DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DS, AND GS MAINTENANCE MANUAL

OPERATION AND MAINTENANCE INSTRUCTIONS FOR OSCILLOSCOPE FD-765MH (PORTASCOPE)

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Operator, Organizational, DS, And GS Maintenance Manual

OPERATION AND MAINTENANCE INSTRUCTIONS FOR OSCILLOSCOPES 765MH AND 765MA (PORTASCOPES)

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CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for operation, and for organizational, DS, and GS maintenance of oscilloscopes 765MH and 765MH/F (Portascopes) (Fig. 1-1).

b. Precautionary measures to be taken during operation and maintenance of the oscilloscopes are contained in appropriate paragraphs of this manual.

1-2. Reporting Equipment Publication Improvements

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, U.S. Army Missile Command, ATTN: AMSMI-NPM, Redstone Arsenal, AL 35809.

1-3. Maintenance Allocation

The prescribed maintenance responsibilities will apply as reflected in TM 9-6625-1753-25P.

1-4. Forms, Records and Reports

Refer to TM 38-750 for the forms, records, and reports required from units maintaining this equipment.

1-5. Differences Among Models

a. General. A difference among models exists when two or more configurations of the same item are used in the equipment. In this equipment these differences are permanent. A permanent difference among models exists when an item is changed during manufacture, but the change does not warrant modification (or retrofit) of the item already in the field. This difference usually arises when the equipment is improved, although the older model can perform its function satisfactorily.

b. Oscilloscope 765MH Main Frame Changes. There are two models of the main frame. The earlier model has an a 11-vacuum tube high-voltage rectifier circuit, while the later model has a solid-state high-voltage rectifier circuit. Replacing the vacuum tube rectifier with solid state rectifiers increases the reliability of the high-voltage power supply.

c. Oscilloscope 765MH/F. With the exception of circuits which provide a higher frequency response, oscilloscope 765MH/F is similar to the newer models of oscilloscope 765MH. To obtain the higher frequency response, CRT termination network 7062 is incorporated into the main frame. This termination provides facilities for adapting dual trace plug-in 79-02A to the unit. Dual trace plug-in 79-02A has a frequency response of 100 mc to the 3 db point, and frequencies as high as 250 mc can be observed using the instrument with this plug-in.

d. Oscilloscope 765MH/F. The round CRT of previous models has been replaced with a rectangular CRT. The high voltage power supply has been replaced with a circuit board assembly. A Z-axis circuit board assembly has been added to allow low level DC inputs to Z-axis.

Note. Do not use shorting type cap plug on EXT Z-axis input connector.

1-6. Nomenclature and Reference Designations

a. Table 1-1 lists the reference designation and official nomenclature of the assemblies that comprise oscilloscopes 765MH or 765MH/F (Portascope).

Table 1-1. Nomenclature and Reference Designations

Reference designation	Official nomenclature	TM nomenclature
1 or 2	Oscilloscope, main frame (with [1]mod 116)	Main frame
8	Delaying sweep plug-in, type 74-13A (with [1]mod 101)	Delaying sweep plug-in
9	Dual trace plug-in, type 76-02A (with [1]mod 101 and delay line or dual trace plug-in, type 79-02A (with [1]mod 103 and delay line)	Dual trace plug-In

1/Mod 161, mod 101, and mod 103 are explained in TM 9-6625-1753-25P.

b. A reference designation provides a convenient code that completely identifies each part in the oscilloscope. The first letter in the grouping is the class of part designation, the second digit or number indicates the assembly in which the part is to be found, and the remaining numbers represent the part designator. For example, Q8101 represents transistor number 101 in the delaying sweep plug-in assembly.

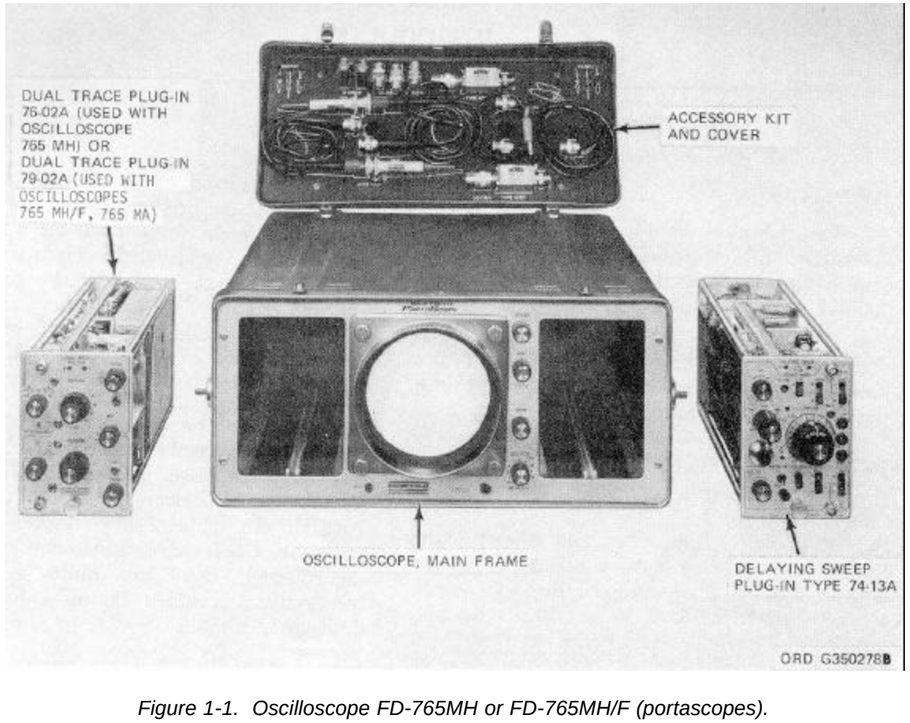

Figure 1-1. Oscilloscope FD-765MH or FD-765MH/F (portascopes).

Section II. DESCRIPTION AND DATA

1-7. Physical Description

a. Complete Unit. There are three assemblies in the oscilloscope (Fig. 1-2). These are: the main frame, the dual trace plug-in, and the delaying sweep plug-in. In addition, there is an accessory kit located inside the cover.

b. Main Frame. The main frame is a metal structure that mounts the cathode-ray tube (CRT) and the power supplies. It has a cavity on each side for holding the dual trace and delaying sweep plug-in's. The low-voltage and high-voltage power supplies are located on the rear plate, and the CRT, which spans the whole structure, is located in the center of the main frame. Both of these items are accessible by removing the fiberglass case. The CRT screen is covered by a neutral, circularly-polarized filter with a 6 by 10-centimeter graticule for measuring the displayed waveform. The filter is held in place by an aluminum bezel. It is mounted on the front panel of the main frame which also mounts five CRT controls.

c. Dual Trace Plug-In and Delaying Sweep Plug-In. These two plug-in units are physically and functionally interchangeable. However, there is no provision for coupling an unblanking pulse from the left-hand plug-in to the CRT, so when a vertical sweep is used, the trace is not blanked between sweeps. Each plug-in is constructed with guide rails to provide for accurate insertion into the main frame cavity. Guide pins assure proper mating of the male connector with the female connector located on the rear plate of the main frame.

Note. Dual trace plug-in 79-02A is to he used for Y deflection (in the left cavity) only.

d. Accessory Kit. The accessory kit consists of the following:

(1) Two attenuator probes X10 (probe assembly 7999B, test prods 4299B, or probe assembly 7994B).

Note. Probes 7999B or 7994B are for oscilloscope 765-MH/F, while probe 4299B is for the 765MH.

(2) Two sets of tip adapters (three per set (probe test kit 50288561).

(3) One connecting cable, BNC-to-alligator clip (test lead 50288581, type 7083).

(4) Two connecting cables, BNC-to-BNC to rf cable assembly 50288581, type 7082).

(5) Two terminators, 50-ohm, 2 watt (dummy load 4285A).

(6) Two UG1090/U binding-post-to- BNC male connectors 0903640, type 7080.

(7) Power cable 50301390.

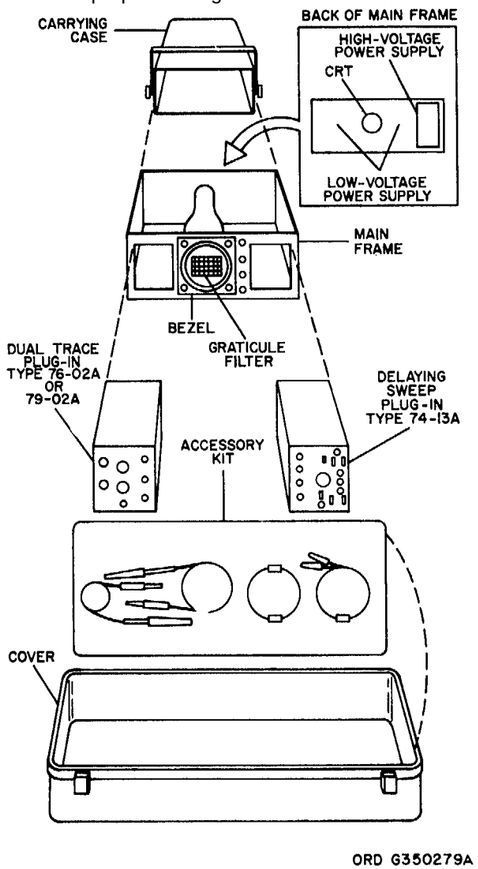

Figure 1-2. Components of oscilloscope.

1-8. Operation and Maintenance Data

A brief description of the operation and maintenance data is given in table 1-2. This table enables operating and maintenance personnel to determine at a glance the operating capabilities of the equipment.

Table 1-2. Oscilloscope Operation and Maintenance Data

Item	Data
Power Requirements	
Power	230 watts
Voltage	105 to 125 vane or 210 to 250 vac (at 60 Hz)
Frequency	48 to 1000 Hz
Temperature Limits	
Storage	-40° to +85°C (-40° to 185°F)
Operating	-30° to 60°C (-22° to +140°F)
Humidity	40°C (104°F), 95% relative humidity
Altitude Range	
Operational	15,000 ft
Non-operating	50,000 ft
CRT	
Fluorescence color	Green
Light transmittal	52%
Persistence	70 µsec
Accelerating potential	13 kv
X axis direct input	10 to 15 volts/cm
Y axis direct input	2.5 to 3.5 volts/cm
Delaying Sweep	
Plug-In	
Sweep rate	10 nsec div to 5 sec div
Bandwidth (dc coupled)	Dc to 2 MHz, down 3 db at 2 MHz
Minimum trigger rate:	
Ac coupling	80 Hz
Afc coupling	10 kHz, with a minimum of 100 µsec rise or fall time

Item	Data
Minimum external trigger (X1 probe)	0.5 volt peak-to peak (dc to 1 MHz) or 1.0 volt peak-to-peak (up to 10 MHz)
External trigger input impedance	1 megohm, shunted by 40 pf nominal
Delay	250 nsec to 20 sec
Dual Trace Plug-In	
Bandwidth	
Dc coupled	Dc to 25 MHZ own db at 25 MHZ
Ac coupled	10 Hz
External trigger input impedance	1 megohm, shunted by 40 pf
Rise time	15 nsec, driven from 25-ohm source
Sensitivity	5 mv div to 25 volts div
Dual trace Plug-In	
79-02A	
Bandwidth (3 db points)	
Dc coupled	
X1 position	0 to 100 MHz
X10 position	0 to 90 MHz
Ac coupled	
X1 position	16 Hz to 100 MHz
X10 position	16 Hz to 90 MHz
Note. Response to frequencies as high as 250 MHz is possible.	
Sensitivity	10 mv/div to 50 v/div
Accuracy (voltage measurements)	±3%
Input impedance	1 megohm shunted by 14 pf nominal

1-9. Capabilities

The oscilloscope displays waveshapes of sampled electronic signals. It incorporates two major features: dual trace and delayed sweep.

a. Dual Trace. The dual trace feature allows you to view two separate signals at the same time. This could be useful, for example, in comparing the time delay of two logic inputs, or the before-and-after effects of a squaring circuit.

b. Delayed Sweep. The delayed sweep feature permits you to select and expand one segment of the displayed signal. For instance, you can measure the rise time of one pulse in a train of several.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. General

a. When a new or reconditioned oscilloscope is first received by the using organization, it is the responsibility of the person-in-charge to determine whether the materiel is complete, and if it is in satisfactory condition in service. The service procedures of a general nature are listed in paragraph 2-2.

b. Make a record of all deficiencies found so that they may be either remedied by the using organization or referred to the direct support and general support maintenance personnel.

2-2. General Services

a. Carefully note all markings and/or tags attached to the materiel, since they may contain information relating to operation and maintenance.

b. Refer to the appendix for applicable forms, records, and reports for inspection. Inspect the records of maintenance, previously performed on the materiel to determine its maintenance background. A record of progressive repairs may indicate a defective unit, while a record of regular preventive maintenance may indicate a unit in excellent condition.

Section II. CONTROLS AND INDICATORS

2-3. General

This section contains tables 2-1 through 2-3 which list the various controls and indicators of the oscilloscope, and describe the type and function of each.

2-4. Main Frame, Controls and Indicators

Table 2-1. Main Frame, Controls and Indicators (Fig. 2-6)

Key	Control, Indicator or Connector	Function
11	INTENSITY control	Regulates brightness of trace on CRT screen.
9	ASTIG control	Adjusts shape of spot on CRT screen.
10	BEAM ROTATE control	Rotates the CRT electron beam to compensate for the EARTH'S magnetic effect on trace alinement.
39	FOCUS control	Adjust sharpness of trace on CRT screen.
38	SCALE ILLUM control and power switch	Dimmer for scale lamps and turns on power to oscilloscope.

2-5. Dual Trace Plug-In, Controls and Indicators

Note. Since the controls and indicators for channel A and B are identical, only the controls for channel A are described.

Table 2-2. Dual Trace Plug-In, Controls and Indicators (Fig. 2-6)

Key	Control, Indicator or Connector	Function
2	Beam position indicators	Arrow next to glowing lamp indicates the direction that trace is deflected (off the CRT screen).
4, 43	ATTEN BAL control	Screwdriver adjustment to prevent displacement of the trace when VARIABLE and VOLTS/DIV controls are activated.
5, 44	POSITION control	Positions the trace up or down on the CRT screen.
6, 42	DC BAL control	Screwdriver adjustment to prevent displacement of the trace when the VARIABLE control is activated.
7	MODE switch	Selects the following dual-trace modes: A: Only channel A signal is displayed. B: Only channel B signal is displayed. ALT: Both channel A and Channel B signals are displayed on alternate sweeps. CHOP: Both channel A and channel B signals are displayed. Switching from channel A to channel B is at an arbitrary rate (approximately 60 kc). This mode of operation is used when a single transient is to be observed at two points in a circuit, and also for slow sweeps when the ALT mode has too much flicker. A + B: Both channel A and B signals displayed at the same time. The overall display is the algebraic sum of both signals.
1, 45	VOLTS/DIV switch	Selects accurately calibrated vertical deflection sensitivities of 0.005, 0.01,0.02, 0.05, 0.1,0.2, 0.5, 1, 2, 5, or 10 volts per division when the VARIABLE control is in the CAL position.
3, 46	VARIABLE control	Provides uncalibrated variable vertical deflection sensitivities between settings of the VOLTS/DIV switch (up to 25 volts/div for a setting of 10), when turned counterclockwise from the CAL position.
49, 52	NORM-INVERT switch	Selects the polarity of the displayed waveform. Provides ac or dc coupling of the input signal in the NORM or INVERT position. NORM: Displayed waveform has the same polarity as the input signal. INVERT: Displayed waveform has the opposite polarity of the input signal (positive-going input signal is displayed as a negative-going signal). GND: Grounds the amplifier input circuit.
50, 51	GAIN ADJ control	Screwdriver adjustment for setting the calibrated vertical deflection sensitivity.

2-5.1. Dual Trace Plug-In 79-02A, Controls, Indicators, and Connectors

Table 2-2.1. Dual Trace Plug-In 79-02A, Controls, Indicators, and Connectors (Fig. 2-6)

Key	Control, Indicator or Connector	Function
72	BEAM FINDER switch	A spring-loaded switch. If the beam is off the screen, the switch may be depressed to locate the beam.
62	CH2 OUT connector	The channel 2 preamplifier output is available at this BNC connector, connected through a 5,000 ohm resistor.