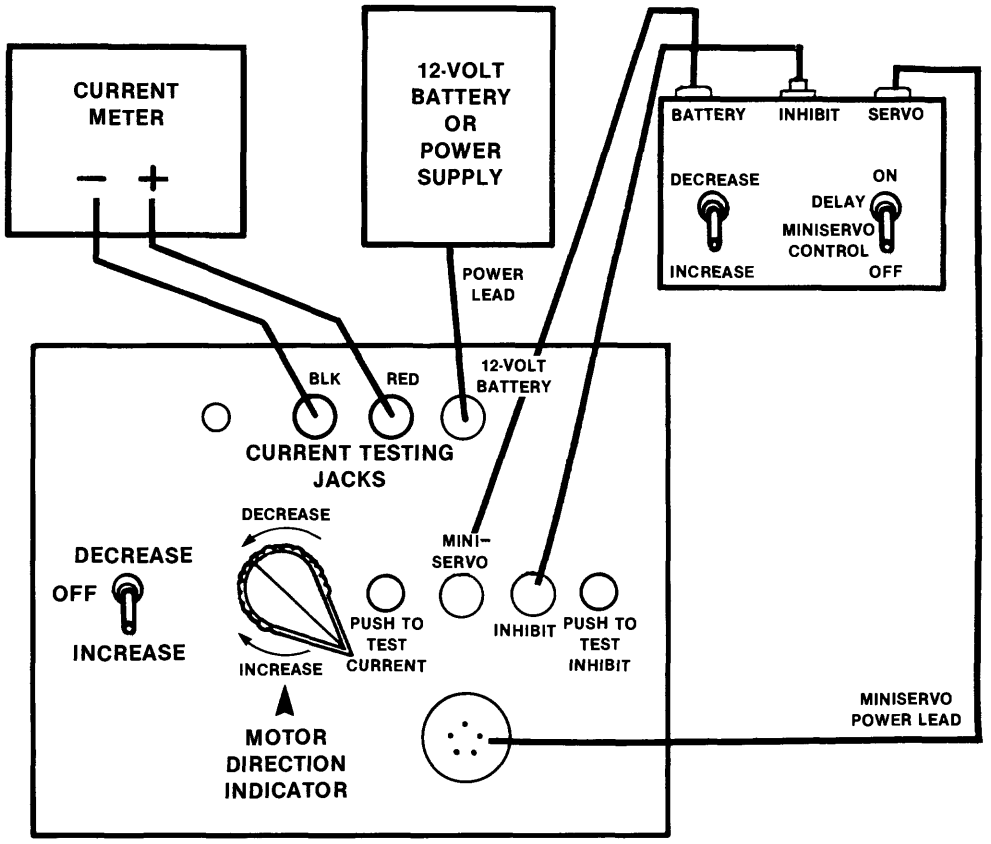

Figure 1.--Connection of miniservo-control tester to miniservo-control unit.

Check MSC motor drive capability with MSCT "increase-decrease" switch in OFF position. Switching MSC's "manual drive" switch first to DECREASE position, then to INCREASE position should result in counterclockwise, then clockwise, rotation of the MSCT motor direction indicator.

4.4 Miniservo-Control Inhibit Capability Test

With the MSCT "increase/decrease" switch in the decrease stage (CUP UP) position and the motor direction indicator rotating counterclockwise, push the "press to test inhibit" switch. The motor direction indicator should STOP rotating and should START rotating again when the switch is released.

With the MSCT "increase/decrease" switch in the increase stage (CUP DOWN) position and the motor direction indicator rotating clockwise, push the "press to test inhibit" switch. The motor direction indicator should STOP rotating and should START rotating again when the switch is released.

4.5 Miniservo-Control Time-Delay-Period Test

There are provisions for MSC time delay periods of approximately 15 to 22 seconds and 30 to 43 seconds. (See Miniservo-Control Instruction Manual.)

With the MSC "delay" switch in the ON position, and the MSCT increase/decrease" switch in the DECREASE position, note the time that the MSCT switch was turned on. At the end of the MSC time interval selected, the motor direction indicator will start turning. The time (in seconds) between turning the "increase/decrease" switch on and when the motor direction indicator starts to turn, is the time delay period for decrease-stage condition.

Using the above instructions, but pushing the "increase/decrease" switch to the INCREASE position will reflect the time delay period for an increase-stage condition.

4.6 Miniservo Time-Delay Current Test

If desired, the charge rate of the time delays can be monitored on the current meter used with the MSCT by keeping the "push to test current" switch depressed while the "increase/decrease" switch is operated. However, when the motor indicator starts turning, caution must be exercised as the current rate increases from about 10 mA to approximately 125 mA. Damage to the current meter used with the MSCT can occur if the meter is on a low amperage scale.

4.7 Manometer Motor Current Test

Connect equipment as shown in figure 2.

With MSC "increase/decrease" switch in the DECREASE position and the test box "push to test current" switch in the DOWN position, the current meter connected to the MSCT will indicate the current drain of the manometer motor.

With MSC "increase/decrease" switch in the INCREASE position and the test box "push to test current" switch in the DOWN position, the manometer motor current drain in the opposite direction is indicated by the current meter.

Note: The current drain for a manometer motor can vary considerably depending on temperature, grease, bearings, accumulative friction in the manometer and other factors. A practical method for each installation is to take a current reading when the battery life at the installation is satisfactory or at time of installation and compare future readings to this reading. (A locally designed chart based on field trips to each area could be used for this purpose.) Drastically higher current values probably would reflect a problem in some part of the manometer system. Lower readings probably reflect temperature-related changes. For guidance on actual expected values of current, see page 8 of the Rechargeable 12-Volt Power System: Implementation Guide 7-83-01.

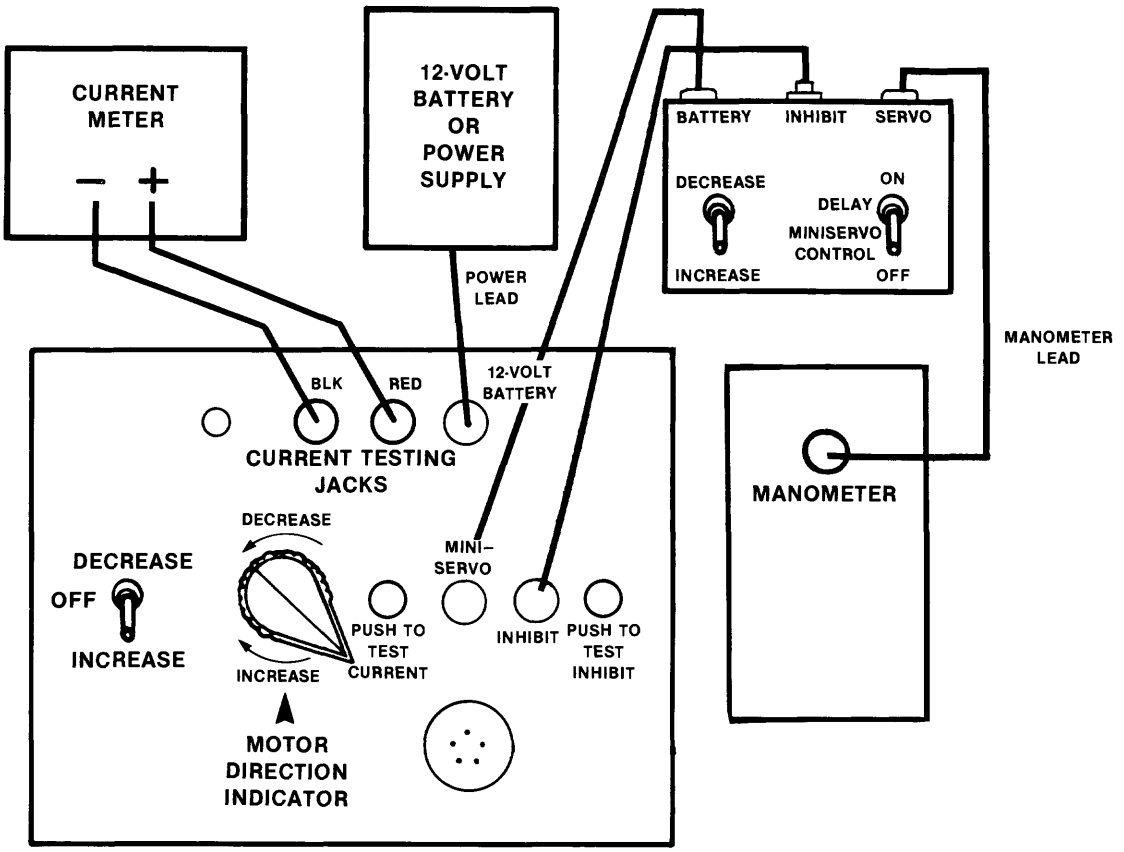

Figure 2.--Miniservo-control tester setup used in checking manometer motor current.