

Instruction Manual

Tektronix

**YT-1 / YT-1S
Chart Recorder**

070-6270-04

NOTE: This manual is intended for YT-1/YT-1S Chart Recorders serial numbers B030500 and higher, or units that have been upgraded to that level (to identify upgrade, see page 8-5 and note frame cutout next to print head). For instruments with serial numbers B030499 and lower that have not been upgraded, please contact your local Tektronix Customer Service Representative for information regarding module exchange service.

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General Safety Summary



CAUTION. Do not operate this product without paper installed, or, if operating when the paper runs out, shut the power off immediately. Printing without paper might burn out the printhead.

Operator Safety Summary

Power Sources

This product is intended to operate from a power source supplied by the parent instrument. Do not attempt to power this module by any other means.

Grounding the Instrument

This product is grounded through the parent instrument. A protective ground connection is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that appear to be insulating) can render an electric shock.

Refer to connector changes to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

Service Safety Summary



CAUTION. *For qualified service personnel only. Refer also to the preceding Operator Safety Summary.*

Do Not Service Alone

Do not perform internal service adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Installation and Repacking

Unpacking and Initial Inspection

Before unpacking the YT-1/YT-1S from its shipping container or carton, inspect for signs of external damage. If the carton is damaged, notify the carrier. The shipping carton contains the basic instrument and its standard accessories. Refer to the replaceable parts list for a complete listing.

If the contents of the shipping container are incomplete, if there is mechanical damage or defect, or if the instrument does not meet operational check requirements, contact your local Tektronix Field Office or representative. If the shipping container is damaged, notify the carrier as well as Tektronix.

The instrument was inspected both mechanically and electrically before shipment. It should be free of mechanical damage and meet or exceed all electrical specifications. Procedures to check operational performance are in the parent instruction service manual. Procedures to check electrical and mechanical specifications are in the Calibration section of this manual.

Power Source and Power Requirements

The YT-1/YT-1S is intended to be operated from the parent instrument's power supply. A protective ground connection by way of proper installation in the parent instrument is essential for safe operation.

Further information on the YT-1/YT-1S power requirements can be found in the Operator Safety Summary and in the Operator section.

Repacking for Shipment

If the YT-1/YT-1S is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing the name and address of the owner, name of the individual at your firm that can be contacted, complete serial number, and a description of the service required. If

the original packaging is unfit for use or is not available, repackage the instrument per the instructions near the end of the Maintenance section in this manual.



Operating Instructions

Operating Instructions

Instructions for Use

Making permanent records with the 1500-Series is easy with the Tektronix YT-1/YT1-1S Digital Chart Recorder.



CAUTION. Do not operate this product without paper installed, or, if operating when the paper runs out, shut the power off immediately. Printing without paper might burn out the printhead.

1. Make sure the desired waveform (or waveforms) is displayed on the LCD.
2. Slide back the protective cover on the recorder. Push PRINT on the front panel of the chart recorder.
3. When the chart recorder has finished, tear off the paper recording, pulling the paper to the left. You may prefer to close the door prior to tearing off the chart to facilitate a cleaner tear.

Making chart recordings with the YT-1/YT1-1S will reduce the charge of the battery pack (if so equipped) in the parent instrument. Read the appropriate battery information in the parent instrument Operator section.

Paper Replacement

1. Turn the knurled knob on the front panel of the chart recorder counter-clockwise until it loosens. Pull the unit from the parent instrument. Set the YT-1/YT1-1S with the front panel to the right.
2. With your thumbs, push the frame surrounding the motor pulley. Push until the motor assembly latch locks the motor assembly to the side frame. This loosens the tension in the paper path, allowing any remaining paper to be removed.
3. Remove the paper retaining knob. Remove any paper and the empty paper core.

4. Following the diagram on the top of the recorder, place a fresh roll of paper in the recorder so the paper unwinds off the right side of the roll into the paper path (looking down on the recorder, the paper unrolls clockwise). Tearing the end of the paper roll on a slant will facilitate placing the paper in the slot.
5. Assure that the paper drops down into the paper path without binding, and the paper protrudes through the slot in the front of the instrument. Release the keeper from the frame, and the paper drive mechanism will return to the operating position.



General Information and Specifications

General Information and Specifications

Product Description

The Tektronix YT-1/YT-1S Chart Recorder is an optional accessory for a parent instrument (e.g., the 1500B/C-series Metallic Time Domain Reflectometers). It is designed to plug into the instrument in the option port.

The YT-1/YT-1S has a water resistant door that covers the record paper slot.

A chart recording is a permanent record. It can be of great service in fault interpretation (e.g., a chart recording of a fault can be compared to that of an acceptable test).

Standards, Documents, and References Used

Terminology used in this manual is in accordance with industry practice. Abbreviations are in accordance with ANSI Y1.1-1972, with exceptions and additions explained in parentheses in the text. Graphic symbology is based on ANSI Y32.2-1975. Logic symbology is based on ANSI Y32.14-1973 and manufacturer's data books or sheets. A copy of ANSI standards may be obtained from the Institute of Electrical and Electronic Engineers, 345 47th Street, New York, NY 10017.

Characteristics and Specifications

The tables on the following pages list the electrical characteristics and features that apply to the Tektronix YT-1/YT-1S Chart Recorder when it is installed in a Tektronix 1500B/C-series TDR instrument and after a 20 minute warm-up.

The Performance Requirement column describes the limits of the characteristic and Supplemental Information column describes features and typical values or information that might be helpful.

Printing Specifications

Characteristic	Performance Required	Supplemental Infor.
Writing method		Direct thermal
Chart paper	Roll type, 50mm. Outside dia. 50mm max. Accept 15mm spindle. Thermal coating facing inside roll. Will allow recorder to meet print density spec.	Example: See Tektronix part number in Accessories section.
End-of-roll warning	Shall be marked by a red line beginning 5 ft. from the end of the roll.	
Print color	Black	
Print density	Solid black print pattern shall measure at 1.1D on Kodak Gray Scale.	Pattern created by printing 40 element blocks three times each until a 360 bit wide by at least 200 bit long (45mm by 25mm min.) image is formed. Density measurement made with an appropriate Densitometer. Pattern print at 25°C ± 5°C.
Background density	Less than 0.2 D when stored at 70°C for 24 hours.	
Print drop-outs	No more than 1% of the elements to be printed shall fail to print. Adjacent failures shall number three or less.	
Print element width	0.125mm	
Addressable print elements	384 (48 8-bit bytes)	
Print field width	48mm	
Alignment of print field	Entire print field must lie on paper.	

Characteristic	Performance Required	Supplemental Infor.
Orthogonality of print field	A line printed across the paper shall be perpendicular to the edge of the paper within 1.0 degrees.	
Paper movement per ADVANCE command	0.125mm, \pm 0.01mm	
Record length		10.87 to 12.76 inches Algorithm dependent
Print time		Typical 20 seconds Algorithm dependent.

Power Specifications

Characteristic	Performance Required	Supplemental Infor.
+5 Volts	+5V \pm 5%, 500mW max	Power is applied to recorder only while it is operating.
+16 Volts	+16 Volts \pm 10%. Average Power = 12W max. Peak current not to exceed 1.7A.	

Mechanical Characteristics: YT-1/YT-1S plugs into the parent instrument Option Port.

General Information and Specifications

Environmental Specifications: Apply when chart recorder is properly installed in a 1500B/C-series TDR Option Port.

Temperature: Operating Non-operating	-10°C to +55°C -62°C to +85°C	Prolonged exposure to temperatures above 70°C might cause thermal paper to darken.
Humidity: Operating Non-operating	0 to 100% RH, excluding condensing 0 to 100% RH, including condensation	
Altitude Operating Non-operating	To 15,000 ft above sea level To 40,000 ft above sea level	
Vibration	5 to 15Hz, 0.7g MIL-T-28800C 15 to 25Hz, 1.3g 25 to 55Hz, 3.0g	Shock or vibration greater than 1g may cause temporary trace discontinuity.
Shock	30g, 11ms 1/2 sine wave-form three shocks in each direction on each axis.	
Salt atmosphere	48 hours, 20% solution. Per MIL-T-28800C.	
Electromagnetic compatibility	When operated in host instrument, unit meets the following requirements of MIL-STD-461A: CE02, CE04, CS02, CS06, RE02, RE02.1, RS03, RS03.1.	
Electrostatic discharge	3kV to 20kV, Tekronix standard 062-2862-XX	
Water resistance	Splash-proof and drip-proof	



Operator Performance Checks

Operator Performance Checks

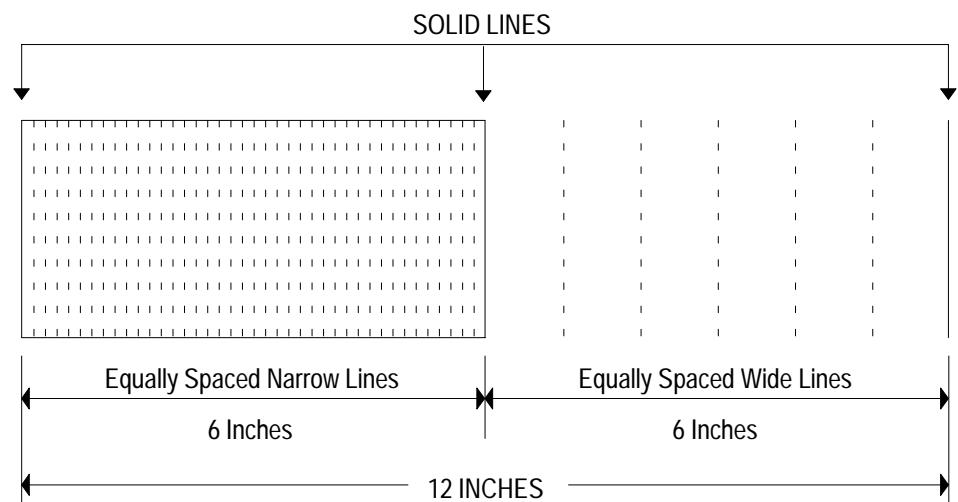
The following checks will confirm if the YT-1/YT-1S is operating according to specification. They are found in the Chart Diagnostics Menu in the Diagnostics Menu of the parent instrument.

Head Alignment Chart Diagnostic

This test gives the chart recorder a rapid feed test as well as a test for print dropouts, feed spacing, and alignment of the head. If the YT-1/YT-1S is not operating properly, symptoms may include pixel drop-out, washed-out print, “titled” chart, chart off the page, or improper or erratic speed.

Chart Quality

1. Access the Head Alignment chart in the Chart Diagnostics menu located under the Diagnostics Menu of the parent instrument.
2. Press MENU. The diagnostic chart that is printed should look like the figure below and must meet the following criteria:



- a. The total chart from first printed line to last printed line must measure between 10.87 to 12.76 inches.

- b.** There must be between 5.43 to 6.38 inches of narrow spaced lines on the chart.
- c.** There must be between 5.43 to 6.38 inches of wide spaced lines on the chart.
- d.** Fold the paper in half at the last narrow line. The two halves of the chart should be equal in length.
- e.** The entire diagnostic should be printed within the boundaries of the paper.
- f.** All vertical lines should be perpendicular relative to the top and bottom of the chart within 1°.
- g.** The three solid vertical lines on the chart must be complete with no missing dots.
- h.** All lines on the chart must be legible with no fading, smearing, or irregularities in print blackness.

If your test chart does not meet the above criteria, send your chart recorder and include the test chart.



Accessories and Options



Accessories and Options

Standard Accessories

Accessory	Tektronix Part Number
Chart paper, single roll	006-7647-00

Optional Accessories

Accessory	Tektronix Part Number
Chart paper, 25-roll quantity	006-7677-00
Chart paper, 100-roll quantity	006-7681-00

Options

There are no options for the YT-1/YT-1S Chart Recorder



WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all safety summaries before performing any service.



Theory of Operations

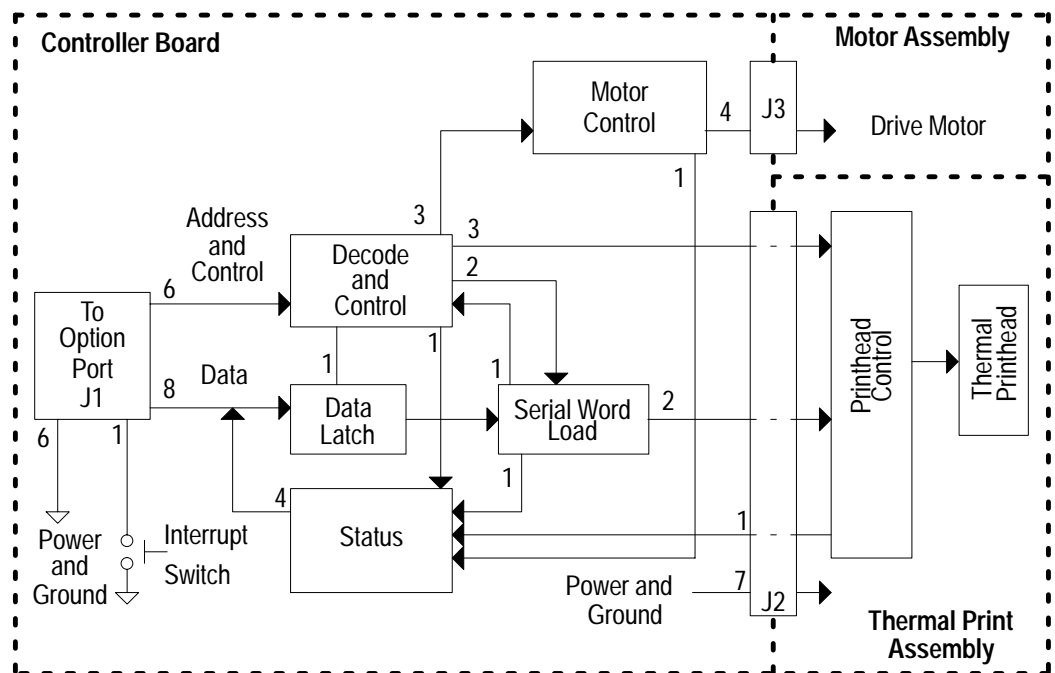
Theory of Operations

Introduction

The YT-1/YT-1S Chart Recorder is to be used with a parent instrument, such as the 1502B/C or 1503B/C Time Domain Reflectometer. This manual contains information on the YT-1/YT-1S only. For related information on the parent instrument, see Option Port Interface in the Circuit Description section of respective service manual.

The YT-1/YT-1S consists of a drive motor assembly, a thermal printhead, and an electronic circuit board.

More information can be found in the Specification section of this manual. A block diagram of the Option Port can be found in the parent manual in the Circuit Description section. See the following figure for the block diagram of the YT-1/YT-1S Chart Recorder.



Circuit Description

Bit-Map (Data Matrix) Operation

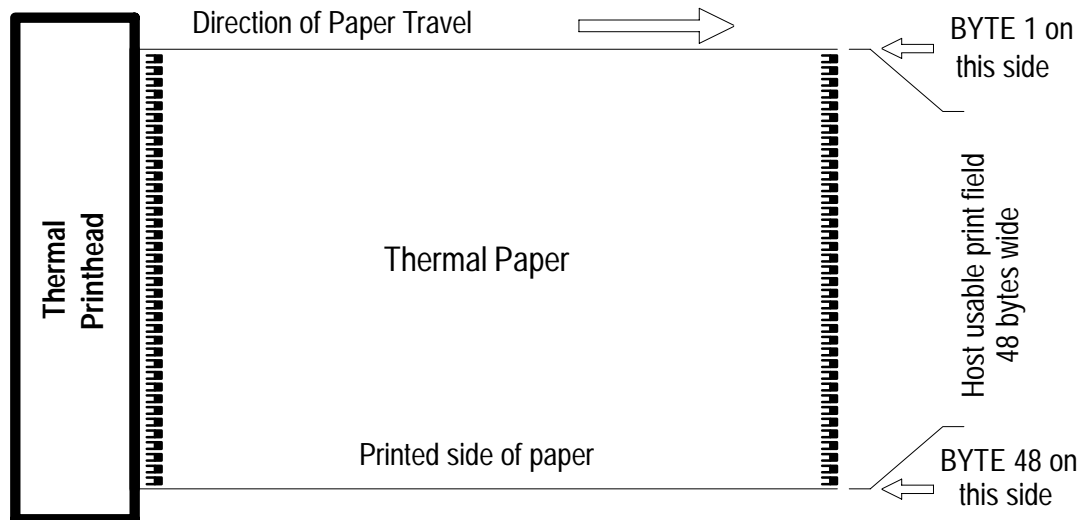
Bit-Map Description

Bit-map operation permits the host to control the 384 individual bits (48 bytes) that make up the recorder print field. This allows any combination of dots to be printed including alpha-numerical characters and graphics. All print data should be sent in the form of bytes (1 byte = 8 bits). The state of the dots printed is controlled by the state of the data bits sent by the host to the recorder. A “0” will turn an element off and a “1” will turn an element on when a row is printed. The bit-mapping is done on rows of the page. There are 8 rows per millimeter and 48 bytes per row. The resolution is thus 1/8mm across the page.

Bit-Map Operation

The recorder uses a thermal printhead with 384 individual elements (48 bytes). The bytes of digital data are shifted through the printhead from left to right. As the new bytes of data are shifted in by the host, the old bytes remaining from the previous line of print data are shifted out one by one. To replace all the old data bytes with new ones the host must completely refill the printhead each time a new line is to be printed. If the host does not completely refill the printhead with a new line of data before printing, the remaining old data will be printed out with the new data. The new data will also be shifted to the left of its proper print field.

The host should never attempt to turn on more than 25% of the dots in the print field at one time. If the host's desired pattern requires the energizing of more than 25% of the dots on a single line, the solution is to divide the pattern into smaller parts. These smaller parts can then be loaded and printed one at a time until the complete pattern is printed. The host can then move on to the next line of print data by advancing the paper. Bits will be turned on as shown:



Individual Write Command Operation

Load a Byte of Print Data

When this write command operation is used the recorder will take the data byte (8 bits) that the host has placed on the data bus and shift it out to the recorder printhead. This command should only be used when the recorder is ready to accept data (i.e. the Accept Data status line $D5 = 1$). Use of this command will cause the Accept Data status line to be disabled ($D5 = 0$). This status line will not be re-enabled until the recorder is ready to accept another data byte. No byte should be sent until this line goes high again ($D5 = 1$).

Latch a Line of Print Data

This write command operation should precede the print command. When the host has completely finished loading the printhead with data this command is used to latch that data into the printhead so that it can be printed. This command should only be used when the recorder is not printing or shifting data (i.e., both Print Ready and Accept Data status lines are high $D6 = 1$, $D5 = 1$). Sending this command while either of these status line is disabled could cause faulty data to be printed out.

Print a Line of Data

This write operation causes the line of print data that the host has loaded and latched into the printhead to be printed. This command should only be used when the recorder is ready to print (i.e., the Print Ready status line $D6 = 1$). This host should never attempt to turn on more than 25% of the dots in the print field at one time. If the host's desired pattern requires the energizing of more than 25% of the dots on a single line, the solution is to divide the pattern into smaller parts. These smaller parts can then be loaded and printed one at a time until the complete pattern is printed. The host can then move on to the next line to print data by advancing the paper.

Advance Paper One Line

This write command operation causes the recorder to advance the paper one line (1/8mm). This command can be used after printing to move to the next print line or can be used without having printed to create a blank line or print leader. This command should only be used when the recorder is ready to advance (i.e., the Advance Ready status line $D4 = 1$). Sending this command while the status line is disabled will disrupt the recorder's stepper motor and cause erratic motor action to result.

Print a Line and Advance Paper One Line

This write command operation combines the print and advance commands previously discussed. Upon receiving this command the recorder will print the current line of print data and advance the paper to the next line. This command should only be used when the recorder is not printing or advancing the paper (i.e., both Print Ready and Advance Ready status lines are high $D6 = 1$, $D4 = 1$). Sending this command before the recorder is ready could cause printing errors or erratic motor action.

Reset Recorder to Quiescent State

This write command resets the recorder to a quiescent state waiting for the host to send a command. After reset the host should still check the status lines before sending a command to insure the recorder is ready.

Individual Read Command Operation

Read Recorder Identify Code

This read command operation allows the host to identify the recorder and insure that it is properly inserted into the host unit. The recorder has an identify code of (01H).

Read Recorder Status Codes

This read command operation allows the host to insure that the recorder is ready to accept the desired command. The host must always wait until the recorder is ready before sending a command. By checking the corresponding status line or lines the host can determine recorder readiness. There are status lines for Ready to Print (D6), Ready to Advance (D4), Ready to Accept Data (D5), and Recorder Fault (D7). Only send commands when the recorder is ready.

Protocol

Introduction

This protocol is designed for the Tektronix YT-1/YT-1S bit map only thermal dot matrix recorder.

The Tektronix YT-1/YT-1S chart recorder produces a hard copy record on thermally activated paper of data provided through a parallel digital interface. The bit map (dot matrix) data is provided one byte at a time (1 byte = 8 bits) line by line (1 print line = 48 bits). This allows any combination of dots to be printed including alpha-numeric characters and graphics. Each dot corresponds to one element of a thermal printhead with a resolution of 200 dots per inch (8 dots per mm). Printing is achieved by energizing the individual elements of the printhead.

Interface Information

The YT-1/YT-1S chart recorder communicates to the host system via the host's address and data bus. The interface includes four address lines, eight data lines, one interrupt line, and three control lines. All interface lines are 74HC compatible.

Inputs and Outputs

The following signal descriptions apply to the host-to-recorder interface. Refer to the following table for pin designations (see Interface Pin Structure).

A0 – A3 (INPUT):	Address lines from the host for the read and write operations to the recorder (all lines active high).
D0 – D7 (INPUT):	Bidirectional data lines for the read and write operations to the recorder (all lines active high).
(INPUT):	Recorder select line from the host (active low).
(INPUT):	Data read line from the host (active low).
(INPUT):	Data write line from the host (active low).
(OUTPUT):	Interrupt request line from the recorder (active low).

Interface Pin Structure

The interface pin structure table along with the associated waveforms are in the Maintenance section of this manual. A 25-pin male D-shell connector is used on the recorder. Information about the operation of these pins is available under Option Port Interface in the Circuit Description section of the 1502B and 1503B Service manuals.

Interface Characteristics

Characteristic	Performance Required	Supplemental Info
Connector	25-pin male D-shell (Holmberg HYM25A28AP or equiv.)	
Protocol	As defined under heading: Protocol	
Logic Interface	74HC CMAS or equiv.	
Print Initiation	Ground Closure on \overline{IR}	\overline{IR} = Pin 7
Command Execution Times Print Command	2.5ms typical. Measure from time command sent to time BUSY flag clears.	
Advance	4ms typical	
Load Data Byte	< 5 μ s typical	
Latch Printhead Data	< 5 μ s typical	

General Interrupt Operations

The recorder generates an interrupt request (\overline{IR}) each time the record push button is depressed. This signal is active low. This signal does not disable communication between the host and the recorder, thus allowing read and write operations to continue even though an interrupt request has been received.

General Command Operations

All commands are sent from the host to the recorder over the address interface bus (A0 - A3). All commands are accompanied by a low strobe of the recorder select line from the host (\overline{RS}). All read commands are accompanied by a low strobe of the data read line from the host (\overline{RD}). All write commands are accompanied by a low strobe at the data write line from the host (\overline{WR}).

Read Command Operations

The recorder has the following read command operations:

Address 0H	Identify code for recorder (Recorder = 01H)
Address 1H	Status codes for recorder
Address 2H – FH	Not used by recorder

The status code bits are formatted as follows:

D0 – D3	Not used by recorder
D4	Indicates recorder ready to accept advance command; 0 = Recorder not ready
D6	1 Indicates recorder ready to accept print command; 0 = Recorder not ready
D7	0 Indicates recorder fault exists; 1 = No fault exists

Write Command Operations

The recorder has the following write command operations:

Address 0H	Reset recorder to quiescent state
Address 1H	Advance paper one line with no printing
Address 2H	Load a byte of print data (8 bits)
Address 3H	Latch a line of print data
Address 4H	Print a line and advance the paper one line
Address 5H	Print a line with no advance of paper
Address 6H – FH	Not used by recorder



Calibration

Calibration

The YT-1/YT-1S Chart Recorder has no electrical adjustments, and few mechanical adjustments. Since the mechanical adjustments are done at the factory, they are not included in the Calibration section. The mechanical adjustments can be found in the Maintenance section. The Performance Check will determine whether or not the instrument is operating according to published specifications.

The YT-1/YT-1S Chart Recorder Performance Check is accomplished via a diagnostic test on the parent instrument (1500B/C-series)

LCD Chart Diagnostic

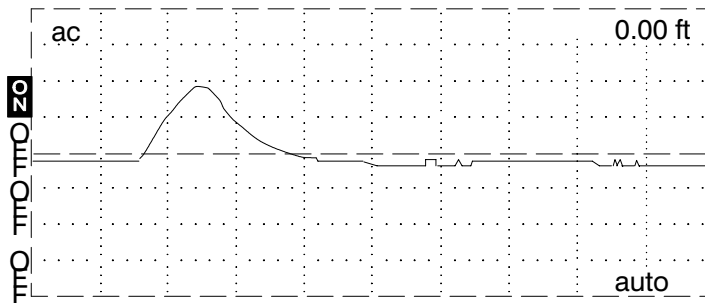
Technically this is not a diagnostic, but for assistance in troubleshooting, temporary adjust of the printing characteristics, and a back-up for the PRINT push button.

For information on the troubleshooting aspects of LCD Chart, see the Maintenance section of this manual.

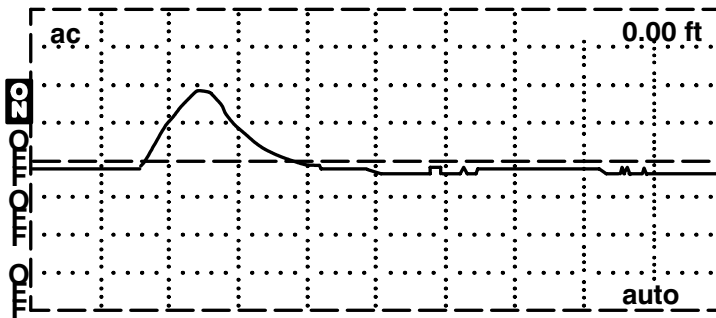
The printing characteristics of the YT-1/YT-1S are designed to provide chart recordings in environmental extremes under varying conditions. If it does become necessary to change the chart characteristics, it is possible from the front panel of the 1500B/C-series instrument.

The thermal printhead of the YT-1/YT-1S has 384 print elements. Because of power economy, not all of the elements are turned on at the same time. When printing, only 40 elements (or dots) of the printhead are activated at a time. Forty dots equals a segment. If it is intended to make the dots darker, elements can be turned on more than once, analogous to a “double-strike” on a mechanical printer.

1. Using MENU and POSITION, access LCD chart in the Chart Diagnostics menu.



2. When adjusted, the left Vp knob will adjust the number of dots the YT-1/YT-1S will print per segment, ranging from 13 to 41. The effect of this adjustment is subtle.
3. When adjusted, the right Vp knob will adjust the number of prints or “strikes” per segment. This adjustment is quite dramatic, resulting in a much darker or lighter chart, and a corresponding change in printer speed.



When the parent instrument POWER is turned on, the printing characteristics will default to 40 elements per segment and one print per segment.

This diagnostic also takes the place of the PRINT push button. If the button should become defective, simply run the LCD chart diagnostic and current screen will be printed.

Paper Skew

If the paper tends to run up to the top or down to the bottom of the paper exit slot of the recorder, the paper skew may need adjustment. Symptoms include information printed off the top or bottom of the page and paper jamming.

Occasionally the paper may skew after the paper has been replaced. This is due to improper setting of the paper in the feed path. This will usually clear itself after a couple of charts. If it does not, the paper still skews after a minimum of two charts, the paper guide would be adjusted.

If the YT-1/YT-1S did not pass the Head Alignment Chart diagnostic, refer to the Maintenance section of this manual.

Performance Check

The following checks will confirm if the YT-1/YT-1S is operating according to specification. They are found under “Chart Diagnostics Menu” in the “Diagnostics Menu”.

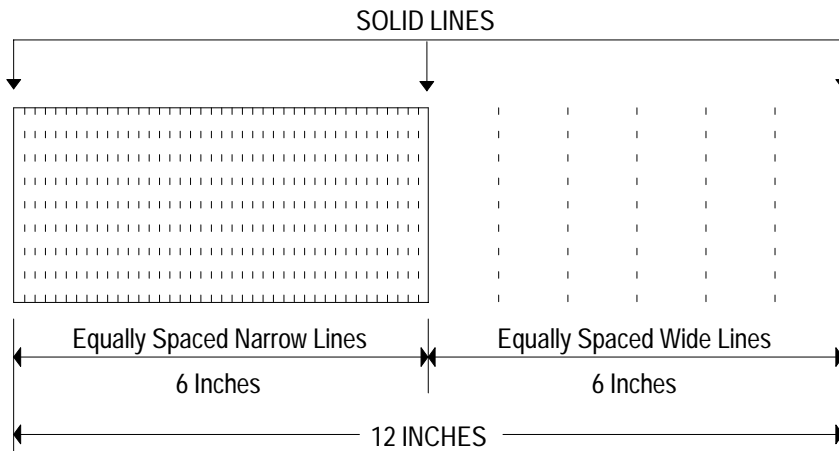
Head Alignment Chart Diagnostic

This test gives the chart recorder a rapid feed test as well as a test for print dropouts, feed spacing, and alignment of the head. If the YT-1/YT-1S is not operating properly, symptoms may include pixel drop-out, washed-out print, “tilted” chart, chart off the page, or improper or erratic speed.

Chart Quality

1. Access Head Alignment chart in the Chart Diagnostics menu located under Diagnostics Menu of the parent instrument.
2. Press MENU. The diagnostic chart that is printed must meet these criteria:

- a. The total chart from first printed line to last printed line must measure between 10.87 to 12.76 inches.
- b. There must be between 5.43 to 6.38 inches of narrow spaced lines on the chart.
- c. There must be between 5.43 to 6.38 inches of wide spaced lines on the chart.
- d. Fold the paper in half at the last narrow line. The two halves of the chart should be equal in length.
- e. The entire diagnostic should be printed within the boundaries of the paper.
- f. All vertical lines should be perpendicular relative to the top and bottom of the chart within 1 degree.
- g. The three solid vertical lines on the chart must be complete with no missing dots.
- h. All lines on the chart must be legible with no fading, smearing, or irregularities in print blackness.





Maintenance

Maintenance

This section contains information of preventive and corrective maintenance, troubleshooting, and shipping instructions.



CAUTION. We recommend that service be performed at an authorized Tektronix Service Center, or by a technician skilled in digital sampling techniques. The circuit board has SMT devices that require special equipment to replace. If found defective, we recommend that the ECB be replaced as an entire unit. We have included a major-parts/connectors locator as an aid to assist in troubleshooting.

Required Tools

This is a list of common tools needed to accomplish the maintenance procedures that follow.

- Oscilloscope (Tektronix 5440 or equivalent)
- Option Port extension cable (174-0950-00)
- 3/8 inch hex nutdriver
- 1/2 inch hex nutdriver
- 0.050 hex wrench
- Phillips head screwdriver
- Straight blade screwdriver
- Long-nosed pliers
- Cotton swabs

Preventive Maintenance

Preventive maintenance includes cleaning and visual inspection. A convenient time to perform preventive maintenance is during the periodic performance check/calibration procedure. If the instrument has been subjected to extreme environments or harsh handling, more frequent preventive maintenance may be necessary.

Cleaning



CAUTION. *Do not use chemical cleaning agents that contain benzene, toluene, xylene, acetone, etc., because of possible damage to plastics in the instrument.*

The outside chassis and front panel should be cleaned gently with a damp cloth.

The interior of the YT-1/YT-1S is protected from dirt and dust as long as it is installed in the option port and the print door is closed. However, if interior cleaning is necessary, blow off accumulated dust with low-pressure air, and remove remaining dirt with a soft brush, cotton swab or pipe cleaner moistened with isopropyl alcohol. The paper must be removed before cleaning with alcohol.

The thermal printhead can be cleaned with a soft cotton swab dipped in a little alcohol. Latch the motor assembly out of the way, remove the paper, and carefully clean the printhead by swabbing the surface. Any of the surfaces that are in the paper path should also be cleaned.

Lubrication

No lubrication is necessary. It is recommended, however, that the YT-1/YT-1S be cleaned on a regular basis.

Visual Inspection

Obvious defects such as broken connectors, damaged board, frayed cables, improperly seated components and heat-damaged components should be corrected first before attempting further troubleshooting. Heat damage usually indicates a deeper problem somewhere in the circuitry, and should be traced and corrected immediately.

We do not recommend electrical checks of individual components because defective components will become evident during instrument operation.

Re-calibration

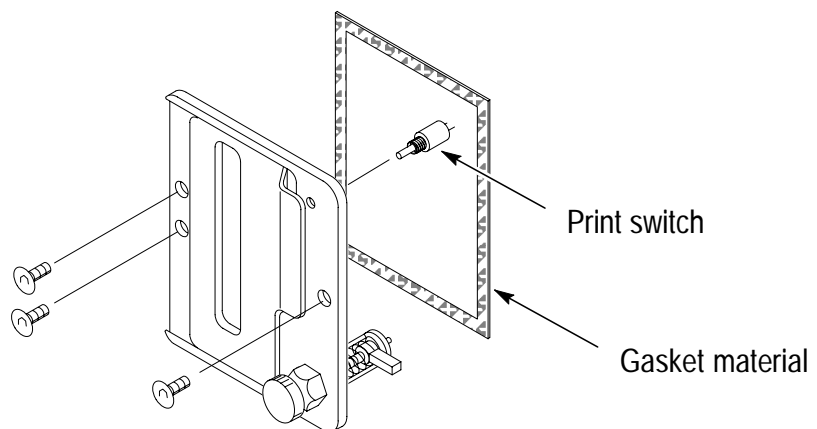
After maintenance has been performed, the instrument should be checked per procedures explained in the Calibration section of this manual.

Parts Removal/Replacement

The YT-1/YT-1S can be disassembled by following these directions in order. It can be assembled by reversing the order.

Front Panel Plate

1. Remove the three mounting screws (one on the right side of the panel and two on the left) which secure the front panel to the frame.
2. Remove the Print switch from the upper right corner of the front panel (use care to not pull the wires loose from this switch).



3. Inspect gasket material and replace if necessary (use Dow Corning 3140 or equivalent to coat mating surface of gasket).

Paper Retaining Mandrel

4. Remove the two mounting screws on the right side panel that attach the paper retaining mandrel assembly.

5. Remove the mandrel from the recorder.

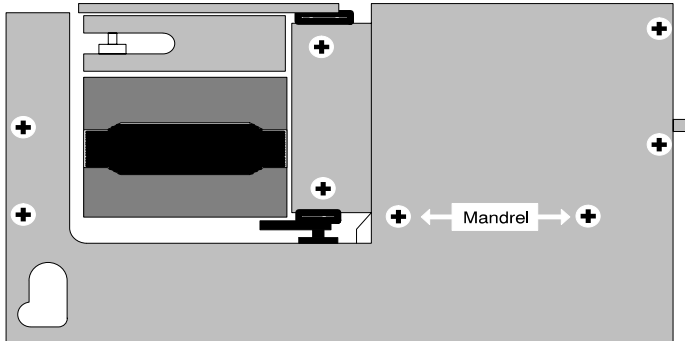
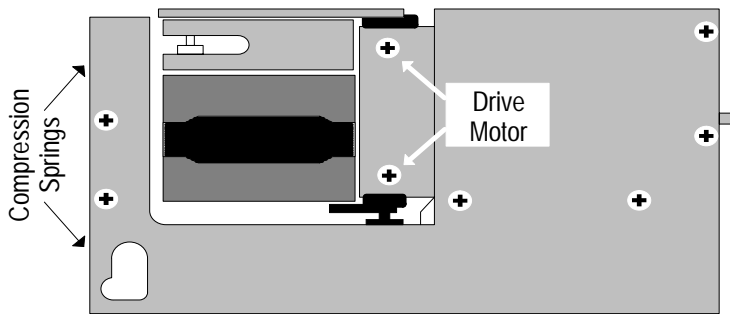


Chart Drive Motor Assembly

6. Remove the two compression springs between the forward support strut and motor drive assembly.

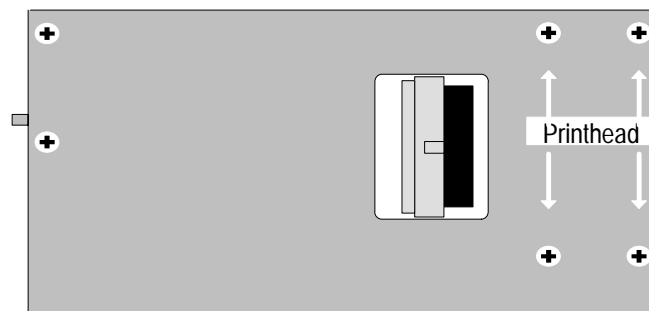


7. Remove the two mounting screws that hold the motor drive assembly to the right side panel. They are located near the middle of the right side panel.

8. With a long-nosed plier or screwdriver, remove the wire harness connector from the ECB socket. Avoid scratching the printhead.
9. Remove the motor assembly through the top of the case.

Thermal Printhead

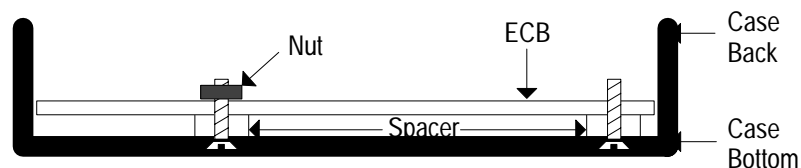
10. Remove the four mounting screws that attach the thermal printhead to the left side panel.



11. Carefully disconnect the thermal printhead from the ECB. Use an IC puller or a long-nosed plier.

Controller Board

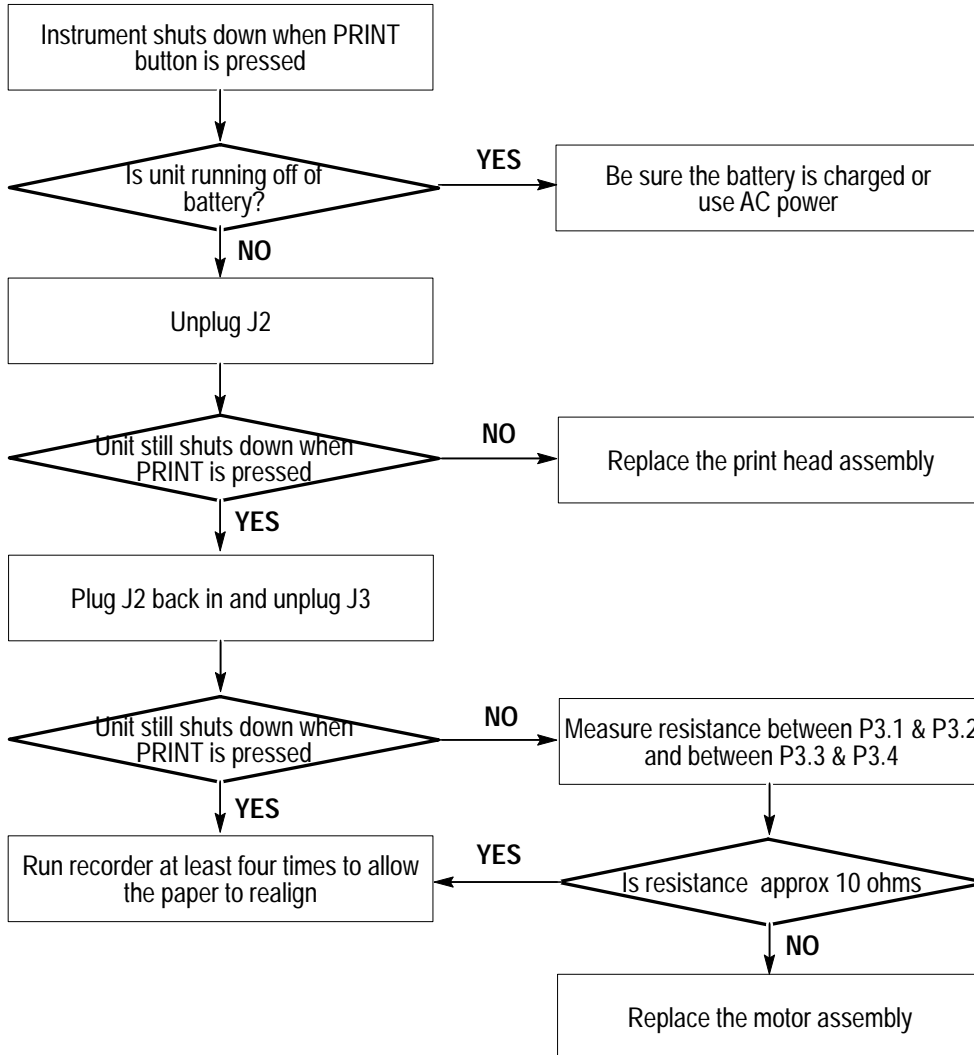
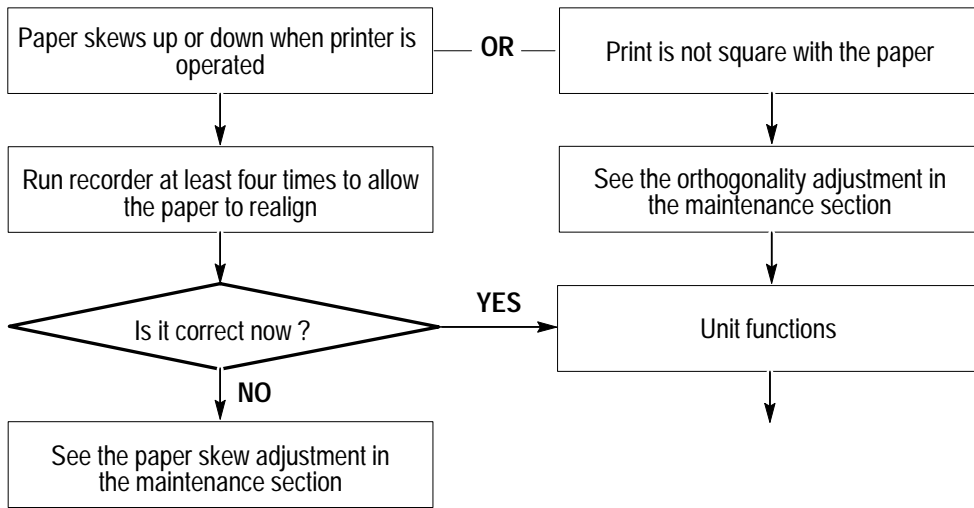
12. Remove three ECB mounting screws, washers and standoffs.

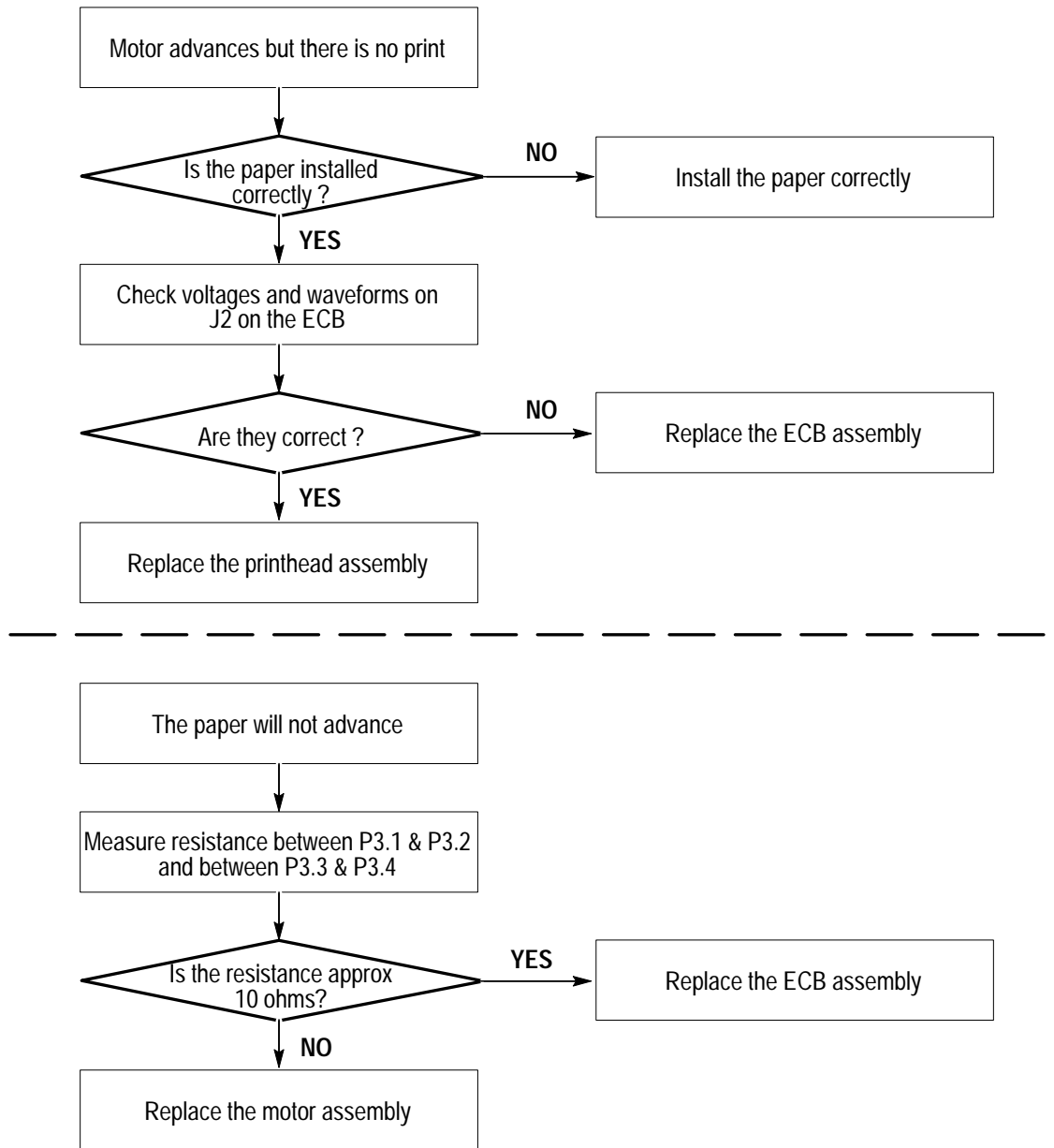


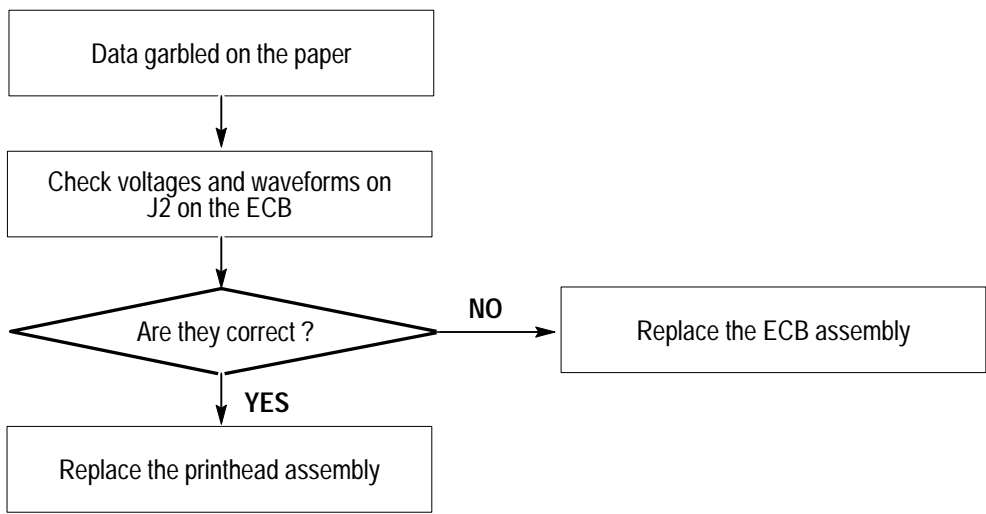
Troubleshooting

Troubleshooting Flow Charts

The following charts are provided to aid you in troubleshooting electrical and mechanical problems with the YT-1/YT-1S. Additional information follows the flow charts.



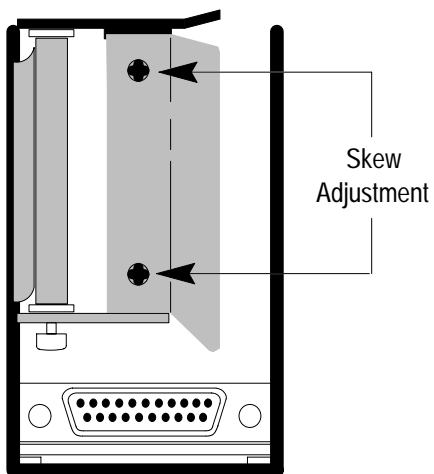




Mechanical

Paper Skew Adjustments

1. To adjust the paper guide, first remove the back panel, then the paper and the paper retaining mandrel (see Part Removal/Replacement in this section).



2. The two screws holding the paper guide onto the motor assembly must be loosened slightly (not too much!). Position the paper guide as follows:

3. Paper Skews Downward

- a. Move the top of the paper guide slightly away from the printhead side of the instrument.
- b. Tighten the two paper guide screws and replace the paper retaining mandrel and the paper.
- c. Run a minimum of two Print Head Alignment chart diagnostics and check for proper paper tracking.

4. Paper Skews Upward

- a. Move the top of the paper guide slightly closer from the printhead side of the instrument.
- b. Tighten the two paper guide screws and replace the paper retaining mandrel and the paper.
- c. Run a minimum of two Print Head Alignment chart diagnostics and check for proper paper tracking.

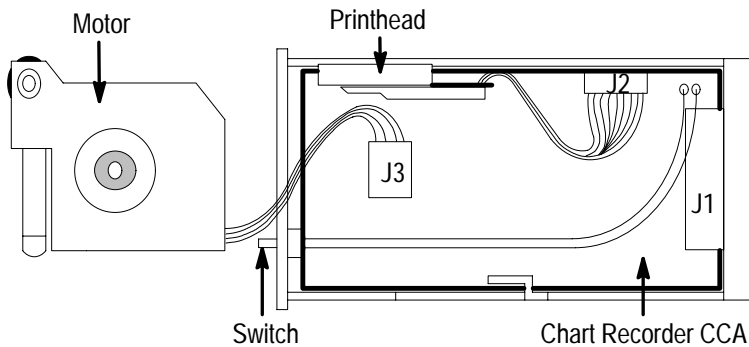
If necessary, repeat the above procedure to fine tune the skew.

Electrical

ECB Inputs and Outputs

Accessing Connectors

To access J2 and J3, remove the ECB from the recorder. Disassemble the chart recorder. Reconnect all wiring. Attach the Option Port extension cable to the parent instrument's Option Port. Connect one end of the cable to J2010 on the parent instrument Main Board and the other end to J1 on the YT-1/YT-1S ECB.



The illustration above shows the connector locations in the YT-1/YT-1S. Each connector and the signals that should be found on them are described in the following paragraphs and tables.

J1 on ECB – Data and Voltage Input

The Option Port Diagnostic creates a repeating pattern of signals at the option port connector to allow service technicians to verify that all signals are present and working correctly. This test does not generate any output to the LCD display.

There are two ways to terminate this diagnostic: hold down the MENU button until the Option Port menu reappears, or momentarily pull the line low.

The purpose of the diagnostic is to exercise the data and control lines at the option port by creating a repeating pattern of signals that can be easily observed with an oscilloscope. The pattern on all data lines is the same and the pattern on the four address lines is also the same. Although the exact patterns on the read, write and enable lines vary, the repetition interval is the same for all patterns (about 15 microseconds). The active low trigger line (pin14 on the 25-pin “D” connector) is unused in the diagnostic. The function of the line can be tested by momentarily grounding it to exit the diagnostic and return to the Option Port menu.

Pin	In/Out	Designation	Function (Status)
25	In/Out	D2	Data Line 2 (active high)
24	In/Out	D3	Data Line 3 (active high)
23	In/Out	D4	Data Line 4 (active high)
22	In/Out	D5	Data Line 5 (active high)
21	In/Out	D6	Data Line 6 (active high)
20	In/Out	D7	Data Line 7 (active high)
19	Input	A0	Address Line 0 (active high)
18	Input	A1	Address Line 1 (active high)
17	Input	A2	Address Line 2 (active high)
16	Input	A3	Address Line 3 (active high)
15	-----	Reserved	Reserved for host
14	-----	Reserved	Reserved for host
13	Input	+16 V	+16 VDC Power (motor/print)
12	Input	+16 V	+16 VDC Power (motor/print)
11	-----	16 V Return	16 VDC Return (Power GND)
10	-----	16 V Return	16 VDC Return (Power GND)
9	Input	+5 V	+5 VDC Power (Logic)
8	-----	5 V Return	5 VDC Return (logic GND)
7	Output	IR	INTERRUPT REQUEST (active low)
6	Not used		

Pin	In/Out	Designation	Function (Status)
5	Input	RS	RECORDER SELECT (active low)
4	Input	RD	DATA READ (active low)
3	Input	WR	DATA WRITE (active low)
2	In/Out	D0	Data Line 0 (active high)
1	In/Out	D1	Data Line 1 (active high)

J2 on ECB – Thermal Printhead Output

J2, Pin No.	Data Present
1	+5 VDC \pm 0.5 V
2	+16 VDC \pm 1.5 V
3	+16 VDC \pm 1.5 V
4	+5 VDC \pm 0.5 V
5	Ground
6	Ground
7	5 V 500Hz Square Wave
8	5 V 500Hz Square Wave
9	5 V Data Stream
10	5 V Data Stream
11	5 V Data Stream
12	No connection
13	+5 VDC \pm 0.5 V
14	+5 VDC \pm 0.5 V

J3 on ECB – Motor Drive Connector

J3, Pin No.	Data Present
1	16 V Data Stream
2	16 V Data Stream
3	16 V Data Stream
4	16 V Data Stream

Shipping Instructions

If possible, reuse the original packaging materials. If this is not possible, use a carton with inside dimensions of no less than six inches for cushioning materials, or obtain a shipping carton from an authorized Tektronix Service Center.

Shipping Carton Test Strength

Gross Weight (lb)	Carton Test Strength (lb)
0 – 10	200
10 – 30	275
30 – 120	375
120 – 140	500
140 – 160	600

1. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.
2. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.
3. Seal carton with shipping tape or industrial stapler.



Replaceable Parts

Replaceable Parts List

This section contains a list of replaceable modules in the YT-1/YT-1S. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts information is available from your Tektronix Service Center or representative. Parts can be ordered through your local Tektronix field office.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to provide benefit of the latest circuit improvements developed by our engineers.

When ordering parts, include the following information:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number (if applicable)

Module Replacement

The YT-1/YT-1S is serviced by replacing defective modules. There are three options you should consider:

Module Exchange

In some cases you may exchange the defective module for a re-manufactured module. Re-manufactured modules cost significantly less than new modules, and meet the same factory specifications. For more information about the module exchange program, call 1-800-832-3814.

Module Repair

You may ship the defective module to Tektronix for repair. We will repair and return the same module to you.

New Modules

New modules can be purchased like other replacement parts.

Using the Replaceable Parts List

The tabular information in the parts list is arranged for easy use.

The parts list is indented to indicate item relationships. The following is an example of the indentation system used in the Name and Description column:

Assembly and/or component
. Detail part of assembly or component
.. Parts of detail part

Abbreviations conform to American Nation Standards Institute (ANSI) standard.

Tektronix Part Number

Use the part number when ordering a replacement part from Tektronix.

Serial/Model No.

These columns show the serial numbers of the first and last instruments in which a part was used. No entry in these columns indicates that the part is used in all instruments.

Name and Description

In the parts list, an item name is separated from its description by a color (:). Because of space limitations, an item name by be

incomplete. For more name identification, refer to the U.S. Federal Cataloging Handbook H6-1.

Mfr. Code and Mfg. Part Number

These columns list the code number of the manufacturer of the part, and the manufacturer's part number for the part. Refer to the Cross Index, Mfg. Code Number to Manufacturer for names and addresses of manufacturers.

CROSS INDEX – MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
54318	ASTRO-MED INC	600 EAST GREENWICH AVE	WEST WARWICK RI 02983-5446
80009	TEKTRONIX	14150 SC KARL BRAUN DR	BEAVERTON OR 97007-0001

REPLACEABLE ELECTRICAL ASSEMBLIES

Fig No.	Tektronix Part No.	Serial No. Effective Dscont	Name & Description	Mfg. Code	Mfr. Part No.
A1	118-7614-02		CIRCUIT BD ASSY:CONTROLLER W/ HARNESS	54318	32001-001
A2	118-7616-01		PRINthead ASSY:THERMAL	54318	30995-014

REPLACEABLE MECHANICAL ASSEMBLIES

Fig No.	Tektronix Part No.	Serial No. Effective Dscont	Name & Description	Mfg. Code	Mfr. Part No.
1	118-7613-01		MOTOR:CHART DRIVE ASSY	54318	31310-000
2	118-8357-00		MANDREL PAPER:W/HARDWARE	54318	22976-010
3	118-7617-00		. KNOB:PAPER RETAINING	54318	12676-001
4	118-7623-00		PANEL,REAR:W/PINS	54318	22354-002
5	118-7622-03		FRAME,CASE:	54318	31268-20X
6	118-7633-00		(3) SPACER:NYLON	54318	10831-000
7	----	----	CKT BD ASSY:SEE A1 REPL		
8	118-7620-00		WIRING HARNESS:PUSHBUTTON,RECORD	54318	12629-000
9	118-7621-01		PANEL,FRONT:W/LATCH YT-1 ONLY	54318	22764-000
	200-3498-00		DOOR ASSY:YT-1S ONLY	54318	31927-000
10	118-7628-00		. LATCH,DOOR:YT-1/YT-1S	54318	22766-000
11	118-7624-02		. GASKET:YT-1/YT-1S	54318	22769-000
12	----	----	THERMAL PRINthead ASSY:SEE A2 REPL		
13	174-3241-00		CABLE ASSY:CHART RECORDER PRINT	54318	22745-952
14	118-7619-00		SPRING:COMPRESSION	54318	10475-001
15	118-7631-00		BLOCK:SPRING SUPPORT	54318	12541-001
16	214-4728-00		BELT,TIMING:1/8 INCH WIDE	54318	22110-048

