

Service Manual

Tektronix

ENC1
Encoded Clock

071-0304-00

Service Manual



ENC1 Encoded Clock

071-0304-00

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and above.



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Company	date or purchase order number
Address	Repair Protection (1,2, or 3 years)
City, State, Postal code	Calibration Services (1,2,3,4, or 5 years)
Country	Instrument model and serial number
Phone	Instrument purchase date

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Use Proper Fuse. Use only the fuse type and rating specified for this product.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Wear Eye Protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Provide Proper Ventilation. Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:



CAUTION
Refer to Manual



WARNING
High Voltage



Double
Insulated



Protective Ground
(Earth) Terminal



Not suitable for
connection to
the public telecom-
munications network

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

Preface

You have purchased this optional service manual for the ENC1 Encoded Clock module. You can also purchase service manuals for the mainframe and other modules. Each module manual begins with a tab so that you can locate it after you add it to the mainframe manual binder.

About This Manual

This manual contains information for servicing the ENC1 module to a module level. The information is designed only for qualified service technicians who have moderate experience in analog circuits, digital circuits, and television technology. This manual is composed of the following sections:

- *Specifications* provides product specifications tables.
- *Operating Information* provides basic operating information.
- *Theory of Operation* is an overview of the main components of the module.
- *Performance Verification* contains procedures necessary to verify that the module is meeting the requirements listed in the *Specifications*.
- *Maintenance* contains installation, removal and replacement, and troubleshooting instructions.
- *Mechanical Parts list* contains the part numbers for replacement parts that you can order for this module. The exploded view illustration helps you to identify the parts.

Contacting Tektronix

Product Support	<p>For application-oriented questions about a Tektronix measurement product, call toll free in North America: 1-800-TEK-WIDE (1-800-835-9433 ext. 2400) 6:00 a.m. – 5:00 p.m. Pacific time</p> <p>Or contact us by e-mail: tm_app_supp@tek.com</p> <p>For product support outside of North America, contact your local Tektronix distributor or sales office.</p>
Service Support	<p>Contact your local Tektronix distributor or sales office. Or visit our web site for a listing of worldwide service locations.</p> <p>http://www.tek.com</p>
For other information	<p>In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.</p>
To write us	<p>Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000</p>



Specifications

Specifications

This section contains a general product description of the ENC1 Encoded Clock module followed by the operating specifications of the module.

Product Description

The ENC1 Encoded Clock module is an optional module that you can purchase for use in the TG 2000 Signal Generation Platform. The function of this module is to provide an encoded clock to genlock a Tektronix TSG1001 Programmable TV Generator.

This module provides three outputs: CLOCK, FRAME, and ENCODED CLOCK. The clock and frame outputs are similar to the BG1 Black Burst Generator module clock and frame outputs. These are provided for design and research and development applications.

The timing of the outputs is time zero for reference timing. The output timing cannot be delayed; the TSG1001 output is at nominally the same time as the BG1 Black Burst Generator module. Timing offset is available at the system level, using the AGL1 Analog Genlock module timing.

In either encoded or nonencoded clock mode, the ENC1 module can be a programmable clock source for the TSG1001. You can also use an ENC1 module to provide the genlock source for the TSG1001 and PSC1125.

You can install an ENC1 module in any version of TG 2000 Platform main-frame.

Key Features

- Full remote control via GPIB and serial ports
- Encoded clock output to drive a TSG1001 Generator encoded clock input (same function as the SPG1000 encoded clock output)
- Front-panel selection of 74.25/15 and 74.175/14.98501 (74.25/1.001) frequencies as listed in the specifications
- Front panel specification of other encoded clock frequencies and nonencoded clock frequencies with variable clock frequency adjustment

Characteristics

Tables 1–1 through 1–5 list the Electrical specifications for the ENC1 Encoded Clock module, and Table 1–6 lists the EMC compliance specifications. Specifications are guaranteed unless labeled “typical.” Typical specifications are provided for your convenience, but are not guaranteed.

Specifications are valid only when the module is properly installed in a TG 2000 Signal Generation Platform, and only after a warm-up period of 20 minutes.

Refer to the *TG 2000 Signal Generation Platform User Manual* for a list of Environmental specifications.

Table 1–1: Encoded Clock Output

Characteristics	Description
Connector	Twin-ax BNO connector. Maximum recommended cable length 10 meters.
Signal Amplitude	Differential ECL.
Encoded Mode Frequencies	69.0 MHz – 78.0 MHz. Presets for 74.25 MHz Clock at 15 Hz Color Frame and 74.17582418 MHz Clock at 14.98501499 Hz Color Frame.
Unencoded Mode Frequencies	10.0 MHz – 100.0 MHz.
Impedance	78 Ω differential.

Table 1–2: Clock Output

Characteristics	Description
Connector	BNC connector.
Signal Amplitude	0.4 V _{p-p} \pm 0.1 V. Into 75 Ω , AC-coupled square wave.
Clock Output Frequencies	10.0 MHz – 100.0 MHz.
Impedance	75 Ω .
Return Loss	\geq 15 dB 1 MHz to 100 MHz.

Table 1-3: Frame Output

Characteristics	Description
Connector	BNC connector.
Signal Amplitude	0.4 V _{p-p} ± 0.1 V. Into 75 Ω, AC-coupled square wave.
Frame Rates	1.609 Hz to 1000 Hz.
Impedance	75 Ω single-ended.
Return Loss	>15 dB from 300 KHz to 100 MHz.

Table 1-4: Data Handling Characteristics

Characteristics	Description
Nonvolatile Memory Retention Time, typical	≥ 10 years.

Table 1-5: Power

Characteristics	Description
Power	All power is derived from the TG 2000 Platform mainframe.
Power Consumption, typical	+5 Volts: 2.0 W -5 Volts: 1.1 W -2 Volts: 0.3 W +15 Volts: 0 W -15 Volts: 0 W Battery: 0 μA

Certifications

Table 1-6: Certifications and compliances

Characteristics	Description
EMC Compliance	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility when it is used with the product(s) stated in the specifications table. Refer to the EMC specification published for the stated products. May not meet the intent of the directive if used with other products.
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits



Operating Information

Installation

This section contains instructions for installing the module into the TG 2000 Platform mainframe.

Preventing Component Damage



CAUTION. *Electrostatic discharge (ESD) can damage components on this module and mainframe. To prevent ESD or other component damage, follow the steps below when installing, removing, or handling modules:*

1. Wear a grounded antistatic wrist strap to discharge the static voltage from your body while installing or removing modules from the TG 2000 Platform mainframe.
2. Transport and store modules in a static-protected bag or container.
3. Do not slide the module over any surface.
4. Handle modules as little as possible.
5. Do not touch module components or connector pins.
6. Do not use any devices capable of generating or holding a static charge in the work area where you remove, install, or handle modules.
7. Avoid handling modules in areas that have a floor or work-surface covering capable of generating a static charge.
8. Do not remove the module circuit board assembly from the shield. The shield provides important support and protection for the surface-mount components.

Module Installation

A T-10 torx tip screwdriver is the only tool you need to install the module. A T-10 torx tip is supplied with the module.

To install the module into the TG 2000 Platform mainframe, perform these steps:

1. Set the TG 2000 Platform mainframe rear-panel power switch to off.
2. Unplug the power cord.
3. Select the slot you will use to install the module. Table 2–1 lists the slot restrictions. Figure 2–1 shows a sample configuration with slot numbers.

Table 2–1: Module slot assignments

Module	Slots in which the module can be installed
AGL1 Genlock module	Slot 2 or 3
AVG1 Generator module	Slots 2 through 10
AWVG1 Generator module	Slots 2 through 10
BG1 Generator module	Slot 2 through 10
Clock module	Slot 1
CPU module	Slot 11
DVG1 Generator module	Slots 2 through 10
ENC1 Encoded Clock module	Slots 2 through 10
GP1 GPIB Interface module	Slot 10

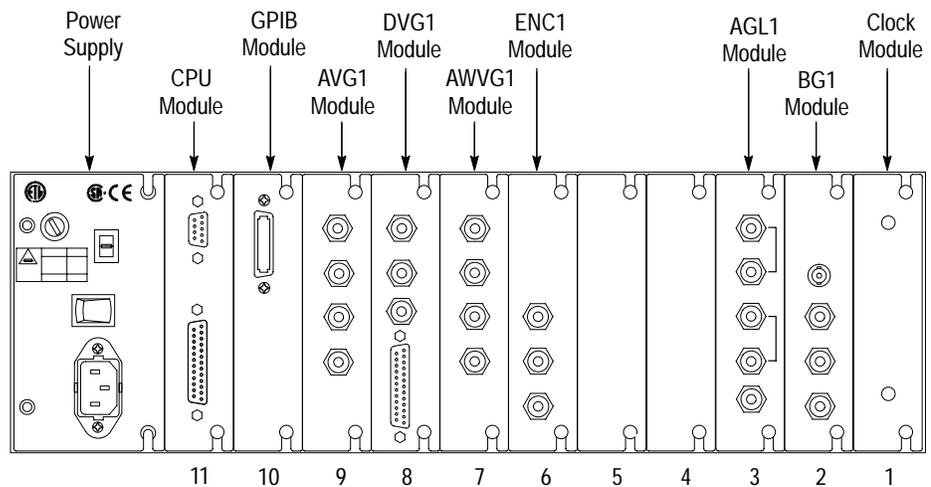


Figure 2–1: TG 2000 Platform mainframe rear panel, showing slot numbering



WARNING. To avoid a shock hazard, always remove the power cord before removing the top cover. Failure to remove the power cord can result in serious injury or death.

4. Refer to Figure 2-2 and remove or loosen all screws to remove the top cover.

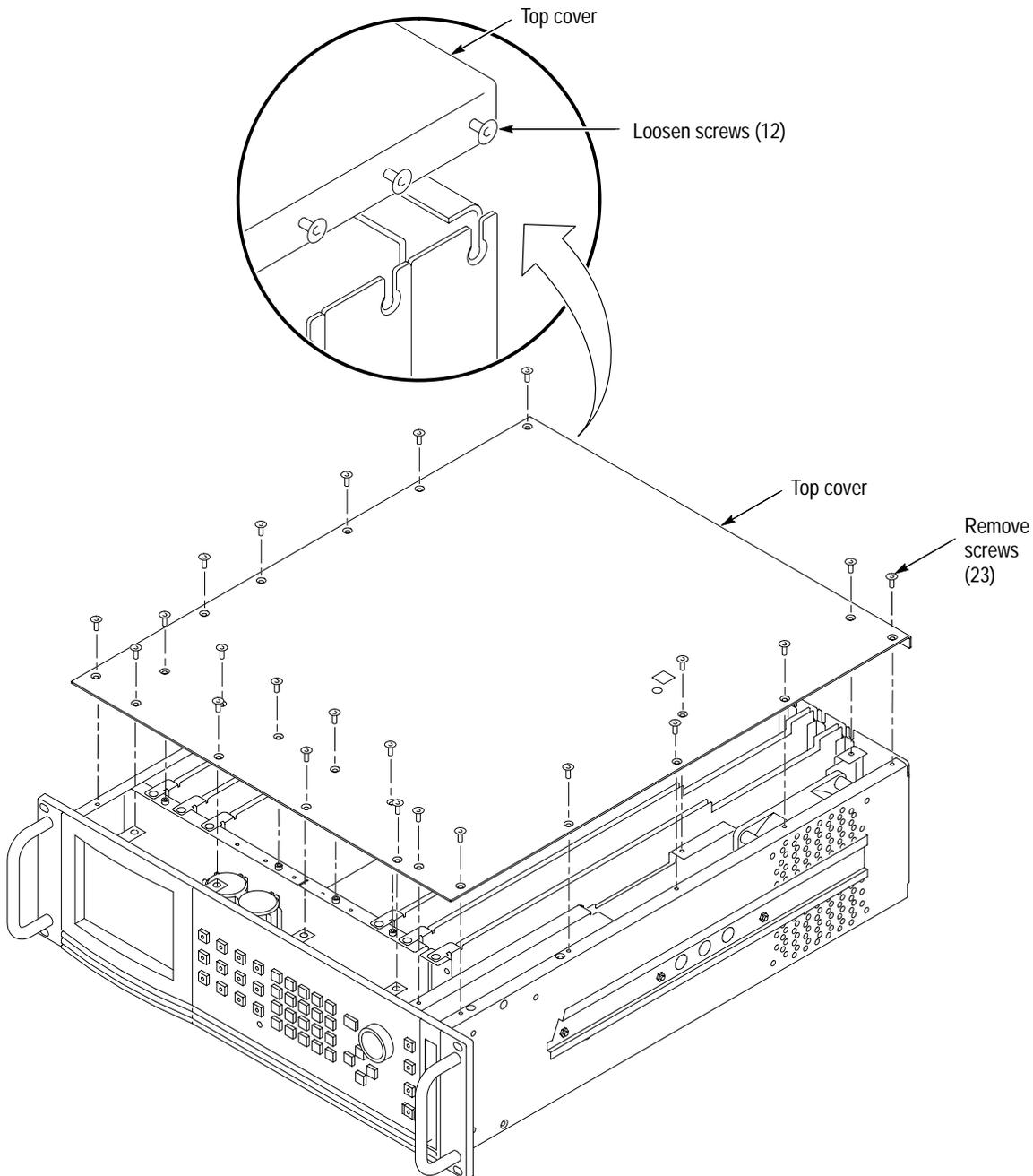


Figure 2-2: Top cover removal

5. Remove the appropriate rear panel as shown in Figure 2-3. Loosen, but do not remove the bottom screw. You will use it later to secure the module.

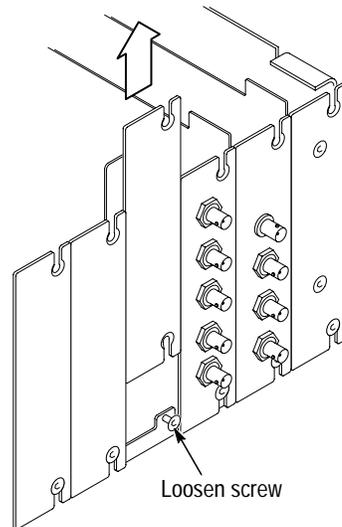


Figure 2-3: Rear panel removal

6. While ensuring correct alignment of the module flange as shown in Figure 2-4, lower the module into the desired slot as shown in Figure 2-5.

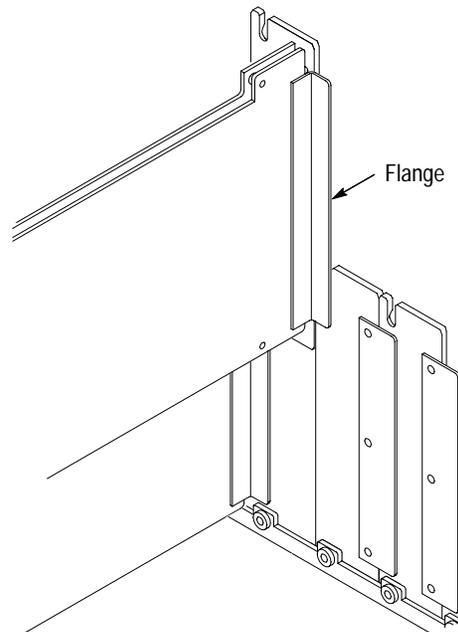


Figure 2-4: Module flange

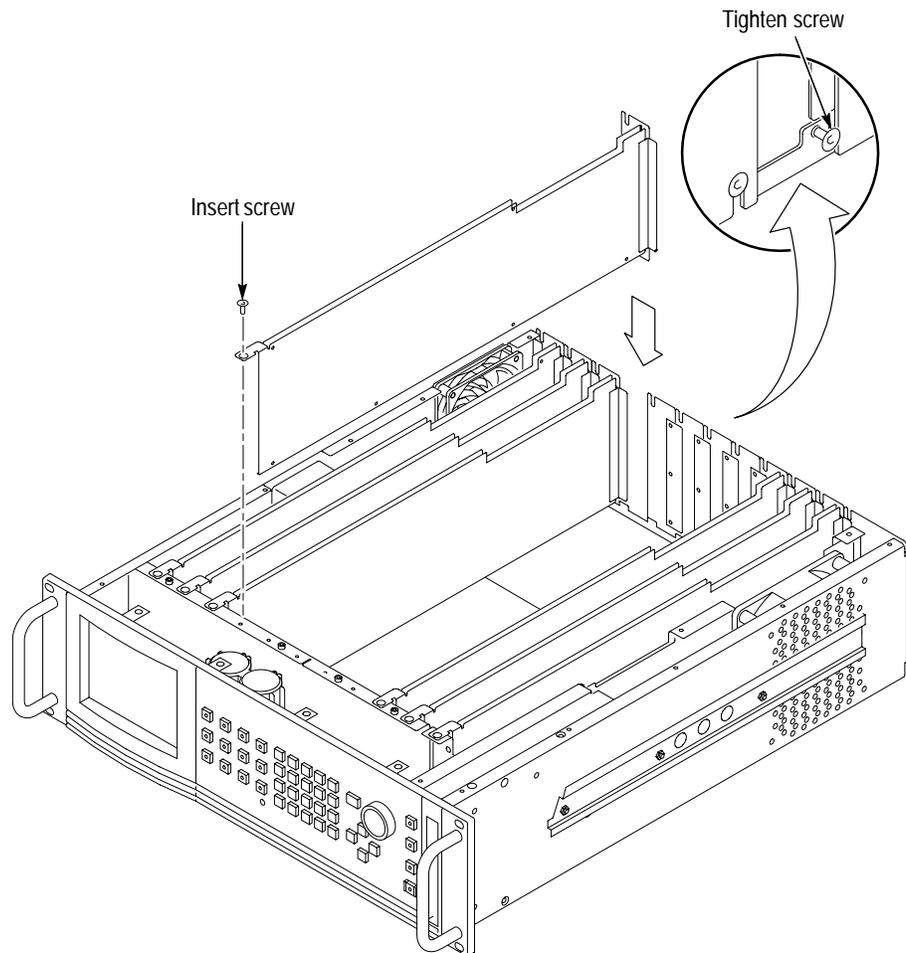


Figure 2-5: Module Installation

7. Ensure that the connectors on the Backplane board and the module exactly match before seating the module.



CAUTION. The connectors must exactly match before you attempt to press the module firmly in place. If the connectors do not match, you might bend a pin that could damage the module, mainframe, or both when power is applied.

8. Press down evenly on the module until it is firmly in place.
9. Insert and tighten the top screw, supplied with your module, as shown in Figure 2-6.
10. Tighten the rear panel screw.

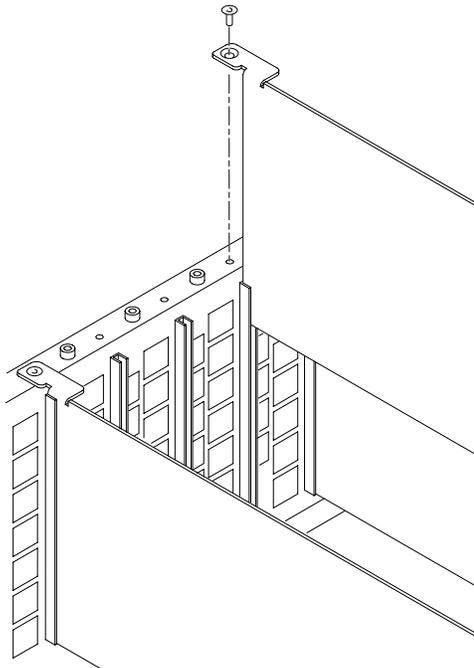


Figure 2-6: Top screw

- 11.** Replace the top cover.
- 12.** Insert and tighten all top cover screws.
- 13.** Plug in the instrument power cord. Power on the mainframe by setting the rear-panel power switch to ON and pressing the front-panel power switch.
- 14.** Wait for the instrument to perform self tests.
- 15.** Check that all modules are in the desired state (enabled/disabled).

The default state for the new ENC1 module is disabled. When you select an output signal for this module, the platform automatically enables the module.

- 16.** Resave instrument presets with the new instrument configuration as follows:
 - a.** Push the **Presets** button.
 - b.** Touch **Presets** on the display.
 - c.** Select the desired preset from the list at the left side of the window.
 - d.** Touch **Save To** to save the current settings to the selected preset. The previous contents of the preset are lost.

Instrument Backup and Restore

It is not necessary to backup the ENC1 module. However, you should perform an instrument backup before you troubleshoot the platform or remove a generator module from the platform. A generator module will lose its signal memory 30 seconds after removal from the mainframe.

Required Equipment You will need blank, DOS formatted 3.5 inch disks. You will need approximately one disk for each installed module, and one disk for the CPU.

Instrument Backup To save signal sets and instrument settings, perform the following procedure:

1. Insert the Troubleshooting disk supplied with the *TG 2000 Signal Generation Platform Service Manual* into the mainframe disk drive and push the front-panel **Sequences** button.
2. Touch **File Utilities** on the display, and then touch **Add Sequences from Disk**.
3. Select the **tgbackup.seq** sequence file, and then touch **Start Load**.
4. When you see the message, “The Load is Complete”, touch **OK**.
5. Touch **Quit**, and then touch **Quit** again.
6. Touch **Sequences** and then select the **tgbackup.seq** file to run (use the touch screen and the **Select** key). Be sure this file name appears in the box at the top of the window.
7. Touch **Run**. A popup message will tell you how many disks are needed. Touch **Quit**.
8. When you see the message, “Insert a Floppy Disk”, remove the troubleshooting disk and insert a blank formatted disk. Touch **Quit**.
9. After each backup disk is complete, a popup message will tell you to insert a new disk. Replace the completed disk with a new disk, and touch **Quit**.
10. After the last backup disk is complete, touch **Quit** and then **Quit** again.

Instrument Restore from Backup To restore signal sets and instrument settings, perform these steps:

1. Insert the Troubleshooting disk supplied with *TG 2000 Signal Generation Platform Service Manual* into the mainframe disk drive and push the front-panel **Sequences** button.
2. Select the **tgrstore.seq** file, and then touch **Start Load**.
3. When you see the message, “The Load is Complete”, touch **OK**.

4. Touch **Quit**, and then touch **Quit** again.
5. Touch **Sequences** and then select the **tgrstore.seq** file to run (use the touch screen and the **Select** key). Be sure this file name appears in the box at the top of the window.
6. Touch **Run**. Insert any of the backup disks that you created when you performed the *Instrument Backup* procedure. Touch **Quit**.
7. Insert another disk and touch **Quit** each time you are prompted. (You can insert the disks in any order.)
8. When the Restore Complete window appears, turn the mainframe power off and then on again to cycle power.

Module Removal

Before removing any of the generator modules that allow you to load signals, such as the AVG1 Generator module and the DVG1 Generator module, you should save the signal sets to a disk. Refer to the module's user manual for instructions on backing up the signal sets. However, you do not need to back up the ENC1 module signals before removing an ENC1 module because they are not lost when the module is removed from the platform.

To remove the module, follow these steps:

1. Turn off the platform by pressing the front-panel **On/Standby** switch and switching the rear panel power switch to off.
2. Unplug the power cord.



WARNING. To avoid a shock hazard, always unplug the power cord before removing the top cover. Failure to unplug the power cord can result in serious injury or death.

3. Remove all top-cover screws and remove the top cover. See Figure 2–2 on page 2–3.
4. Remove the appropriate rear panel as shown in Figure 2–3 on page 2–4. Loosen, but do not remove the bottom screw. You will use it later to secure the rear panel.
5. Refer to Figure 2–6 on page 2–6 and remove the top screw.
6. Remove the module. To leave the slot empty, proceed to step 8 of this procedure.
7. To install a module in the empty slot, proceed to *Module Installation* on page 2–2.
8. To ensure proper cooling and adherence to EMI shielding requirements, install a blank panel to cover any empty slots in the rear panel. A spare blank panel is included in the TG 2000 Platform mainframe accessories kit.
9. Tighten the screws on the blank rear panel.
10. Reinstall the top cover and insert and tighten all top cover screws.

Operating Information

This section tells you how to power on the mainframe and select the ENC1 module, select the module output, and set the user and user encoded clocks.

Refer to Figure 2–7 on page 2–11 for information on how to access the appropriate window for these procedures.

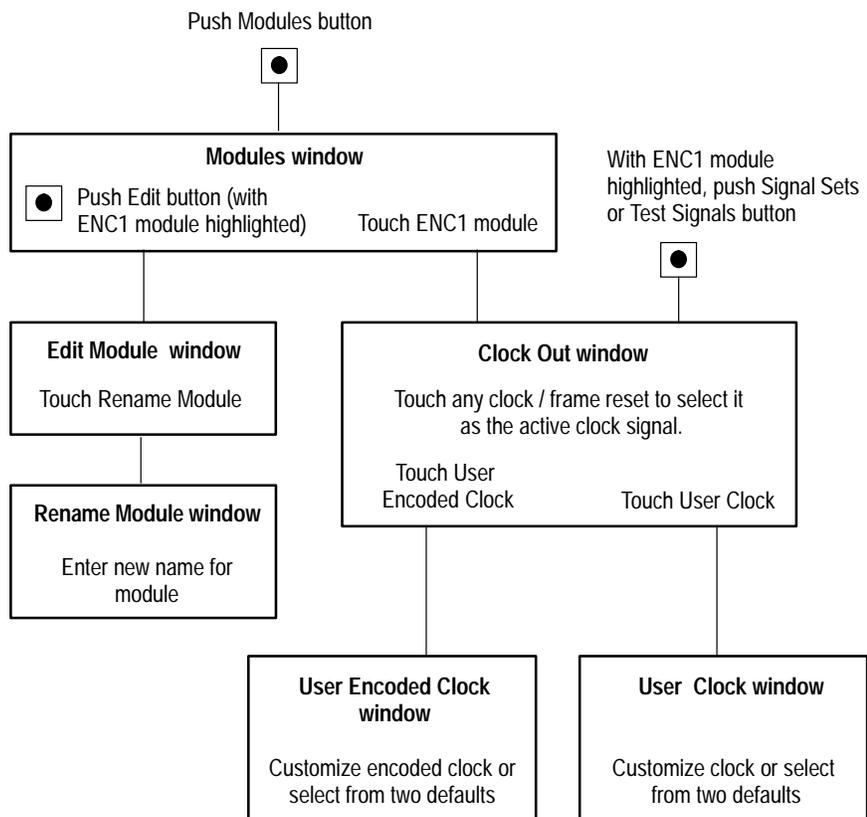


Figure 2–7: Basic menu structure for the ENC1 module

Power On and Select the Module

After the module is installed in the mainframe, and the mainframe is installed in the rack or other location where it will be used, power on the mainframe and select the module by following these steps:

1. Set the rear-panel power switch to the **ON** position.
2. Press the front-panel **POWER** switch if necessary.
3. Wait for a few seconds as the mainframe executes confidence tests on the mainframe and modules. Check for any error messages that might appear.
4. When self tests are complete, check for an icon representing each installed generator module. After each module name is an area that can be used to indicate the slot number in which it is installed. If an installed module is not represented, refer to *Troubleshooting* in the *TG 2000 Signal Generation Platform Service Manual*.
5. Since you have just powered on the mainframe, the Modules window is displayed. To access this window at other times, push the front-panel **Modules**.
6. Touch the **ENC1** icon on the display (or push the **Signal Sets** button if the ENC1 icon is already highlighted). The Clock Out window appears, as shown in Figure 2–8.

Select the Clock Output Signal

The ENC1 Encoded Clock module provides three outputs; a clock, a frame, and a frame encoded clock. To select the output signal, follow these steps:

1. Select the ENC1 module.
2. Push the **Signal Sets** button.
3. In the Clock output window (shown below) touch the desired output on the display. (In this example, a standard encoded clock is selected.)

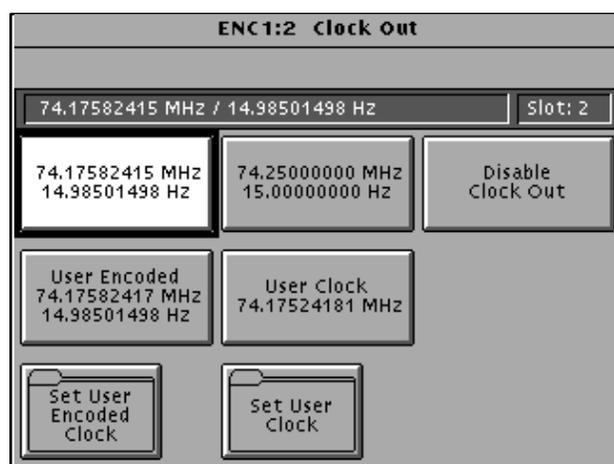


Figure 2–8: Clock Out window

4. You can also select the output signal using the List window as follows:
 - a. Push the front-panel **List** button to display the list of test signals.
 - b. Use the Navigation arrow keys to highlight the module and signal.
 - c. Push the **Select** button.

Set User Clock

You can set a new unframed clock using the Set User Clock window. Setting a new unframed clock selects that clock as the output and disables the Frame output.

1. In the Clock Out window (Figure 2–8), touch **Set User Clock**. The Set User Clock window opens (Figure 2–9).



Figure 2–9: Set User Clock window

2. Define the new unframed clock as follows:
 - Use the keypad or large knob to assign a value.
 - Touch **Default 1** or **Default 2** on the display to set the clock to either of these standard values.

If you want to return to the previous value, touch **Undo**.

3. Touch **Quit** to exit the window with the new clock setting in place.

Set User Encoded Clock

You can define a new frame-encoded clock using the Set User Encoded Clock window.

1. In the Clock Out window (Figure 2–8), touch **Set User Encoded Clock**. The Set User Encoded Clock window opens (Figure 2–10). This window includes two informational fields:
 - 27 MHz Clks/Frm. Displays the integer count of 27 MHz clock cycles needed to generate the frame. Frames are always based on the fixed 27 MHz clock.
 - Clock. Displays a valid encoded clock frequency. Encoded clocks must have an integer number of cycles per color frame. The clock is derived from the frame rate multiplied by the clocks per frame. The frequency is limited to the range allowed by the TSG1001.

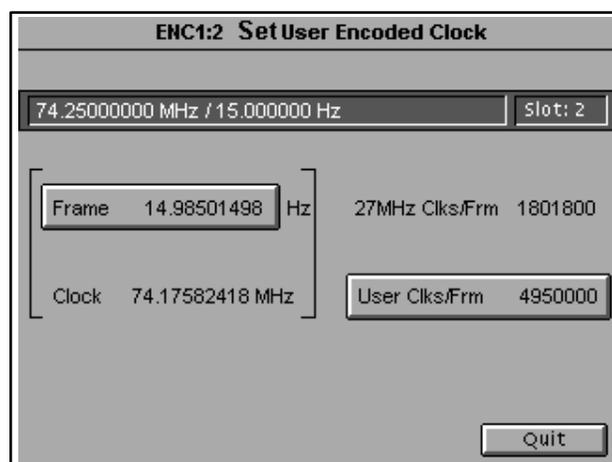


Figure 2–10: Set User Encoded Clock window

2. Use the following fields to define the new clock. Use the touch screen or the directional arrows to select fields. For numeric fields, use either the keypad or the knob to enter the desired value.
 - Frame. Use this field to set the frame rate of the encoded clock signal.
 - User Clks/Frm. Use this field to set the number of user clock cycles per frame.
 - Default 1 or Default 2. Select a default if you want to set the clock and frame to standard frequencies.
 - Undo. Select Undo if you want to restore the previous values.
 - Quit. Select Quit to save the changes you made and exit the window.



Theory of Operation

Theory of Operation

The Theory of Operation section provides a module-level overview of the ENC1 Encoded Clock module. Refer to Figure 3–1 while reading this section.

The ENC1 module is designed to be installed in the TG 2000 Signal Generation Platform. This module's main function is to provide encoded clocks to the TSG1001 Programmable Signal Generator. These clocks are on a shielded differential twinax cable system for noise immunity and have a frame pulse encoded into the clock for genlock frame timing.

The TG 2000 Signal Generation Platform processor interfaces with the ENC1 module in the same manner as other modules; user actions select functions for the board via its slot addresses.

Under software control, the ENC1 module board selects one of the three systems clocks and one of the two frames. The clock is then buffered and supplied on the CLOCK BNC connector. The frame signal is then registered with the selected clock and supplied on the FRAME BNC connector. Finally, the clock and the registered frame are combined to make the encoded clock. This is done by blanking one-half cycle of the clock. The resulting signal is supplied on the ENCODED CLOCK special BNC connector.

The ENC1 board follows most of the standard TG 2000 Signal Generation Platform conventions. It contains its own module firmware in flash ROM, it has a non-volatile storage system for saving settings during power off, and it has power-on self-test for evaluating board operation.

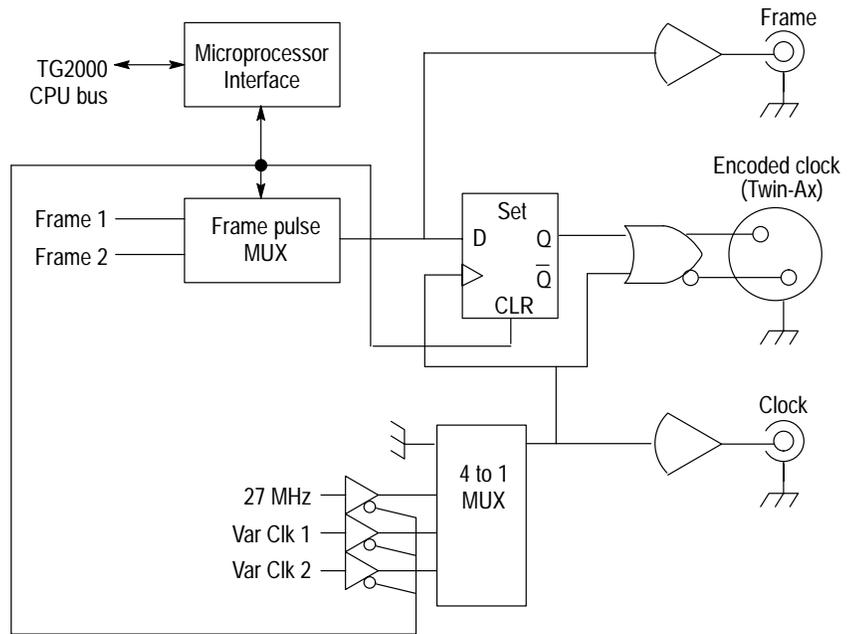


Figure 3-1: Block Diagram



Performance Verification

Performance Verification

Perform the following procedure to verify that your ENC1 module is meeting the requirements listed in the *Specifications* section. You do not need to remove the covers from the mainframe.

If, after performing this procedure, you determine that the module is not meeting specifications, refer to *Troubleshooting* in this manual or contact your Tektronix representative.



WARNING. *Dangerous electric shock hazards exist inside the mainframe. Only qualified service personnel should perform these procedures.*

Verification Interval

To ensure correct instrument operation, verification procedures should be performed once a year. Before performing any verification procedures, complete all relevant maintenance procedures outlined in the *Maintenance* section of this manual.

Required Equipment

Test Equipment

Table 4–1 lists the equipment required for the *Performance Verification* procedure.

Table 4–1: Equipment required for Performance Verification

Equipment	Example or Tektronix equivalent
Impedance Adapter	Tektronix AMT75
High Precision Oscilloscope	TDS784 Series Oscilloscope
1 meter low-loss precision 75 Ω coaxial cable	Tektronix part number 012-0159-00
Wide-band oscilloscope probe	Tektronix P6204 or P6245

Clock Output

Use the following procedure to verify the clock output specifications (see page 1–2):

1. Use the precision coaxial cable to connect the Clock Output of the ENC1 module to the AMT75. Connect the AMT75 to the Ch 1 input on the oscilloscope.
2. Set the oscilloscope to 0.1 V / div vertical and 10 ns / div horizontal.
3. Set the ENC1 module User Clock to 27.000 MHz.
4. Set the oscilloscope trigger to Ch 1, edge trigger, 0 volt level, normal mode.
5. Use the H Bar cursors to measure the amplitude by putting one cursor at average of top and bottom levels.
6. Check that the signal is a clean square wave, balanced around 0 V. Check that the signal amplitude measures between 0.32 and 0.48 volts.

Frame Output

Use the following procedure to verify the frame output specifications (see page 1–3):

1. Use the precision coaxial cable to connect the Clock Output of the ENC1 module to the AMT75. Connect the AMT75 to the Ch 1 input on the oscilloscope.
2. Set the oscilloscope to 0.1 V / div vertical and 10 ns / div horizontal.
3. From the TG 2000 Platform mainframe front panel, set the ENC1 module output to 74.25 MHz clock at 15 Hz frame.
4. Set the oscilloscope trigger to Ch 1, edge trigger, 0.2 volt level, normal mode.
5. Use the H Bar cursors to measure the amplitude by putting one cursor at average of top and bottom levels.
6. Check that the signal is a clean positive pulse with the low level at ground. Check that the signal amplitude measures between 0.32 and 0.48 volts.



Adjustment Procedures



Adjustment Procedures

There are no adjustments for the ENC1 Encoded Clock module.



Maintenance

Maintenance

This section contains instructions and procedures for maintaining and servicing the ENC1 Encoded Clock module.

Preparation

Follow these instructions when maintaining or servicing the instrument.

Servicing Prerequisites

- Only qualified service personnel may maintain or service this instrument.
- Before maintaining or servicing this instrument, read the *Service Safety Summary* and the *Operating Information* in this manual.

Electrostatic Damage Prevention

This instrument contains electrical components that are susceptible to damage from electrostatic discharge. Static voltages of 1 kV to 30 kV are common in unprotected environments.



CAUTION. *Static discharge can damage any semiconductor component in this instrument.*

Observe the following precautions to avoid static damage:

- Minimize handling of static-sensitive components.
- Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
- Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should only be performed at a static-free workstation by qualified personnel.
- Do not allow anything capable of generating or holding a static charge on the workstation surface.
- Keep the component leads shorted together whenever possible.
- Pick up components by the body, never by the leads.
- Do not slide the components over any surface.

- Do not handle components in areas that have a floor or work surface covering capable of generating a static charge.
- Use a soldering iron that is connected to earth ground.
- Use only special antistatic, suction-type or wick-type desoldering tools.

NOTE. A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.

Inspection and Cleaning

Preventive maintenance consists of cleaning, visual inspection, and performance verification. The preventive maintenance schedule established for the instrument should be based on the environment in which it is operated and the amount of use. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

General Care

Protect this instrument from adverse weather conditions. The instrument is not waterproof.



CAUTION. To avoid damage to this instrument, do not expose it to sprays, liquids, or solvents.

To avoid damage to the module circuit board, do not flex the circuit board if you remove the board from its mounting shield. The circuit board can be damaged by flexing. The shield provides necessary structural support to the circuit board.

Cleaning

The instrument should be cleaned often enough to prevent dust or dirt from accumulating. Dirt acts as a thermal insulating blanket that prevents effective heat dissipation, and can provide high-resistance electrical leakage paths between conductors or components in a humid environment.

Clean the exterior of the instrument by removing dust with a lint-free cloth. Use care to avoid scratching the touch screen. A small, soft-bristled brush is useful to remove dust from around the connectors.

For further cleaning, use a soft cloth or paper towel dampened with water. You can use a 75% isopropyl alcohol solution for more efficient cleaning.



CAUTION. To avoid damage to the surface of this instrument, do not use abrasive or chemical cleaning agents.

If you must clean the interior of the instrument, allow the interior to thoroughly dry before reassembling and applying power to the instrument.

Visual Inspection

After cleaning, carefully check the instrument for defective connections, damaged parts, and improperly seated transistors or integrated circuits. The remedy for most visible defects is obvious; however, if heat-damaged parts are discovered, determine the cause of overheating before replacing the damaged part.

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit.

Performance Verification

Instrument performance should be checked after each 2000 hours of operation or every 12 months. This will help to ensure maximum performance and assist in locating defects that may not be apparent during regular operation. Performance verification procedures are included in this manual.

Removal and Replacement

This section contains the instructions on how you can remove and replace the customer replaceable parts of the ENC1 Encoded Clock module.

Tools Required

The following tools are required to perform the removal and replacement procedures:

Table 6-1: Required tools

Tool	Use
Torx screwdriver handle	Removing the module from the mainframe
T-10 Torx tip	Removing the module from the mainframe
9/16 inch box wrench	Removing the rear panel

Removing the Rear Panel

To remove the rear panel from a module, perform the following steps:

1. Use the *Module Removal* procedure on page 2–9 to remove the ENC1 module from the mainframe.
2. Remove the nuts and washers from each of the rear panel connectors.
3. Lift the rear panel away from the module.
4. To replace the rear panel, position it on the module, install the lock washers and then the nuts.
5. Tighten the nuts.

Replacing the Shield

It is usually not necessary to remove the shield. If you are returning the module to Tektronix for service, do not remove the shield. Return the entire module.

If you need to replace a damaged shield, carefully follow these instructions.



CAUTION. *The shield provides important support and protection for the surface-mount components. If you remove the shield, be sure not to flex the circuit board.*

1. Perform *Removing the Rear Panel* on page 6–5.
2. Using the T-10 Torx tip, remove the eight screws that attach the ENC1 circuit board to the shield.
3. Using great care not to bend or flex the circuit board, pull it out until the connectors clear the rear portion of the shield. Remove the circuit board from the shield and place it on a static free surface.
4. Set the replacement shield assembly (which includes a metal portion and a plastic portion) on a firm, flat, static-free work surface. Carefully place the circuit board in place on the shield.
5. Install but do not tighten the eight screws that you removed in step 2. Check that the circuit board is flat and is not flexed.



CAUTION. *When installing the circuit board onto the shield, make sure both the shield and the circuit board are flat. If the board is flexed or warped, it may damage sensitive surface-mount components.*

6. Reinstall the rear panel.
7. Position the module so that the flange hangs over the edge of the work surface, and the shield is flat on the work surface. See Figure 6–1. Tighten the eight screws that attach the shield to the circuit board.

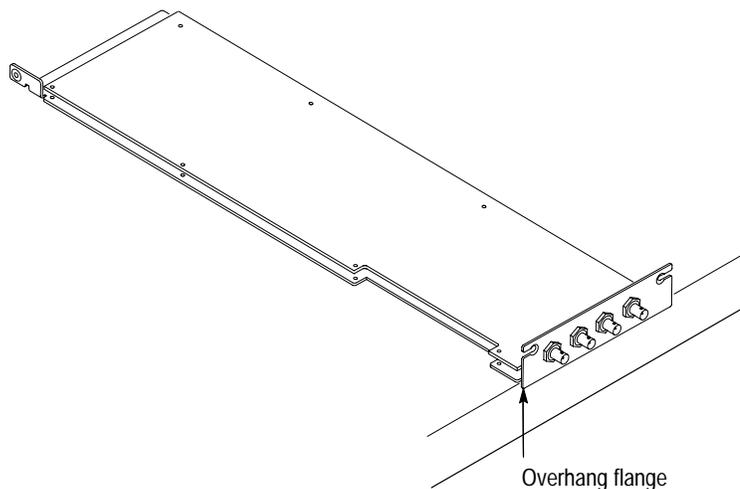


Figure 6–1: Position the shield flat on the work surface

Replacing the Rear Panel Connectors

It is usually not necessary to replace the rear panel connectors (shown in the *Mechanical Parts List*, Figure 10-1-7). However, if a connector becomes damaged, you can replace it by performing the following steps:

1. Refer to the preceding instructions, *Replacing the Shield*, to remove the shield from the ENC1 module.
2. Carefully desolder the damaged connector (at J4, J13, J16, or J7) from the back side of the board.
3. To replace the connector, reverse the procedure.

Troubleshooting

This section contains instructions and procedures for troubleshooting the ENC1 Encoded Clock module. These procedures will help you decide whether it is necessary to replace your module.

If the TG 2000 Platform mainframe does not boot up or if the display is not working, refer to *Troubleshooting* in the *TG 2000 Signal Generation Platform Service Manual*.

Required Equipment

The equipment listed in Table 6–2 is required for troubleshooting.

Table 6–2: Equipment required for troubleshooting

Equipment description	Minimum requirements/example
Torx screwdriver handle	Accepts Torx-driver bits
T-10 Torx tip	Torx-driver bit for T-10 screw head
Blank disks	MS-DOS preformatted, 3.5 inch. For instrument backup, you will need approximately one disk for each installed generator module, and one disk for the CPU. To write the console ring file, you will need two disks.
Troubleshooting disk	Supplied with the <i>TG 2000 Signal Generation Platform Service Manual</i>

General Troubleshooting

This section contains general troubleshooting instructions and procedures to use when you begin to troubleshoot suspected faults with the ENC1 Encoded Clock module.

Instrument Backup

Before troubleshooting the platform, you should back up the TG 2000 Signal Generation Platform signals using the procedure on page 2–7. Save the backup disks until after the problem is solved, and use them to restore the platform signals if it becomes necessary.



CAUTION. *To prevent data loss, back up the instrument before you begin any troubleshooting procedures.*

Saving the Console Ring File to Disk

The TG 2000 Platform mainframe displays module diagnostic information during instrument power up. Any error messages are written to an internal file called the console ring file. Tektronix technicians can use the information in the console ring file to help troubleshoot a malfunctioning module.

NOTE. *Write the console ring file to disk before performing troubleshooting to prevent the troubleshooting routines from overwriting the console ring file.*

Write the file as follows:

1. Load the Troubleshooting disk (supplied with the *TG 2000 Signal Generation Platform Service Manual*) into the floppy drive. Press the front-panel **Sequences** button.
2. Touch **File Utilities**, and then touch **Add Sequences from Disk**.
3. Select the **consbak.seq** sequence file and then touch **Start Load**.
4. Touch **OK, Quit**, and then **Quit** again.
5. Touch **Sequences** and then select the **consbak.seq** file to run (use the **Select** key).
6. Touch **Run**. Insert a blank disk when prompted, and touch **Quit**. Label this disk #1.
7. Turn the instrument off and then back on from the front panel. Wait until the instrument has completed its power up process.
8. Write the console ring file to disk again, using a different disk. Label this disk #2.

9. Read the console ring file power up messages. If there are ENC1 module errors, refer to the *Fault Symptom Table* on page 6–11.
10. If the TG 2000 Platform does not display any power-up confidence test messages, or the CPU module fails the confidence test, refer to *Troubleshooting* in the *TG 2000 Signal Generation Platform Service Manual*.

Returning Modules to Tektronix

When you return a mainframe or module to Tektronix for repair or replacement, be sure to include the following:

- The disks containing the console ring files
- Whether or not the module passed diagnostics, the highest number reached for that module, and any error messages
- Description of the problem, including which troubleshooting flow chart you used

Fault Symptom Table

Use this fault symptom table after you have performed the preceding *General Troubleshooting*. Before proceeding, it is important to save the console ring file as indicated in *General Troubleshooting* on page 6–10.

Locate your fault symptom in Table 6–3 and go to the flowchart indicated.

Table 6–3: Fault symptom table

Symptom	Flowchart
Major difficulties with module	page 6–12
with module installed in current slot	page 6–13
with module moved to different slot	page 6–14
Mainframe fails to power up	page 6–15
Missing output signal	page 6–16
Jitter on the signal	page 6–16

Troubleshooting Flowcharts

The troubleshooting flowcharts provide a series of steps to help you determine whether the ENC1 Generator module is faulty. Each chart relates to an entry in Table 6–3.

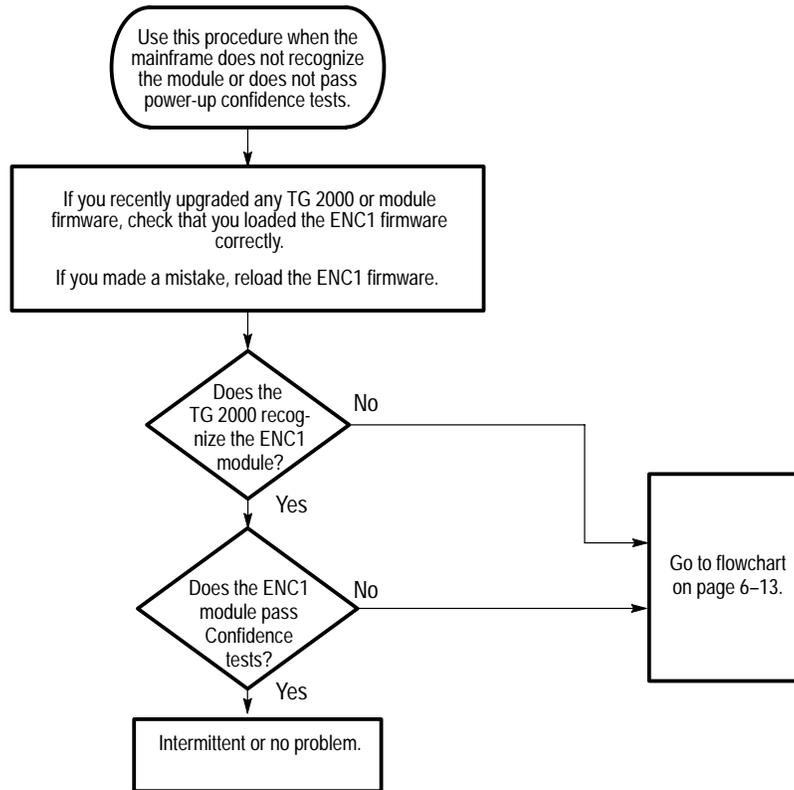


Figure 6-2: Flowchart for major difficulties with module

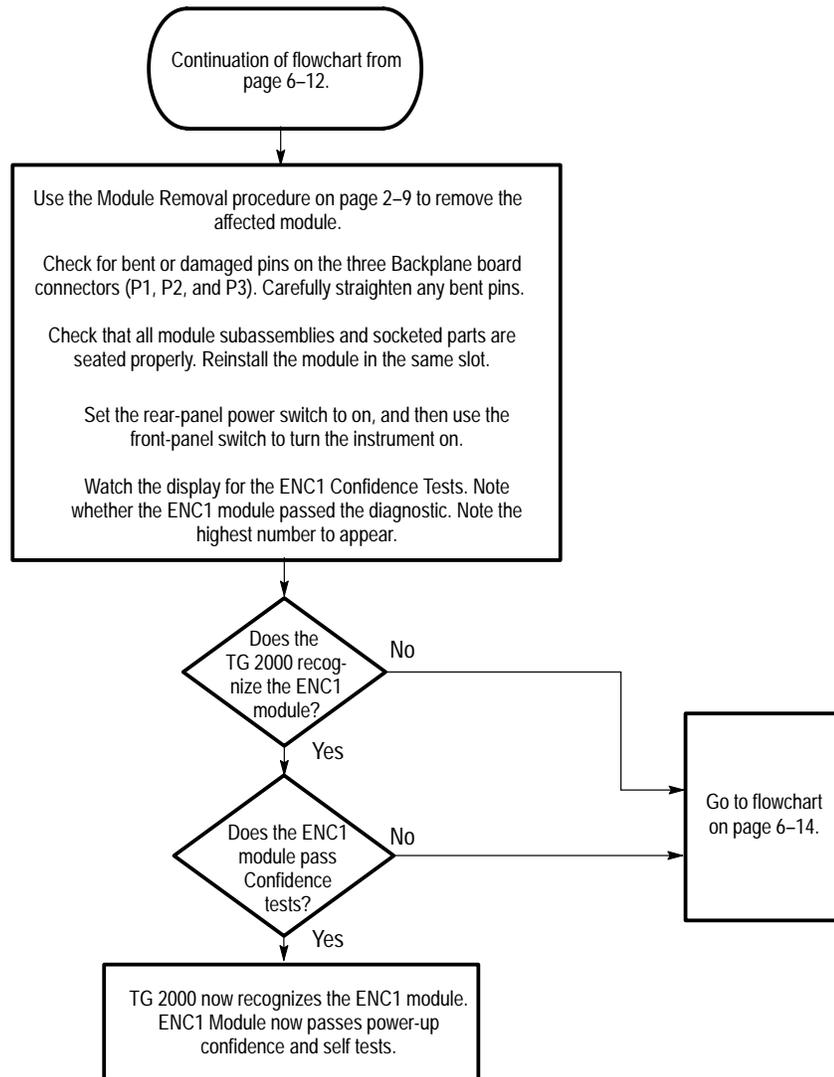


Figure 6-3: Flowchart for checking the current module installation slot

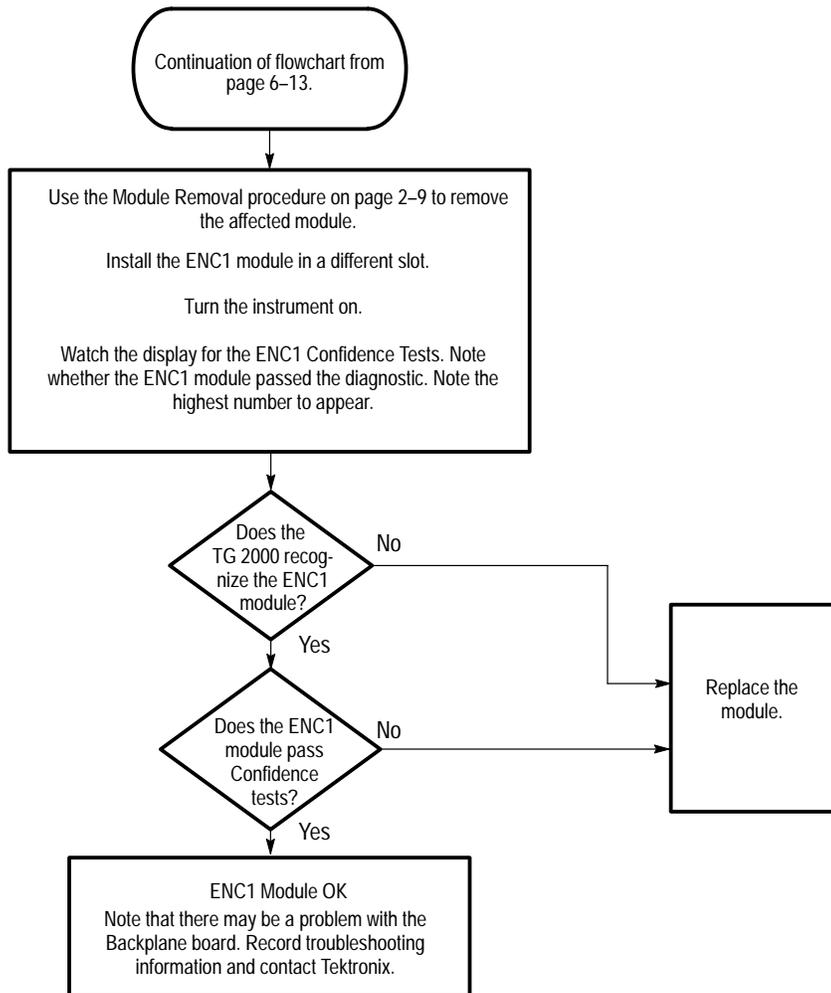


Figure 6-4: Flowchart for checking the module in a different slot

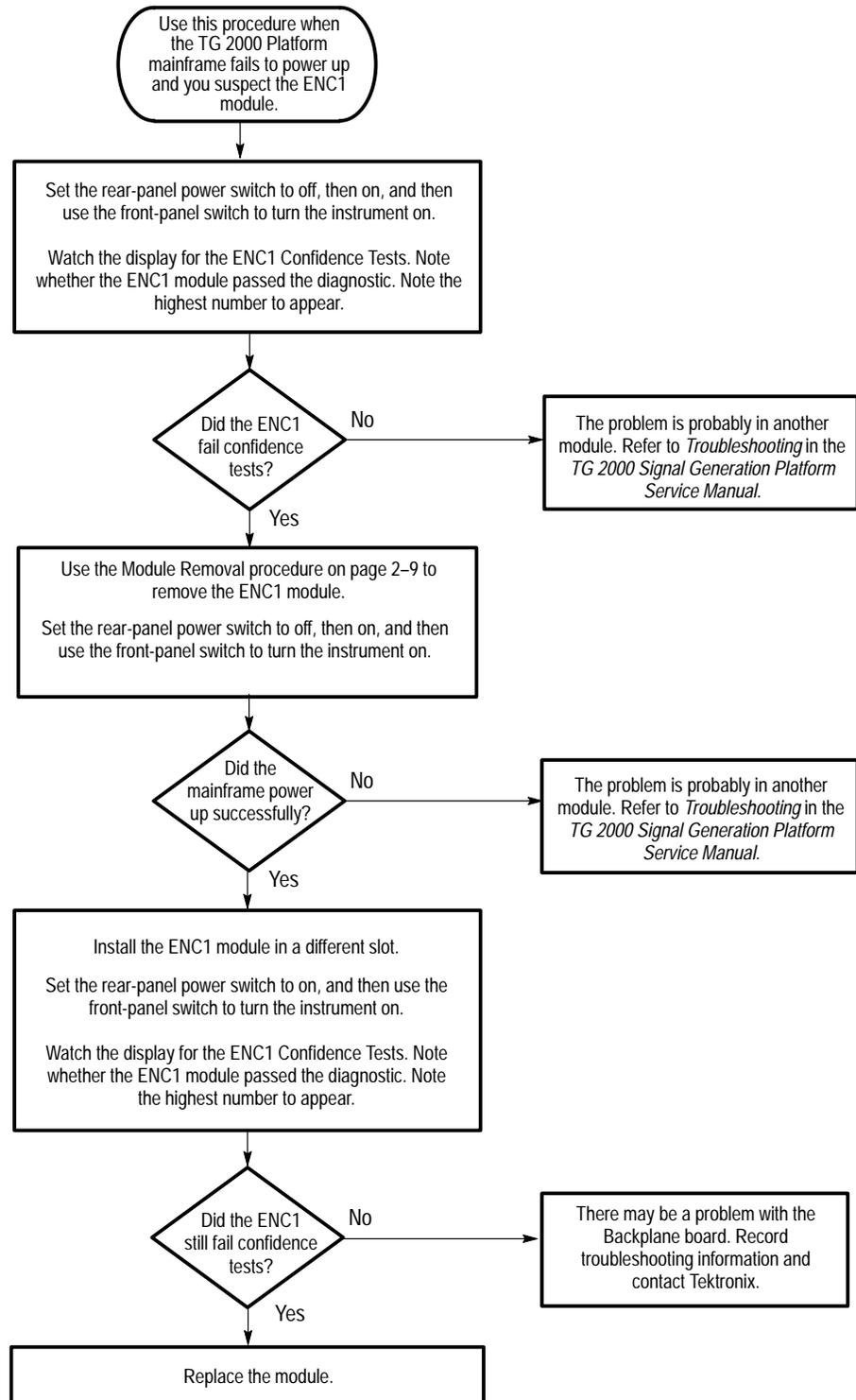


Figure 6-5: Flowchart for failure to power up

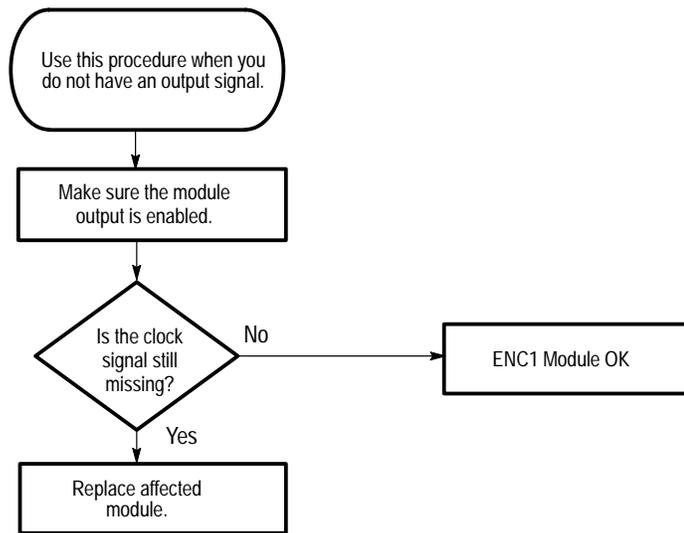


Figure 6-6: Flowchart for missing output signal

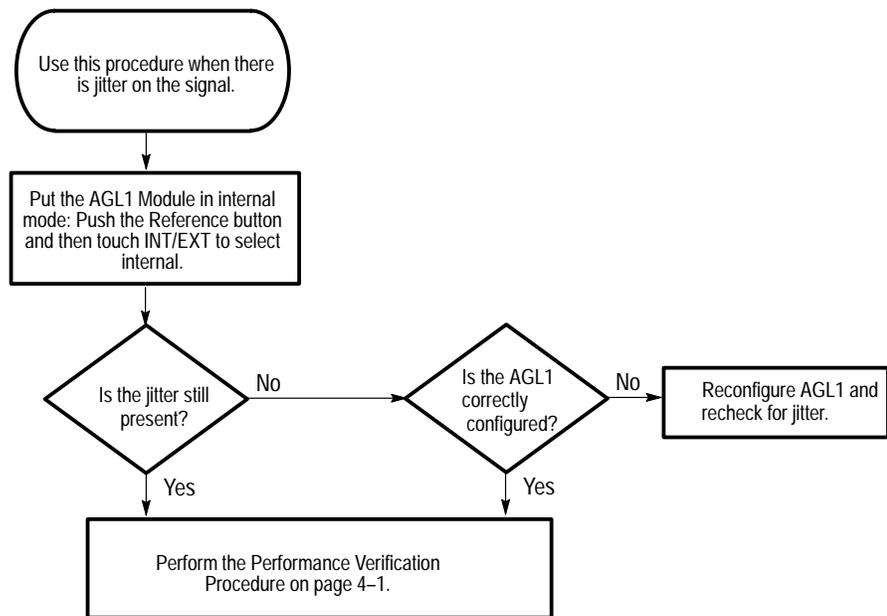


Figure 6-7: Flowchart for jitter on signal

Repackaging Instructions

Use the following instructions to prepare your instrument for shipment to a Tektronix, Inc., service center:

- 1.** Attach a tag to the instrument showing: the owner, complete address and phone number of someone at your firm who can be contacted, the instrument serial number, and a description of the required service.
- 2.** Package the instrument in the original packaging materials. If the original packaging materials are not available, follow these directions:
 - a.** Obtain a carton of corrugated cardboard having inside dimensions six or more inches greater than the dimensions of the instrument. Use a shipping carton that has a test strength of at least 250 pounds (113.5 kg).
 - b.** Place the instrument in its carrying pouch or surround the instrument with a protective bag.
 - c.** Pack dunnage or urethane foam between the instrument and the carton. If using Styrofoam kernels, overfill the box and compress the kernels by closing the lid. There should be three inches of tightly packed cushioning on all sides of the instrument.
- 3.** Seal the carton with shipping tape, industrial stapler, or both.



Options



Options

There are no options available for the ENC1 Encoded Clock module.



Replaceable Electrical Parts



Replaceable Electrical Parts

The module-level replaceable electrical parts are included in the *Replaceable Mechanical Parts* list. Since component-level repair is not supported, individual electrical components are not listed.



Diagrams

Diagrams

Figure 9–1 shows the ENC1 Encoded Clock module and how it interconnects with the TG 2000 Signal Generation Platform.

Diagrams showing mainframe component interconnections, such as power supply and clock, can be found in the *TG 2000 Signal Generation Platform Service Manual*.

A block diagram of the ENC1 Encoded Clock module is located on page 3–2.

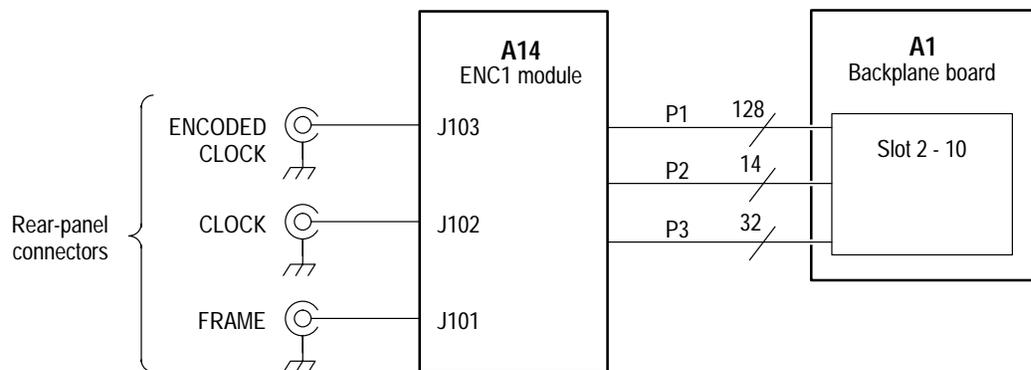


Figure 9–1: ENC1 module connections



Replaceable Mechanical Parts

Replaceable Mechanical Parts

This section contains a list of the replaceable modules for the ENC1 Encoded Clock module. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest 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 you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

Module Exchange. In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-TEK-WIDE.

Module Repair and Return. You may ship your module to us for repair, after which we will return it to you.

New Modules. You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

The following table describes each column in the parts list.

Parts List Column Descriptions

Column	Column name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial Number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
7	Mfr. Code	This indicates the code of the actual manufacturer of the part.
8	Mfr. Part Number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations Abbreviations conform to American National Standard ANSI Y1.1–1972.

Mfr. Code to Manufacturer Cross Index The table titled *Manufacturers Cross Index* shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers cross index

Mfr. code	Manufacturer	Address	City, state, zip code
00779	AMP INC.	CUSTOMER SERVICE DEPT PO BOX 3608	HARRISBURG, PA 17105-3608
01536	TEXTRON INC	1818 CHRISTINA ST	ROCKFORD, IL 61108
OKB01	STAUFFER SUPPLY CO	810 SE SHERMAN	PORTLAND, OR 97214-4657
0L8S3	TELECT INC	ATTN: DIVERSIFIED PROD GRP PO BOX 665 N. 2111 MOLTER ROAD	LIBERTY LAKE, WA 99019
14949	TROMPETER ELECTRONICS INC.	31186 LA BOYA DR .	WESTLAKE VILLAGE, CA 91362
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD PO BOX 76500	COLD SPRINGS, KY 41076
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077-0001
TK1943	NEILSEN MANUFACTURING INC	3501 PORTLAND RD NE	SALEM, OR 97303

Replaceable parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
10-1-1	211-0408-00			8	SCR,ASSEM WSHR:4-40 X 0.250,PNH,STL,ZINC,T-10 TORX	OKB01	211-0408-00
-2	211-0725-00			2	SCREW,MACHINE:6-32 X 0.375,FLH TORX	01536	ORDER BY DESCR
-3	672-1523-00			1	CIRCUIT BD ASSY:ENCODED CLOCK FRAME,671-4633-00	80009	672-1523-00
					ATTACHING PARTS		
	131-5453-00			1	CONN,RF JACK:BNC-TWIN,MALE/FEMALE,RTANG	14949	CBBJR39A
					END ATTACHING PARTS		
-4	337-4063-01			1	SHIELD ASSEMBLY:ALUM,W/O-020 POLYCARBONATE	TK1943	337-4063-01
-5	131-3378-00			2	CONN,RF JACK:BNC,50 OHM,FEMALE,RTANG	00779	227677-1
-6	333-4297-00			1	PANEL,REAR:ENC1,1.240 X 5.20,.100 AL,TG2000	TK1943	333-4297-00
-7	210-1039-00			3	WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	OKB01	1224-02-00-0541C
-8	220-0497-00			3	NUT,PLAIN,HEX:0.5-28 X 0.562 HEX,BRS CD PL	73743	ORDER BY DESCR
					STANDARD ACCESSORIES		
	071-0298-00			1	MANUAL,TECH:USER,ENC1 ENCODED CLOCK MODULE	80009	071-0298-00
	174-2355-01			1	CABLE ASSY,RF:78 OHM COAX,1 METER L	0L8S3	174-2355-01
					OPTIONAL ACCESSORIES		
	071-0304-00			1	MANUAL,TECH:SERVICE,ENC1 ENCODED CLOCK MODULE	80009	071-0304-00

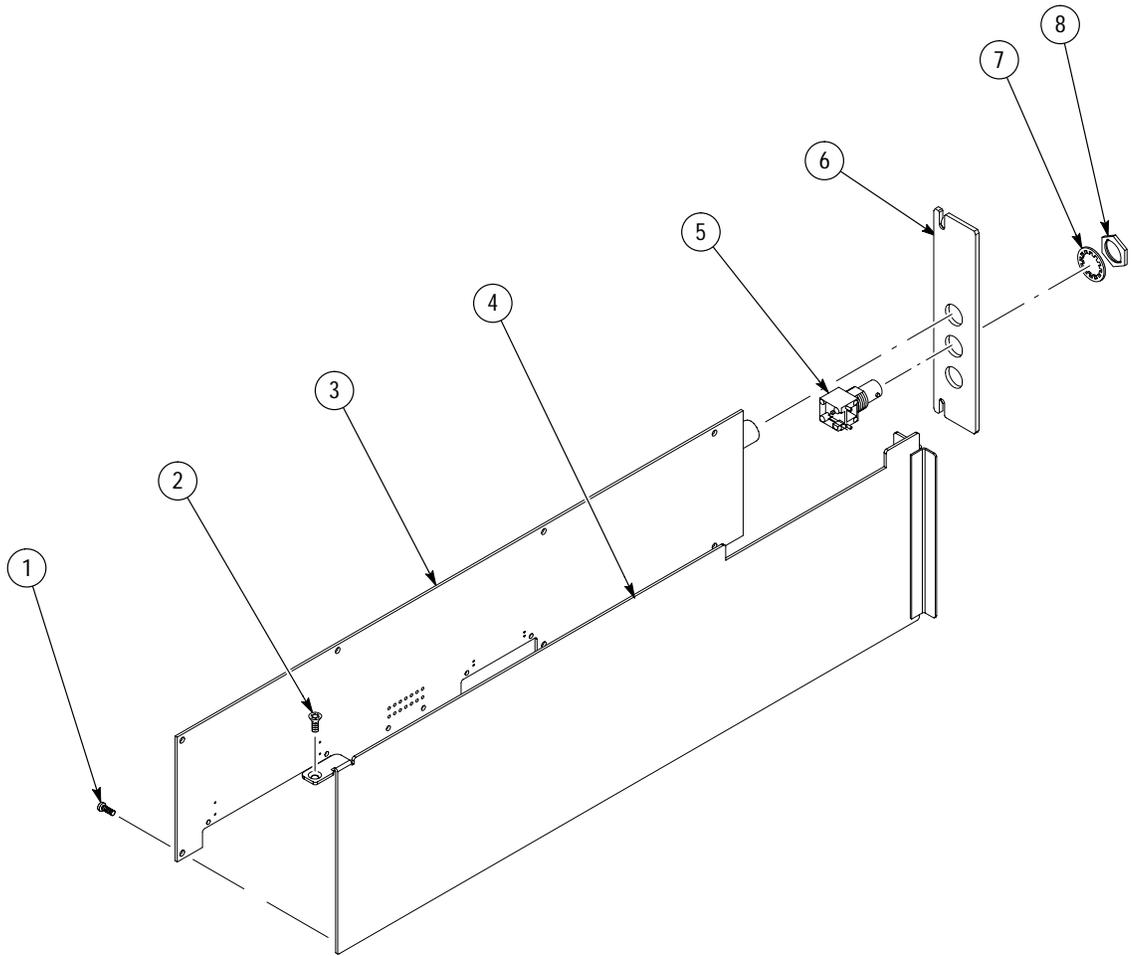


Figure 10-1: Exploded view

