

# Radar Tracking Training System (add-on to the Radar Processor/Display)

8112501 (8097-30)

**FESTO**

LabVolt Series

Datasheet



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## Table of Contents

|   |          |
|---|----------|
| <b>General Description</b>                | <b>3</b> |
| <b>List of Equipment</b>                  | <b>3</b> |
| <b>List of Manuals</b>                    | <b>4</b> |
| <b>Table of Contents of the Manual(s)</b> | <b>4</b> |
| <b>System Specifications</b>              | <b>4</b> |
| <b>Equipment Description</b>              | <b>5</b> |

## General Description

The Radar Tracking Training System adds on to the pulse radar implemented with the Basic Radar Training System and the Radar Processor/Display to form a continuous tracking radar. This radar can track a passive target that moves in the classroom laboratory.

The Radar Tracking Training System includes an interface module to be installed in the RTM of the Radar Processor/Display, a special dual-feed parabolic antenna, a joystick-type hand controller, a set of accessories, and a student manual.

\* **WARNING:** This equipment is subject to export control. Please contact your sales representative to know if this product can be imported in your region.

The tracking radar can operate in three different modes (Scan, Manual, and Lock), which are selected through the hand-controller buttons. In scan mode, the antenna rotates at constant speed, allowing observation of targets on the PPI display. In manual mode, the operator can isolate a fixed or moving target of his or her choice, using the hand controller to control the antenna beam angle and to position an electronic marker (range gate) over the target echo signal. A computer-based O-scope display is used to monitor the position of the range gate relative to the echo signal of the target to be acquired. When the range gate straddles the target echo signal, the lock mode can be activated and the target is automatically tracked in range and azimuth by the system.

Range tracking is achieved by means of the split range-gate technique, whereas angle tracking is accomplished using lobe switching (sequential lobing). In addition to the fully automatic tracking mode, several useful ECCM features are available, such as a switchable lobing rate, a range tracking rate limiter in the range loop, manual control of either the range loop or the azimuth loop while the system is locked onto a target, and leading-edge range tracking. The computer-based interface of the tracking radar allows control of these functions and offers the same other possibilities as for the pulse radar system (visualization of the system's block diagrams, connection of virtual probes in the onscreen block diagrams, observation of signals on the built-in oscilloscope, fault insertion, etc.)



Figure 12. Antenna replacement is quick and easy thanks to miniature plug-in connectors in the antenna frame and antenna pedestal's shaft.

Installation of the Radar Tracking Training System is very simple: insert the interface module in the RTM, modify a few connections, connect the hand controller to a USB port of the host computer, and replace the conventional parabolic antenna with the dual-feed parabolic antenna. These two antennas come with a miniature plug-in connector to facilitate replacement, as shown in Figure 12.

## List of Equipment

| Qty | Description                         | Model number      |
|-----|-------------------------------------|-------------------|
| 1   | Tracking Radar (Student Manual)     | 580422 (38545-00) |
| 1   | Dual Feed Parabolic Antenna         | 581937 (9604-A0)  |
| 1   | Radar Target Tracking Interface     | 8112778 (9633-10) |
| 1   | Accessories for the Tracking Radar  | 581984 (9690-B0)  |
| 1   | Radar Tracker Hand Controller (USB) | 581992 (9694-10)  |

## List of Manuals

| Description                        | Manual number     |
|------------------------------------|-------------------|
| Tracking Radar (Workbook)          | 580422 (38545-00) |
| Radar Training System (User Guide) | 8112390           |

## Table of Contents of the Manual(s)

### Tracking Radar (Workbook) (580422 (38545-00))

- 1 Familiarization with the Tracking Radar
- 2 Manual Tracking of a Target
- 3 Automatic Range Tracking
- 4 Angle Tracking Techniques
- 5 Automatic Angle Tracking
- 6 Range and Angle Tracking Performance (Radar-Dependent Errors)
- 7 Range and Angle Tracking Performance (Target-Caused Errors)
- 8 Troubleshooting a Radar Target Tracker

## System Specifications

| Parameter                                      | Value               |
|--|---------------------|
| Lobe Switch Control Input, Voltage Range       | -5 to +5 V          |
| Antenna Rotation Command Input, Voltage Range  | -5 to +5 V          |
| Lobe Switch Control Output, Voltage Range      | -5 to +5 V          |
| Antenna Rotation Command Output, Voltage Range | -5 to +5 V          |
| <b>PPI Display</b>                             |                     |
| X- and Y-Output Voltage Range                  | -8 to +8 V          |
| Z Output Voltage Range                         | TTL                 |
| <b>O-Scope Display</b>                         |                     |
| Video Output Voltage Range                     | -10 to +10 V        |
| Time Base Output Voltage Range                 | 0 to +10 V          |
| Maximum Range Tracking Rate                    | >35 cm/s (>14 in/s) |
| Maximum Angle (Azimuth) Tracking Rate          | >6°/s               |
| On-Screen Test Points                          | 24                  |
| Faults   | 12                  |

## Equipment Description

### Dual Feed Parabolic Antenna 581937 (9604-A0)



The Dual Feed Parabolic Antenna mounts on the rotating antenna pedestal and is fully compatible with the miniature plug-in RF quick connector. The dual-feed horns are connected to a microwave SPDT switch that allows alternating transmission and reception of the signal from each horn through the single rotary joint of the antenna pedestal. Switch control is achieved by superimposing a DC bias on the transmitted RF signal. The antenna beams formed by each horn are squinted in azimuth to allow lobe switching (sequential lobing) target tracking.

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## Specifications

| Parameter                                 | Value                                      |
|---|--|
| Crossover Level of Antenna Beams (at 6 m) | 3.2 dB (typical)                           |
| Antenna beam Squint (at 6 m)              | $\pm 3.2^\circ$ (typical)                  |
| <b>Physical Characteristics</b>           |  |
| Dimensions (H x W x D)                    | 425 x 375 x 515 mm (16.8 x 14.8 x 20.3 in) |
| Net Weight                                | 1.9 kg (4.2 lb)                            |

### Radar Target Tracking Interface 8112778 (9633-10)



The Radar Target Tracking Interface is a compact module designed to be installed into one of the slots on the RTM of the Radar Processor/Display. The module provides the lobe switching control signal and the RF circuitry (bias tee and DC blocking capacitor) required to perform lobe switching with the Dual Feed Parabolic Antenna. To allow manual or automatic control of the radar antenna rotation, the Radar Target Tracking Interface is also used to intercept the rotation command signal produced by the antenna controller before it reaches the antenna motor driver.

The Radar Target Tracking Interface is provided with four SMA connectors that provide access to the lobe switching RF circuitry. It also has two BNC-conductor inputs (lobe switch control input and antenna rotation command input) and two BNC-conductor

outputs (lobe switch control output and antenna rotation command output). All these inputs and outputs are protected from misconnections within the system. Test points are available on the module's front panel to observe the signals on the BNC-conductor inputs and outputs using a conventional oscilloscope.

DC power is automatically supplied to the Radar Target Tracking Interface when it is installed into the RTM.

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## Specifications

| Parameter                              | Value                                   |
|--|---|
| <b>RF Inputs and Outputs</b>           |   |
| Impedance                              | 50 $\Omega$                             |
| Frequency Range                        | 8 to 10 GHz                             |
| <b>Lobe Switch Control Input</b>       |   |
| Voltage Range                          | -5 to +5 V                              |
| Impedance                              | 1.5 k $\Omega$                          |
| <b>Lobe Switch Control Output</b>      |   |
| Voltage Range                          | -5 to +5 V                              |
| Impedance                              | 1.0 k $\Omega$                          |
| <b>Antenna Rotation Command Input</b>  |   |
| Voltage Range                          | -10 to +10 V                            |
| Impedance                              | 10 k $\Omega$                           |
| <b>Antenna Rotation Command Output</b> |   |
| Voltage Range                          | -10 to +10 V                            |
| Impedance                              | 600 $\Omega$                            |
| Test Points                            | 4                                       |
| <b>Physical Characteristics</b>        |   |
| Dimensions (H x W x D)                 | 114 x 110 x 209 mm (4.5 x 4.3 x 8.2 in) |
| Net Weight                             | 0.7 kg (1.6 lb)                         |

## Accessories for the Tracking Radar 581984 (9690-B0)



The Accessories for the Tracking Radar contains a cylinder target, two zigzag targets, and a BNC connector-to-miniature banana jack cable.

## Radar Tracker Hand Controller (USB) 581992 (9694-10)



The Radar Tracker Hand Controller (USB) is a joystick-type device designed to be connected to a USB port of a personal computer. It is used to select specific targets when the tracking radar is in the manual mode of operation. Fore and aft motion of the handle allows range positioning of a tracking cursor (range gate). Left-right motion of the handle controls the direction of the antenna's rotation, thereby allowing the antenna to be rotated to a particular azimuth. Mode control of the tracking radar is achieved with the trigger buttons on the handle of the Hand Controller.

## Specifications

| Parameter                       | Value                                   |
|---------------------------------|---|
| <b>Physical Characteristics</b> |   |
| Dimensions (H x W x D)          | 190 x 165 x 165 mm (7.5 x 6.5 x 6.5 in) |

| Parameter  | Value           |
|------------|-----------------|
| Net Weight | 0.8 kg (1.8 lb) |

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**Festo Didactic SE**

Rechbergstrasse 3  
73770 Denkendorf  
Germany

P. +49(0)711/3467-0  
F. +49(0)711/347-54-88500

**Festo Didactic Inc.**

607 Industrial Way West  
Eatontown, NJ 07724  
United States

P. +1-732-938-2000  
F. +1-732-774-8573

**Festo Didactic Ltée/Ltd**

675 rue du Carbone  
Québec QC G2N 2K7  
Canada

P. +1-418-849-1000  
F. +1-418-849-1666

**[www.labvolt.com](http://www.labvolt.com)**

**[www.festo-didactic.com](http://www.festo-didactic.com)**