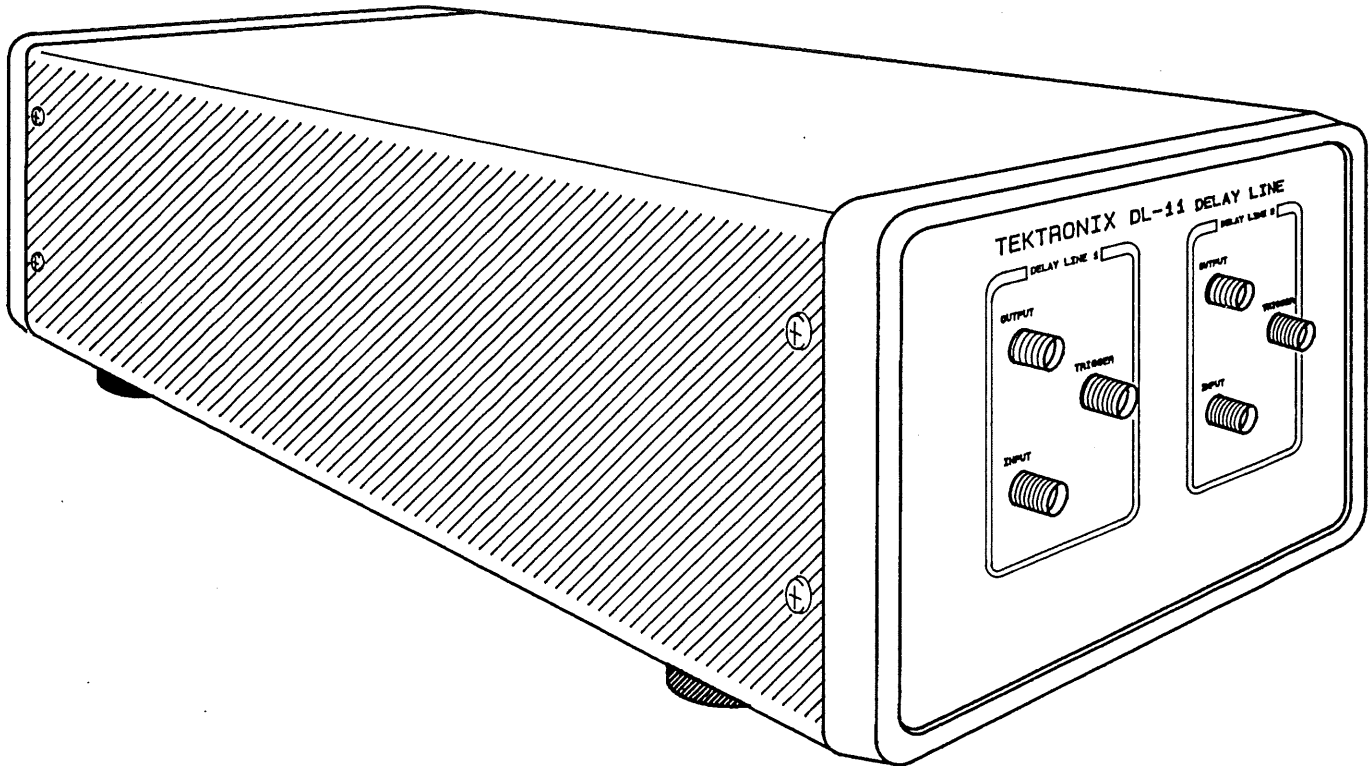


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## DL-11 DELAY LINE



### PRODUCT DESCRIPTION

The DL-11 Delay Line contains two independent delay lines, with a trigger pickoff on the input of each delay line. When used with a TEKTRONIX 11801 Digital Sampling Oscilloscope, the DL-11 Delay Line allows viewing of the trigger event (pretrigger view). The cables necessary to connect the DL-11 Delay Line to the 11801 Oscilloscope External Trigger and sampling head inputs are supplied with the DL-11 Delay Line.

NO. 070-7051-00

DATE AUG 1988

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# Safety Summary

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The safety information in this summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

## **Terminology**

*CAUTION* statements in manuals identify conditions or practices that could result in damage to the equipment or other property.

*WARNING* statements in manuals identify conditions or practices that could result in personal injury or loss of life.

*CAUTION* on equipment means a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property; including the equipment itself.

*DANGER* on equipment means a personal injury hazard immediately accessible as one reads the marking.

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# General Information

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The DL-11 Delay Line is a passive instrument, and does not require any power input.

## Connecting Signals

The signal connectors on the front panel of the DL-11 Delay Line are SMA connectors, mechanically compatible with Precision APC 3.5.

You must attach cables to the SMA-compatible connectors carefully to prevent damage to the cables or the connector. Do not turn the cable, only turn the nut on the cable, and use light finger pressure initially to connect the cable. Then use a torque wrench to tighten the connection to within the 79-112 N-cm (7-10 in-lb) range.



*Do not over-tighten SMA-compatible connectors.*

Improper tightening may cause a change in impedance.

## Packaging for Shipment

If the DL-11 Delay Line is to be shipped for long distances by commercial transportation, we recommend that it be packaged in the original manner. The carton and packaging material in which your delay line was shipped should be saved and used for this purpose.

Also, if the DL-11 Delay Line is to be shipped to your local Tektronix Service Center for service or repair, attach a tag to the delay line showing the following:

- Owner of the delay line (with address);
- Name of person to contact at your firm;
- Complete delay line type and serial number;
- Describe the service required, or the symptoms that the delay line is exhibiting.

If the original packaging is unfit for use or not available, package the delay line as follows:

- Step 1: Obtain a corrugated cardboard shipping carton with a 200-pound test strength and having inside dimensions at least six inches greater than the delay line dimensions (refer to Specifications in this instruction sheet). This allows for cushioning.
- Step 2: Wrap the delay line with polyethylene sheeting or equivalent material to protect the finish.
- Step 3: Cushion the delay line on all sides by tightly packing dunnage or urethane foam between the carton and the delay line, allowing three inches on each side.
- Step 4: Seal the carton with shipping tape or with an industrial stapler.

- Step 5: Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

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# Installation

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This section lists examples of the test equipment required for the Installation and Operational Checkout Procedures that follow. The Installation Procedure is also listed here.

Table 1 contains examples of test equipment required to perform the Installation and Operational Checkout Procedures. Procedure steps are based on the test equipment examples given, but other equipment with similar specifications may be substituted.

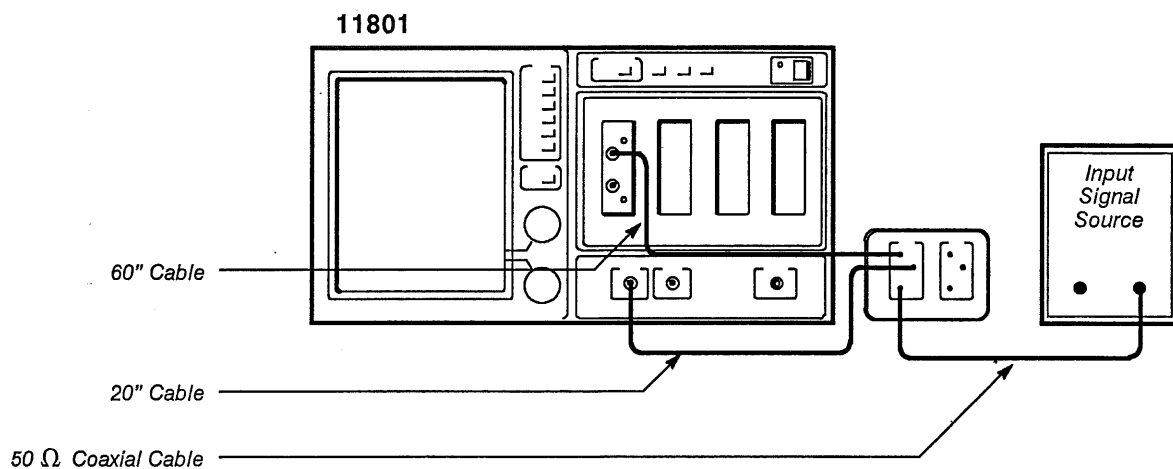
**Table 1 – Equipment List**

| Description   | Examples of Applicable Test Equipment |
|---|---------------------------------------|
| Digital Sampling Oscilloscope                                       | TEKTRONIX 11801 Oscilloscopes         |
| Pulse Generator   | TEKTRONIX PG-502 Pulse Generator      |
| Coaxial Cable, 50 $\Omega$  | Tektronix Part 012-0482-00            |
| Torque Wrench, 8 mm (5/16 in)<br>open-end, 79-112 N-cm (7-10 in-lb) |                                       |
| Nutdriver, 11/32 in   |                                       |
| Screwdriver, T-10 Torx  |                                       |
| Screwdriver, T-15 Torx  |                                       |



The illustration below shows the connections between the DL-11 Delay Line, a signal source, and an 11801 Digital Sampling Oscilloscope.

- Connect the signal source to a DL-11 INPUT.
- Connect the matching DL-11 OUTPUT to the 11801 Oscilloscope sampling head input using the provided 60-inch cable.
- Connect the DL-11 TRIGGER to the 11801 Oscilloscope trigger input using the provided 20-inch cable.



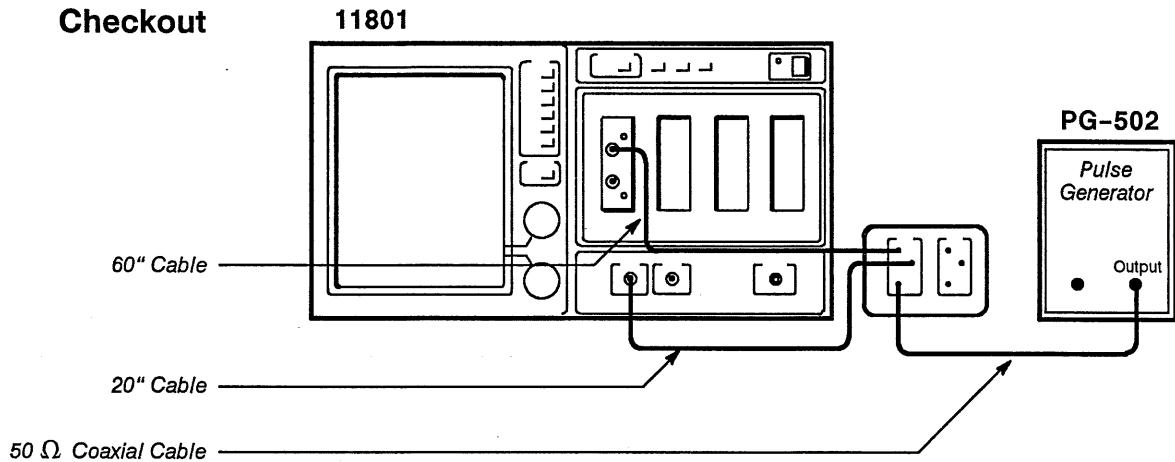
**Figure 1** – Connection With Oscilloscope and Signal Source

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# Operational Checkout

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## Setup for Operational Checkout



*Figure 2 – Setup for Operational Checkout*

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## Procedure to Perform an Operational Checkout

- Step 1: Initialize the 11801 Oscilloscope.
- Step 2: Set the pulse generator period to 1  $\mu$ s, the duration to squarewave, and the amplitude of the squarewave to approximately 1 V.
- Step 3: Select the sampling head channel.
- Step 4: Set the time base to 1 ns/div.
- Step 5: Touch **Main Pos**, and when the of **Numeric Entry & Knob Res** pop-up menu appears, touch **Set to Min**.
- Step 6: Touch the trigger icon.
- Step 7: Touch **Trigger Level**, and then **Fine** in the **Numeric Entry & Knob Res** pop-up menu.
- Step 8: Set the trigger level control so that you can see the rising edge of the signal.

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# Removing and Replacing FRUs

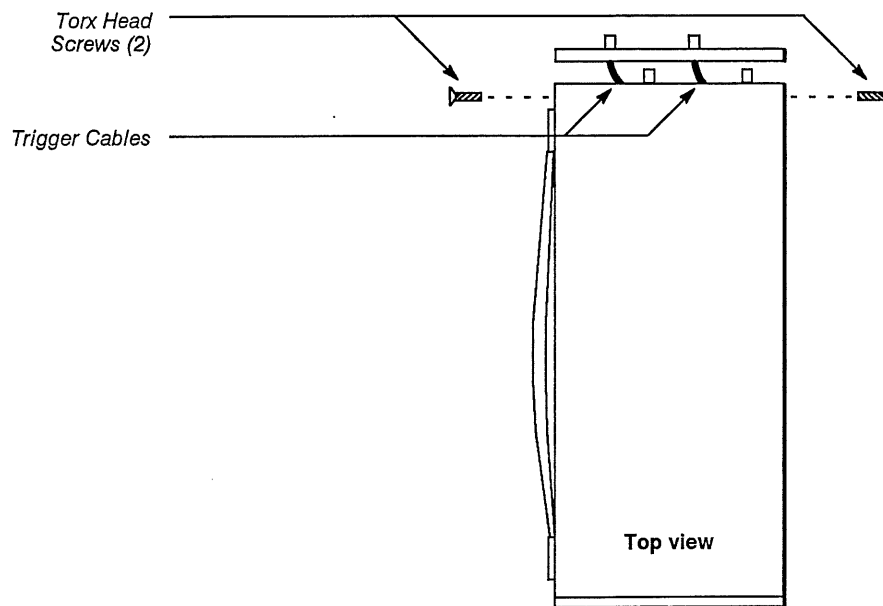
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The exploded view drawing associated with the Replaceable Parts list may be helpful in the removal or disassembly of individual Field Replaceable Units (FRUs).

## Delay Line

Remove the delay line as follows:

- Step 1: Position the delay line on its rear panel, and remove the four Torx head screws that retain the front panel.
- Step 2: Lift the front panel straight up so that you have access to the nuts of the trigger pickoff cables.
- Step 3: Use a 5/16-inch open-end wrench to disconnect the trigger cables from the front panel connectors, and remove the front panel.



*Figure 3 – Removing Front Panel*

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- Step 4: To disassemble the chassis from the delay line, set the delay line on its feet, and remove the two Torx head screws from the rear panel.
- Step 5: Slide the delay line chassis out of the case.

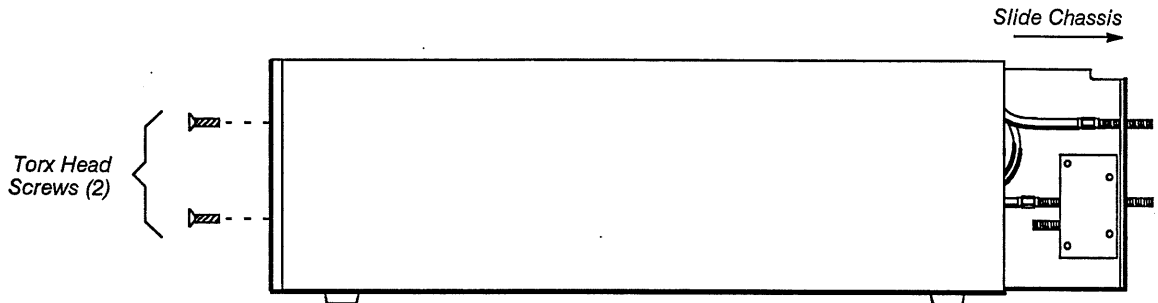


Figure 4 — Sliding Out Chassis Assembly

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- Step 6: Use an 11/32-inch nutdriver to remove the two washer nuts, flat washers, and retaining clamps holding the delay line coil to the chassis.
- Step 7: Use a 5/16-inch open-end wrench to loosen the delay line nuts at the SMA connectors, then alternate loosening the nuts with your fingers and pulling the delay line coil away from the connectors, so that you pull the delay line off smoothly.

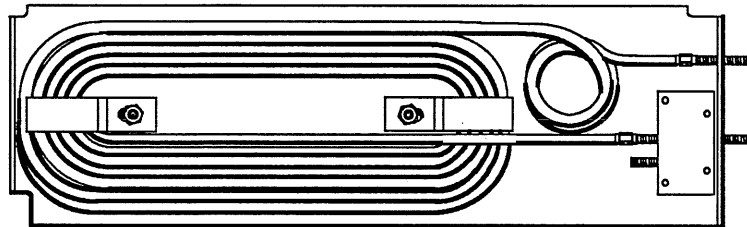


Figure 5 — Chassis Assembly

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To replace the delay line, follow Steps 1-8 in the reverse order. When attaching the delay line to the chassis, attach the front clamp first and pull it towards the front of the chassis while tightening the nut. Then attach the rear clamp and pull it towards the rear of the chassis while tightening the nut. Use an open-end torque wrench to tighten the connector nuts to 110 N-cm (10 in-lb).

## Trigger Pickoff and Compensator Assembly

Remove the Trigger Pickoff and Compensator assembly as follows:

- Step 1: Remove the delay line attached to the Trigger Pickoff and Compensator assembly (see the delay line removal procedure).
- Step 2: Use a 5/16-inch open-end wrench to remove the trigger pickoff cable from the Trigger Pickoff and Compensator assembly.
- Step 3: Remove the two Torx screws and withdraw the Trigger Pickoff and Compensator assembly from the chassis.

To replace the Trigger Pickoff and Compensator assembly, follow Steps 1 through 3 in reverse order. Use an open-end torque wrench to tighten the connector nuts to 110 N-cm (10 in-lb).

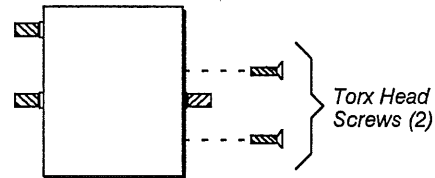


Figure 6 – Trigger Pickoff and Compensator Assembly

Refer to Connecting Signals in this instruction sheet before proceeding.

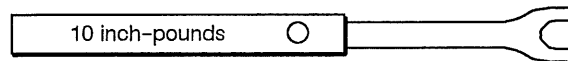
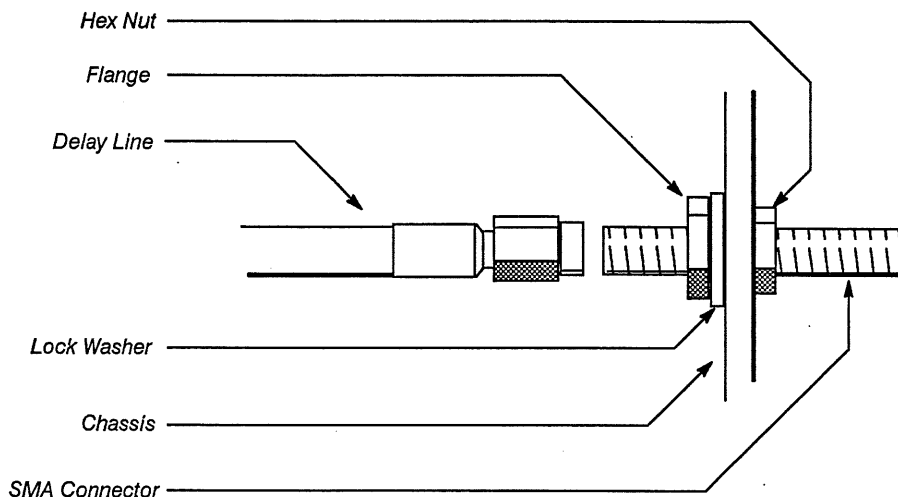


Figure 7 – Open-End Torque Wrench

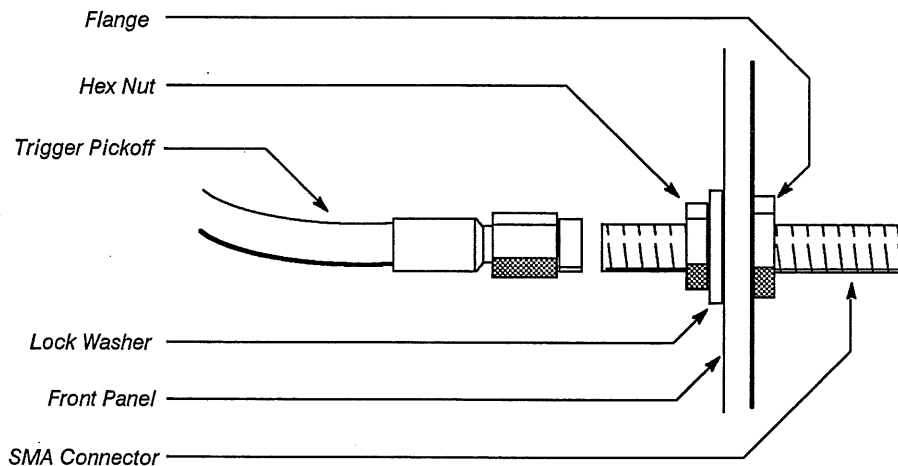
### SMA-Compatible Connectors

Install SMA-compatible connectors in the delay line chassis as shown in Figure 8, with the fixed flange and lock washer on the inside of the chassis.



**Figure 8 – Mounting SMA-Compatible Input & Output Connectors In Subchassis**

Install SMA-compatible connectors in the delay line front panel as shown in the Figure 9, with the fixed flange on the outside and the nut and lock washer on the inside of the front panel.



**Figure 9 – Mounting SMA-Compatible Trigger Connector In Front Panel**

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# Specifications

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This section contains the mechanical and environmental characteristics of the DL-11 Delay Line.

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## Mechanical

|                 |                    |
|-----------------|--------------------|
| Weight          | 4.8 kg (10.5 lb)   |
| Shipping Weight | 5.5 kg (12 lb)     |
| Height          | 119 mm (4.680 in)  |
| Width           | 159 mm (6.260 in)  |
| Depth           | 356 mm (14.050 in) |

---

## Environmental

Meets Mil-T-28800D, Type III, Class 5

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### Temperature, ambient

|               |                |
|---------------|----------------|
| Operating     | 0° to +50° C   |
| Non-Operating | -40° to +75° C |

---

### Altitude

|               |                       |
|---------------|-----------------------|
| Operating     | To 4.5 km (15,000 ft) |
| Non-Operating | To 15 km (50,000 ft)  |

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|          |   |
|----------|---|
| Humidity | Up to 95% relative humidity<br>at up to 50° C |
|----------|---|

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# Replaceable Parts

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## Parts Ordering Information

This section contains a list of the components that are replaceable for the DL-11 Delay Line. As described below, use this list to identify and order replacement parts.

Replacement parts are available from or through your local Tektronix, Inc. Service Center or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part Number
- Instrument Type or Model Number
- Instrument Serial Number
- Instrument Modification Number, if applicable

If a part you order has been replaced with a different or improved part, your local Tektronix Service Center or representative will contact you concerning any change in the part number.

Change information, if any, is located at the rear of this manual.

## Using the Replaceable Parts List

The tabular information in the Replaceable Parts List is arranged for quick retrieval. Understanding the structure and features of the list will help you find all the information you need for ordering replacement parts.

### Item Names

In the Replaceable Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, U.S. Federal Cataloging Handbook H6-1 can be used where possible.

### Indentation System

This parts list is indented to show the relationship between items. The following example is of the indentation system used in the Description column:

| 1 | 2 | 3 | 4 | 5 | Name & Description  |
|---|---|---|---|---|---|
|   |   |   |   |   | <i>Assembly and/or Component</i>  |
|   |   |   |   |   | <i>Attaching parts for Assembly and/or Component</i><br>(END ATTACHING PARTS) |
|   |   |   |   |   | <i>Detail Part of Assembly and/or Component</i>                               |
|   |   |   |   |   | <i>Attaching parts for Detail Part</i><br>(END ATTACHING PARTS)               |
|   |   |   |   |   | <i>Parts of Detail Part</i>   |
|   |   |   |   |   | <i>Attaching parts for Parts of Detail Part</i><br>(END ATTACHING PARTS)      |

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. Attaching parts must be purchased separately, unless otherwise specified.

### Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1



## CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

| Mfr.<br>Code | Manufacturer  | Address                              | City, State, Zip Code   |
|--------------|---|--------------------------------------|-------------------------|
| 26805        | M/A-COM OMNI SPECTRA INC<br>MICROWAVE CONNECTOR DIV<br>SUB OF M/A-COM INC | 140 4TH AVE                          | WALTHAM MA 02154-7507   |
| 78189        | ILLINOIS TOOL WORKS INC<br>SHAKEPROOF DIV                                 | ST CHARLES ROAD                      | ELGIN IL 60120          |
| 80009        | TEKTRONIX INC   | 14150 SW KARL BRAUN DR<br>PO BOX 500 | BEAVERTON OR 97707-0001 |
| 83486        | ELCO INDUSTRIES INC   | 1101 SAMUELSON RD                    | ROCKFORD IL 61101       |
| 86928        | SEASTROM MFG CO INC   | 701 SONORA AVE                       | GLENDALE CA 91201-2431  |

| Fig. &<br>Index<br>No. | Tektronix<br>Part No. | Serial/Assembly No. |        | Qty | 12345 Name & Description   | Mfr.  |                |
|------------------------|-----------------------|---------------------|--------|-----|--|-------|----------------|
|                        |                       | Effective           | Dscort |     |  | Code  | Mfr. Part No.  |
| 1-1                    | 200-2191-00           |                     |        | 2   | CAP, RETAINER: PLASTIC   | 80009 | 200-2191-00    |
| -2                     | 367-0247-01           |                     |        | 1   | HANDLE, CARRYING: 11.54 L, W/CLIP  | 80009 | 367-0247-01    |
| -3                     | 348-0187-00           |                     |        | 4   | FOOT, CABINET: BLACK POLYURETHANE  | 80009 | 348-0187-00    |
| -4                     | 386-5737-00           |                     |        | 1   | SUBPANEL, FR:<br>(ATTACHING PARTS)                                       | 80009 | 386-5737-00    |
| -5                     | 211-0373-00           |                     |        | 4   | SCREW, MACHINE: 4-40 X 0.25, PNH, STL<br>(END ATTACHING PARTS)           | 80009 | 211-0373-00    |
| -6                     | 131-0850-00           |                     |        | 4   | CONN, FEEDTHRU: 3MM FEMALE EA END  | 26805 | 2084-5059-02   |
| -7                     | 333-3599-00           |                     |        | 1   | PANEL, FRONT:  | 80009 | 333-3599-00    |
| -8                     | 214-4082-00           |                     |        | 4   | PIN, GUIDE: 0.850 L, NYLON   | 80009 | 214-4082-00    |
| -9                     | 386-5738-00           |                     |        | 1   | SUBPANEL, REAR:<br>(ATTACHING PARTS)                                     | 80009 | 386-5738-00    |
| -10                    | 211-0373-00           |                     |        | 4   | SCREW, MACHINE: 4-40 X 0.25, PNH, STL<br>(END ATTACHING PARTS)           | 80009 | 211-0373-00    |
| -11                    | 441-1820-00           |                     |        | 2   | CHASSIS, MODULE: DELAY LINE<br>(ATTACHING PARTS)                         | 80009 | 441-1820-00    |
| -12                    | 211-0721-00           |                     |        | 4   | SCREW, MACHINE: 6-32 X 0.375, PHN, STL<br>(END ATTACHING PARTS)          | 83486 | ORDER BY DESCR |
| -13                    | 343-1373-00           |                     |        | 4   | CLAMP, DLY LINE: 1.430 X 1.350, ALUMINUM<br>(ATTACHING PARTS)            | 80009 | 343-1373-00    |
| -14                    | 210-0458-00           |                     |        | 4   | NUT, PL, ASSEM WA: 8-32 X 0.344, STL CD PL                               | 78189 | 511-081800-00  |
| -15                    | 210-1061-00           |                     |        | 4   | WASHER, FLAT: 0.203 ID X 0.625 OD X 0.062, STL<br>(END ATTACHING PARTS)  | 86928 | A371-141-62    |
| -16                    | 119-2957-00           |                     |        | 2   | DELAY LINE, ELEC: 45NS, 50 OHM   | 80009 | 119-2957-00    |
| -17                    | 657-0063-00           |                     |        | 2   | MODULAR ASSY: DELAY LINE COMPENSATOR<br>(ATTACHING PARTS)                | 80009 | 657-0063-00    |
| -18                    | 211-0718-00           |                     |        | 4   | SCREW, MACHINE: 6-32 X 0.312, FLH, 100 DEG, STL<br>(END ATTACHING PARTS) | 83486 | ORDER BY DESCR |
| -19                    | 174-1120-00           |                     |        | 2   | CABLE ASSY, RF: 50 OHM COAX, 8.5 L                                       | 80009 | 174-1120-00    |
| -20                    | 390-1038-00           |                     |        | 1   | CAB, WRAPAROUND:   | 80009 | 390-1038-00    |
| STANDARD ACCESSORIES   |                       |                     |        |     |  |       |                |
|                        | 070-7050-00           |                     |        | 1   | MANUAL, TECH: USERS INSTALLATION, DL11                                   | 80009 | 070-7050-00    |
|                        | 070-7051-00           |                     |        | 1   | MANUAL, TECH: INSTRUCTION, DL11  | 80009 | 070-7051-00    |
|                        | 174-1427-00           |                     |        | 1   | CABLE ASSY, RF: 50 OHM COAX, 20.0 L                                      | 80009 | 174-1427-00    |
|                        | 174-1428-00           |                     |        | 1   | CABLE ASSY, RF: 50 OHM COAX, 60.0 L                                      | 80009 | 174-1428-00    |

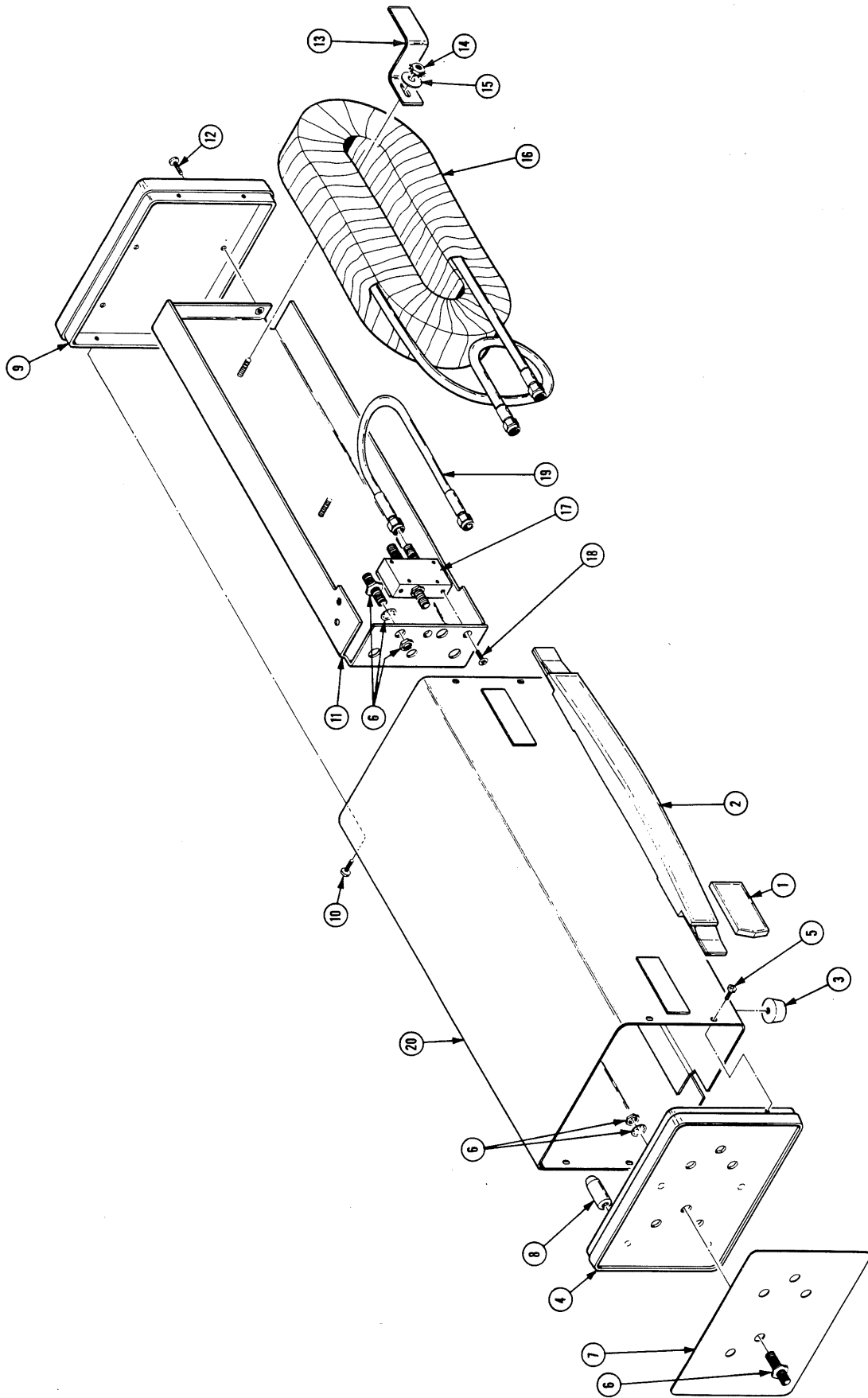


FIG.1 EXPLODED VIEW  
DL-11 Delay Line Instruction Sheet

