Instruction Manual

Tektronix

TMS 600
SAB-C167 80C167 Microcontroller Support

070-9800-00

There are no current European directives that apply to this product. This product provides cable and test lead connections to a test object of electronic measuring and test equipment.

Warning
The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

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In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

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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

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Connect and Disconnect Properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marking on the product. Consult the product manual for further ratings information before making connections to the product.

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

Use Proper AC Adapter. Use only the AC adapter specified for this product.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

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.

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.

Keep Product Surfaces Clean and Dry.

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:

WARNING
High Voltage

Protective Ground
(Earth) Terminal

CAUTION
Refer to Manual

Double
Insulated

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.

Disconnect Power. To avoid electric shock, disconnect the main power by means of the power cord or, if provided, the power switch.

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: Microcontroller Support Documentation

This instruction manual contains specific information about the TMS 600 80C167 microcontroller support and is part of a set of information on how to operate this product on compatible Tektronix logic analyzers.

If you are familiar with operating microcontroller supports on the logic analyzer for which the TMS 600 80C167 support was purchased, you will probably only need this instruction manual to set up and run the support.

If you are not familiar with operating microcontroller supports, you will need to supplement this instruction manual with information on basic operations to set up and run the support.

Information on basic operations of microcontroller supports is included with each product. Each logic analyzer has basic information that describes how to perform tasks common to supports on that platform. This information can be in the form of online help, an installation manual, or a user manual.

This manual provides detailed information on the following topics:

- Connecting the logic analyzer to the system under test
- Setting up the logic analyzer to acquire data from the system under test
- Acquiring and viewing disassembled data
- Using the probe adapter

Manual Conventions

This manual uses the following conventions:

- The term “disassembler” refers to the software that disassembles bus cycles into instruction mnemonics and cycle types.
- The phrase “information on basic operations” refers to online help, an installation manual, or a basic operations of microcontroller supports user manual.
- In the information on basic operations, the term “XXX” or “P54C” used in field selections and file names must be replaced with C167. This is the name of the microcontroller in field selections and file names you must use to operate the 80C167 support.
- The term “system under test” and “SUT” refers to the microcontroller-based system from which data will be acquired.

- The term “logic analyzer” refers to the Tektronix logic analyzer for which this product was purchased.
- The term “module” refers to a 102/136-channel or a 96-channel module.
- “80C167” refers to the SAB-C167 or the 80C167, which are two different names for the same microcontroller.
- A tilde (~) following a signal name indicates an active low signal.

Logic Analyzer Documentation

A description of other documentation available for each type of Tektronix logic analyzer is located in the corresponding module user manual. The manual set provides the information necessary to install, operate, maintain, and service the logic analyzer and associated products.

Contacting Tektronix

Product Support	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 Or, contact us by e-mail: tm_app_supp@tek.com For product support outside of North America, contact your local Tektronix distributor or sales office.
Service Support	Contact your local Tektronix distributor or sales office. Or, visit our web site for a listing of worldwide service locations. http://www.tek.com
For other information	In North America: 1-800-TEK-WIDE (1-800-835-9433) An operator will direct your call.
To write us	Tektronix, Inc. P.O. Box 1000 Wilsonville, OR 97070-1000

Getting Started

Getting Started

This chapter provides information on the following topics and tasks:

- A description of the TMS 600 microcontroller support package
- Logic analyzer software compatibility
- Your SUT (system under test) requirements
- Support restrictions
- How to configure your probe adapter
- How to connect to your SUT
- How to apply and remove power from the probe adapter

Support Description

The TMS 600 microcontroller support package disassembles data from systems that are based on the Siemens 80C167 microcontroller. The support runs on a compatible Tektronix logic analyzer equipped with a 102/136-channel module or a 96-channel module.

Refer to information on basic operations to determine how many modules and probes your logic analyzer needs to meet the minimum channel requirements for the TMS 600 microcontroller support.

Table 1–1 shows the microcontrollers and packages from which the TMS 600 support can acquire and disassemble data.

Table 1–1: Supported microcontrollers

Name	Package
80C167CR	PQFP
80C167SR	PQFP
80C167S	PQFP

A complete list of standard and optional accessories is provided at the end of the parts list in the *Replaceable Mechanical Parts* chapter.

To use this support efficiently, you need to have the items listed in the information on basic operations as well as:

- *C167 User's Manual*, Siemens, August 1994
- *C16x Instruction Set Manual*, Siemens, September 1995

Information on basic operations also contains a general description of supports.

Logic Analyzer Software Compatibility

The label on the microcontroller support floppy disk states which version of logic analyzer software the support is compatible with.

Logic Analyzer Configuration

To use the 80C167 support, the Tektronix logic analyzer must be equipped with either a 102/136-channel module, or a 96-channel module at a minimum. The module must be equipped with enough probes to acquire channel and clock data from signals in your 80C167-based system.

Refer to information on basic operations to determine how many modules and probes the logic analyzer needs to meet the channel requirements.

Requirements and Restrictions

You should review the general requirements and restrictions of microcontroller supports in the information on basic operations as they pertain to your SUT.

You should also review electrical, environmental, and mechanical specifications in the *Specifications* chapter in this manual as they pertain to your system under test, as well as the following descriptions of other 80C167 support requirements and restrictions.

System Clock Rate. The TMS 600 support can acquire data from the 80C167 microcontroller at speeds of up to 20 MHz[1]; it has been tested to 5 MHz.

Hardware Reset. If a hardware reset occurs in your 80C167 system during an acquisition, the disassembler might acquire an invalid sample.

1 **Specification at time of printing. Contact your Tektronix sales representative for current information on the fastest devices supported.**

Dynamic Bus Width Switching. The disassembler does not acquire data when the microcontroller is operating in dynamic bus width switching mode.

Code In Internal ROM. The disassembler does not acquire code in internal ROM when executed.

PEC Detection. The disassembler does not support PEC (peripheral event controller) detection by the disassembler, only the marking options are provided.

Opcode Fetch and Data Read. There is no signal on the microcontroller to distinguish between Opcode Fetches and Data Reads. Use marking options to correct the disassembler.

Configuring the Probe Adapter

There is one jumper on the probe adapter to select between multiplexed and demultiplexed address mode.

Figure 1–1 shows the MUX/DEMUX jumper location on the probe adapter.

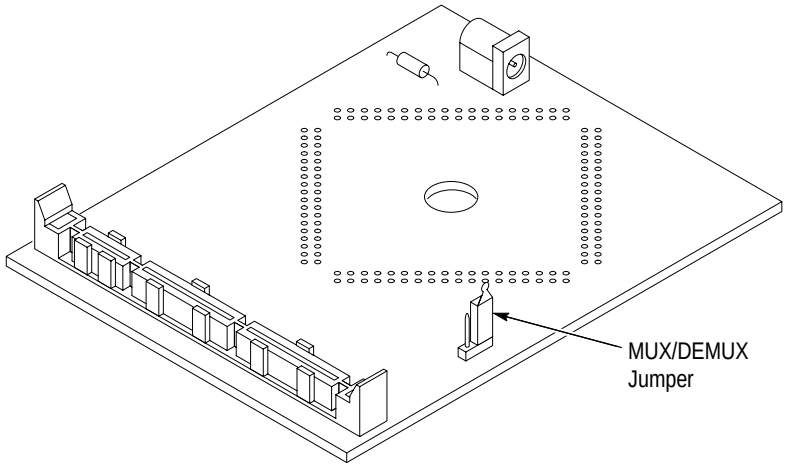


Figure 1–1: Jumper locations on the probe adapter

Connecting to a System Under Test

Before you connect to the SUT, you must connect the probes to the module. Your SUT must also have a minimum amount of clear space surrounding the microcontroller to accommodate the probe adapter. Refer to the *Specifications* chapter in this manual for the required clearances.

The channel and clock probes shown in this chapter are for a 102/136-channel module. The probes will look different if you are using a 96-channel module.

The general requirements and restrictions of microcontroller supports in the information on basic operations shows the vertical dimensions of a channel or clock probe connected to square pins on a circuit board.

With a PQFP Probe Adapter

To connect the logic analyzer to a SUT using a PQFP probe adapter, follow these steps:

1. Turn off power to your SUT. It is not necessary to turn off the logic analyzer.

CAUTION. *Static discharge can damage the microcontroller, the probe adapter, the probes, or the module. To prevent static damage, handle all the above only in a static-free environment.*

Always wear a grounding wrist strap or similar device while handling the microcontroller and probe adapter.

2. To discharge your stored static electricity, touch the ground connector located on the back of the logic analyzer. Then, touch any of the ground pins of the probe adapter to discharge stored static electricity from the probe adapter.
3. Line up pin 1 on the 144 pin EIAJ QFP test clip, to pin 1 on the connector located on the bottom of the probe adapter circuit board, as shown in Figure 1–2.

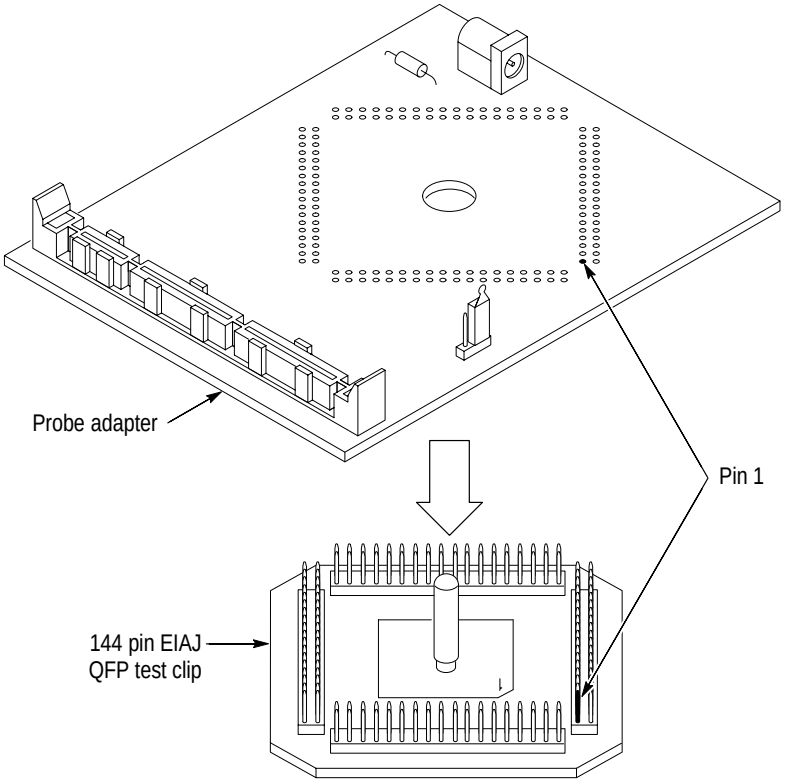


Figure 1–2: Attaching the PQFP clip to the probe adapter.

CAUTION. *This EIAJ PQFP (Plastic Quad Flat Pack) probe adapter has been equipped with a clip that has been designed for tight tolerances.*

The clip supports only PQFP devices that conform to the EIAJ standard. Attaching the clip to a device that does not conform to this EIAJ standard can easily damage the clip's connection pins and/or the microcontroller, causing the probe adapter to malfunction.

Please contact the IC manufacturer to verify that the microcontroller you are connecting to conforms to the EIAJ standard.

For best performance and long probe life, exercise extreme care when connecting the probe to the microcontroller.

4. Place the probe adapter assembly onto the microcontroller on your SUT, as shown in Figure 1–3.

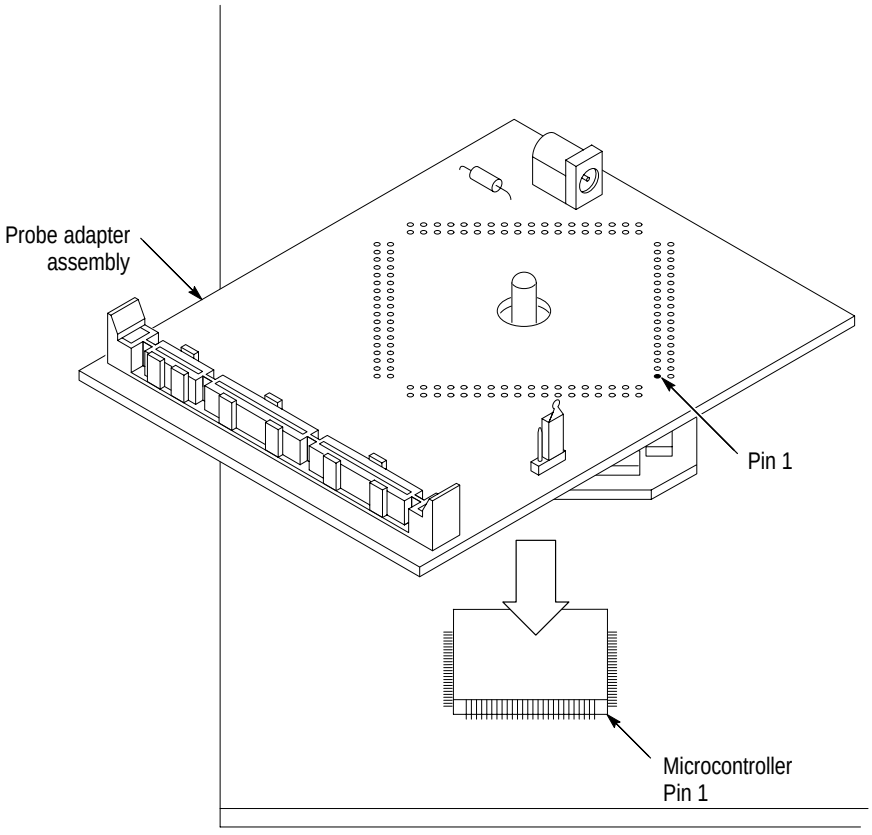


Figure 1–3: Connecting the probe adapter to the SUT.

5. Align pin 1 on the LO cable connector, the end on the narrowest cable strip of the cable, with pin 1 on the LO connector on the high-density probe. Connect the cable to the connector as shown in Figure 1–4.

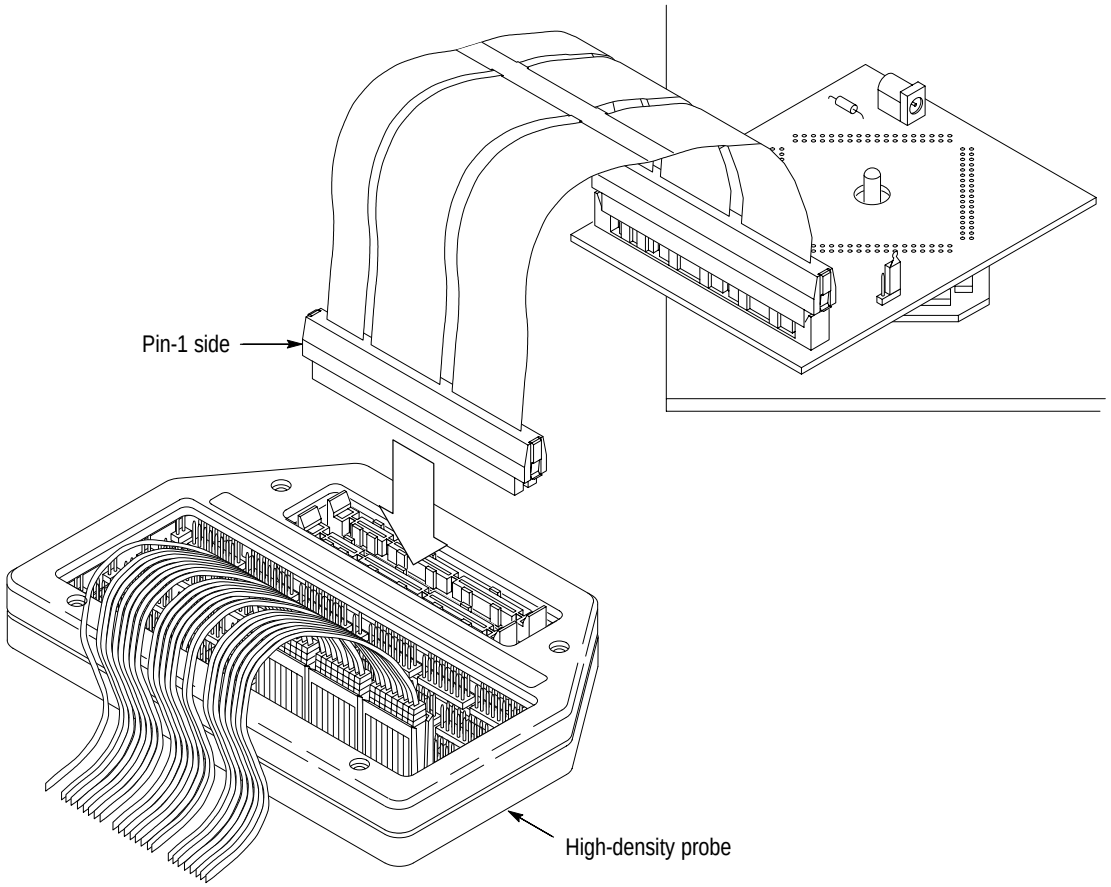


Figure 1–4: Connecting the cable to the high-density probe

CAUTION. *Failure to correctly place the probe adapter onto the microcontroller might permanently damage all electrical components when power is applied.*

Center the clip on the microcontroller and apply an equal downward force on all four sides of the clip, slightly rocking the probe adapter in a clockwise circle.

Do not apply leverage to the probe adapter when installing or removing it.

6. Connect the channel and clock probes to the high-density probe as shown in Figure 1–5. Match the channel groups and numbers on the probe labels to the corresponding pins on the high-density probe. Match the ground pins on the probes to the corresponding pins on the probe adapter.

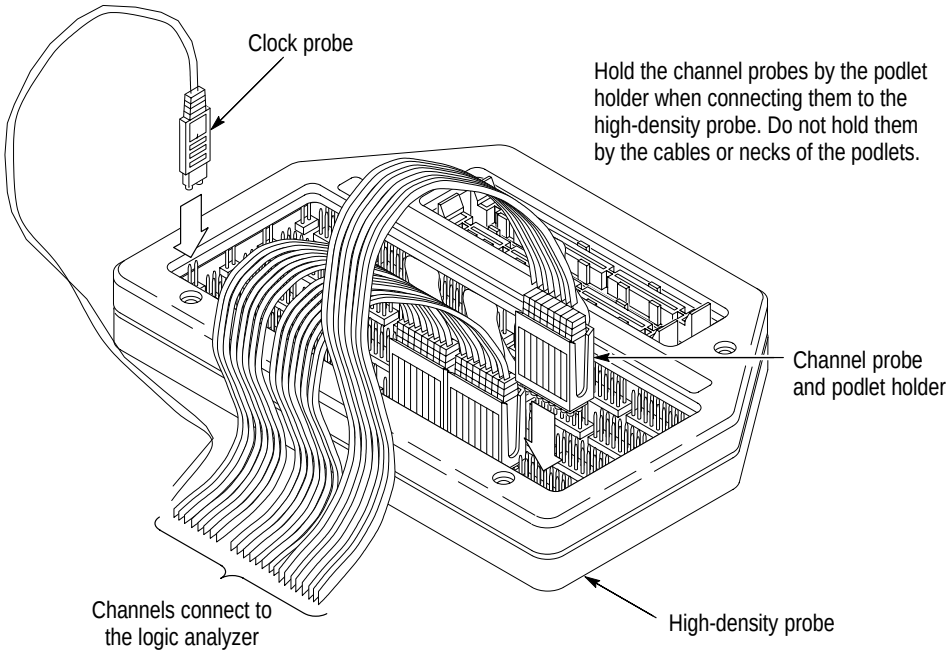


Figure 1–5: Connecting channel and clock probes to a high-density probe

7. Measure the resistance between Vcc and ground to verify that they are not shorted together. If you detect a short, determine the source and repair the problem before applying power.

Without a Probe Adapter

You can use channel probes, clock probes, and leadsets with a commercial test clip (or adapter) to make connections between the logic analyzer and your SUT.

To connect the probes to 80C167 signals on the SUT using a test clip, follow these steps:

1. Turn off power to your SUT. It is not necessary to turn off power to the logic analyzer.

CAUTION. *Static discharge can damage the microcontroller, the probes, or the module. To prevent static damage, handle all of the above only in a static-free environment.*

Always wear a grounding wrist strap or similar device while handling the microcontroller.

2. To discharge your stored static electricity, touch the ground connector located on the back of the logic analyzer. If you are using a test clip, touch any of the ground pins on the clip to discharge stored static electricity from it.

3. Use Table 1–2 to connect the channel probes to 80C167 signal pins on the test clip or in the SUT.

Use leadsets to connect at least one ground lead from each channel probe and the ground lead from each clock probe to ground pins on your test clip.

Table 1–2: 80C167 signal connections for channel probes

Section:channel	80C167 signal	Section:channel	80C167 signal
A3:7	P2.15*	D3:7	T2IN*
A3:6	P2.14*	D3:6	T3IN*
A3:5	P2.13*	D3:5	T4IN*
A3:4	P2.12*	D3:4	CAPIN*
A3:3	P2.11*	D3:3	MRST*
A3:2	P2.10*	D3:2	MTSR*
A3:1	P2.9*	D3:1	TXD0*
A3:0	P2.8*	D3:0	RXD0*
A2:7	A23	D2:7	CC31IO*
A2:6	A22	D2:6	CC30IO*
A2:5	A21	D2:5	CC29IO*
A2:4	A20	D2:4	CC28IO*
A2:3	A19	D2:3	POUT3*
A2:2	A18	D2:2	POUT2*
A2:1	A17	D2:1	POUT1*
A2:0	A16	D2:0	POUT0*
A1:7	A15	D1:7	D15
A1:6	A14	D1:6	D14
A1:5	A13	D1:5	D13
A1:4	A12	D1:4	D12

Table 1–2: 80C167 signal connections for channel probes (cont.)

Section:channel	80C167 signal	Section:channel	80C167 signal
A1:3	A11	D1:3	D11
A1:2	A10	D1:2	D10
A1:1	A9	D1:1	D9
A1:0	A8	D1:0	D8
A0:7	A7	D0:7	D7
A0:6	A6	D0:6	D6
A0:5	A5	D0:5	D5
A0:4	A4	D0:4	D4
A0:3	A3	D0:3	D3
A0:2	A2	D0:2	D2
A0:1	A1	D0:1	D1
A0:0	A0	D0:0	D0
C3:7	CS4~*	C2:7	BHE~
C3:6	CS3~*	C2:6	WR~
C3:5	CS2~*	C2:5	RD~
C3:4	CS1~*	C2:4	ALE
C3:3	CS0~*	C2:3	READY~*
C3:2	CLKOUT*	C2:2	RSTIN~
C3:1	NMI~*	C2:1	HLDA~
C3:0	EA~*	C2:0	RSTOUT~
C1:7	P8.7*	C0:7	P2.7*
C1:6	P8.6*	C0:6	P2.6*
C1:5	P8.5*	C0:5	P2.5*
C1:4	P8.4*	C0:4	P2.4*
C1:3	P8.3*	C0:3	P2.3*
C1:2	P8.2*	C0:2	P2.2*
C1:1	P8.1*	C0:1	P2.1*
C1:0	P8.0*	C0:0	P2.0*

*** Signal not required for disassembly.**

Table 1–3 shows the clock probes and the 80C167 signal to which they must connect for disassembly to be correct.

Table 1–3: 80C167 signal connections for clock probes

Section:channel	80C167 signal
CK:3	BHE~=
CK:2	WR~=
CK:1	RD~=
CK:0	ALE=

= Indicates the channel is double probed

4. Align pin 1 or A1 of your test clip with the corresponding pin 1 or A1 of the 80C167 microcontroller in your SUT and attach the clip.

Applying and Removing Power

A power supply for the TMS 600 80C167 probe adapter is included with the support. The power supply provides +5 volts power to the probe adapter. The center connector of the power jack connects to Vcc.

NOTE. *Whenever the SUT is powered off, be sure to remove power from the probe adapter.*

To apply power to the 80C167 probe adapter and SUT, follow these steps:

CAUTION. *Failure to use the +5 V power supply provided by Tektronix might permanently damage the probe adapter and 80C167 microcontroller. Do not mistake another power supply that looks similar for the +5 V power supply.*

1. Connect the +5 V power supply to the jack on the probe adapter. Figure 1–6 shows the location of the jack on the adapter board.

CAUTION. *Failure to apply power to the probe adapter before applying power to your SUT might permanently damage the 80C167 microcontroller and SUT.*

2. Plug the power supply for the probe adapter into an electrical outlet.
3. Power on the SUT.

Figure 1–6 shows the location of the power jack.

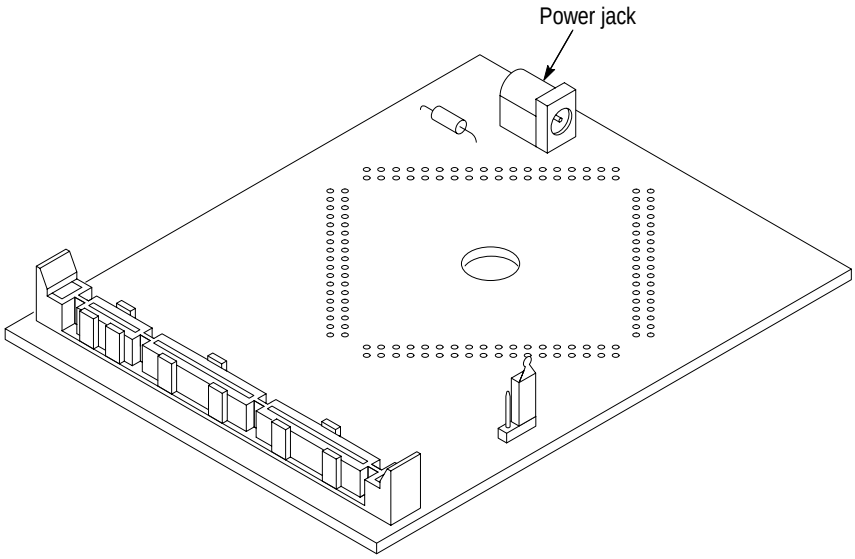


Figure 1–6: Location of the power jack

To remove power from the SUT and 80C167 probe adapter, follow these steps:

CAUTION. *Failure to power down your SUT before removing the power from the probe adapter might permanently damage the 80C167 microcontroller and SUT.*

1. Power off your SUT.
2. Unplug the power supply for the probe adapter from the electrical outlet.

Operating Basics

Setting Up the Support

This section provides information on how to set up the support. Information covers the following topics:

- Channel group definitions
- Clocking options
- Symbol table files

The information in this section is specific to the operations and functions of the TMS 600 80C167 support on any Tektronix logic analyzer for which it can be purchased. Information on basic operations describes general tasks and functions.

Before you acquire and disassemble data, you need to load the support and specify setups for clocking and triggering as described in the information on basic operations. The support provides default values for each of these setups, but you can change them as needed.

Channel Group Definitions

The software automatically defines channel groups for the support. The channel groups for the 80C167 support are Address, Data, Mnemonic, Control, Port2, Misc0, Misc1, P7 (7-0), and P8 (7-0). If you want to know which signal is in which group, refer to the channel assignment tables beginning on page 3–6.

Clocking Options

The TMS 600 support offers a microcontroller-specific clocking mode for the 80C167 microcontroller. This clocking mode is the default selection whenever you load the 80C167 support.

A description of how cycles are sampled by the module using the support and probe adapter is found in the *Specifications* chapter.

Disassembly will not be correct with the Internal or External clocking modes. Information on basic operations describes how to use these clock selections for general purpose analysis.

The clocking options for the TMS 600 support are: Write Mode and Alternate Bus Master Cycles.

Alternate Bus Master Cycles

An alternate bus master cycle is defined as the cycle in which the 80C167 microcontroller gives up the bus to an alternate device (a DMA device or another microcontroller). These types of cycles are acquired when you select Included.

The Alternate Bus Master cycles will have the following selections available:

- Excluded – DMA cycles are not acquired (default)
- Included – DMA cycles are acquired

Write Mode

The clocking options write mode is used to configure the Write Configuration used by the microcontroller.

The write mode will have the following selections available:

- WR – In WR mode pin WR~ retains its normal function.
- WRL-WRH – In WRL-WRH mode pin WR~ acts as WRL~, and pin WRH~ acts as byte high enable.

Symbols

The TMS 600 support supplies one symbol table file. The 80C167_Ctrl file replaces specific Control channel group values with symbolic values when Symbolic is the radix for the channel group.

Table 2–1 shows the name, bit pattern, and meaning for the symbols in the file 80C167_Ctrl, the Control channel group symbol table.

Table 2–1: Control group symbol table definitions

Symbol	Control group value ALE RD~ WR~ BHE~ HLDA~ RSTIN~ RSTOUT~	Meaning
OPCODE/READ	X 0 1 X X 1 X	Memory code read (Opcode Fetch)
DATA WRITE	X 1 0 X X 1 X	Any memory I/O write
HIGH DATA WRITE	X 1 1 0 X 1 X	High data memory I/O write
RESET	X 1 1 X X 0 0	RESET signal asserted

Information on basic operations describes how to use symbolic values for triggering and for displaying other channel groups symbolically, such as the Address channel group.

Acquiring and Viewing Disassembled Data

This section describes how to acquire data and view it disassembled. Information covers the following topics and tasks:

- Acquiring data
- Viewing disassembled data in various display formats
- Cycle type labels
- Changing the way data is displayed
- Changing disassembled cycles with the mark cycles function

Acquiring Data

Once you load the 80C167 support, choose a clocking mode, and specify the trigger, you are ready to acquire and disassemble data.

If you have any problems acquiring data, refer to information on basic operations in your online help or *Appendix A: Error Messages and Disassembly Problems* in the basic operations user manual.

Viewing Disassembled Data

You can view disassembled data in four display formats: Hardware, Software, Control Flow, and Subroutine. The information on basic operations describes how to select the disassembly display formats.

NOTE. *Selections in the Disassembly property page (the Disassembly Format Definition overlay) must be set correctly for your acquired data to be disassembled correctly. Refer to* Changing How Data is Displayed *on page 2–6.*

The default display format shows the Address, Data, and Control channel group values for each sample of acquired data.

The disassembler displays special characters and strings in the instruction mnemonics to indicate significant events. Table 2–2 shows these special characters and strings, and gives a definition of what they represent.

Table 2–2: Meaning of special characters in the display

Character or string displayed	Meaning
m	The instruction was manually marked as a program fetch
****	Indicates there is insufficient data available for complete disassembly of the instruction; the number of asterisks indicates the width of the data that is unavailable. Each two asterisks represent one byte.
#	Indicates an immediate value
t	Indicates the number shown is in decimal, such as #12t

Hardware Display Format

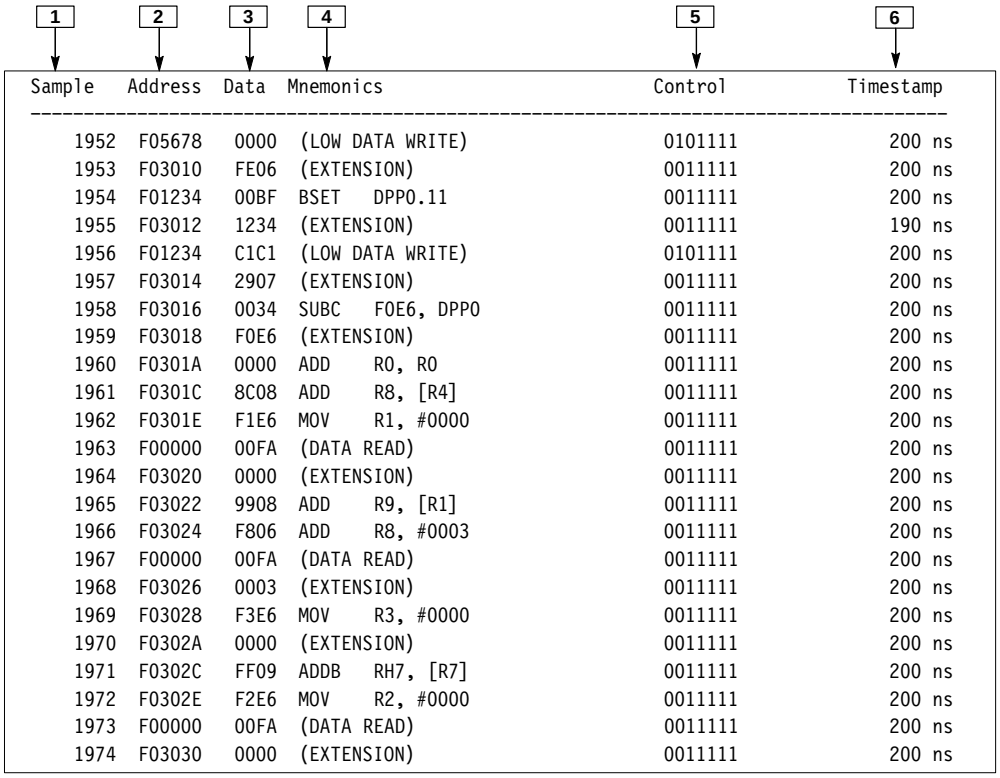
In Hardware display format, the disassembler displays certain cycle type labels in parentheses. Table 2–3 shows these cycle type labels and gives a definition of the cycle they represent. Reads to interrupt and exception vectors will be labeled with the vector name.

Table 2–3: Cycle type definitions

Cycle type	Definition
(DATA WRITE)	Used to indicate that the write operation is being performed
(HIGH DATA WRITE)	Used to indicate that a high byte data write operation is being performed
(RESET)	Used to indicate the RESET state of the microcontroller
(UNKNOWN BUS CYCLE)	The combination of control bits is unexpected and/or unrecognized
(DATA READ)*	Used to indicate a memory read
(FLUSH)*	Used to indicate an instruction fetch that the microcontroller did not use
(EXTENSION)*	Used to indicate that an operand is displayed as an extension
(LOW DATA WRITE)*	Used to indicate that a low byte data write operation is being used

* **Computed cycle types.**

Figure 2–1 shows an example of the Hardware display.



Sample	Address	Data	Mnemonics	Control	Timestamp
1952	F05678	0000	(LOW DATA WRITE)	0101111	200 ns
1953	F03010	FE06	(EXTENSION)	0011111	200 ns
1954	F01234	00BF	BSET DPP0.11	0011111	200 ns
1955	F03012	1234	(EXTENSION)	0011111	190 ns
1956	F01234	C1C1	(LOW DATA WRITE)	0101111	200 ns
1957	F03014	2907	(EXTENSION)	0011111	200 ns
1958	F03016	0034	SUBC F0E6, DPP0	0011111	200 ns
1959	F03018	F0E6	(EXTENSION)	0011111	200 ns
1960	F0301A	0000	ADD R0, R0	0011111	200 ns
1961	F0301C	8C08	ADD R8, [R4]	0011111	200 ns
1962	F0301E	F1E6	MOV R1, #0000	0011111	200 ns
1963	F00000	00FA	(DATA READ)	0011111	200 ns
1964	F03020	0000	(EXTENSION)	0011111	200 ns
1965	F03022	9908	ADD R9, [R1]	0011111	200 ns
1966	F03024	F806	ADD R8, #0003	0011111	200 ns
1967	F00000	00FA	(DATA READ)	0011111	200 ns
1968	F03026	0003	(EXTENSION)	0011111	200 ns
1969	F03028	F3E6	MOV R3, #0000	0011111	200 ns
1970	F0302A	0000	(EXTENSION)	0011111	200 ns
1971	F0302C	FF09	ADDB RH7, [R7]	0011111	200 ns
1972	F0302E	F2E6	MOV R2, #0000	0011111	200 ns
1973	F00000	00FA	(DATA READ)	0011111	200 ns
1974	F03030	0000	(EXTENSION)	0011111	200 ns

Figure 2–1: Hardware display format

1 **Sample Column.** Lists the memory locations for the acquired data.

2 **Address Group.** Lists data from channels connected to the 80C167 Address bus.

3 **Data Group.** Lists data from channels connected to the 80C167 Data bus.

4 **Mnemonic Column.** Lists the disassembled instructions and cycle types.

5 **Control Column.** Lists the disassembled instructions and cycle types.

6 **Timestamp.** Lists the timestamp values when a timestamp selection is made. Information on basic operations describes how you can select a timestamp.

Software Display Format

The Software display format shows only the first opcode fetch of executed instruction cycles. Flushed cycles and extensions are not shown, even though they are part of the executed instruction. Read extensions will be used to disassemble the instruction, but will not be displayed as a separate cycle in the Software display format. Data reads and writes are not displayed.

Control Flow Display Format

The Control Flow display format displays only the first opcode fetch of instructions that causes a branch in the addressing. Branches not taken will not be displayed. Only conditional jumps that are taken will be displayed.

Instructions that will unconditionally generate a change in the flow of control in the 80C167 microcontroller are as follows:

JMPS	CALLR	CALLS	PCALL	RET
RETI	RETP	RETS	SRST	TRAP

Instructions that conditionally generate a change in the flow of control in the 80C167 microcontroller are as follows:

CALLA	CALLI	JMPA	JMPI	JMPR
JNB	JNBS	JB	JBC	

Subroutine Display Format

The Subroutine display format shows only the first fetch of subroutine call and return instructions. It will display conditional subroutine calls if they are considered to be taken.

Instructions that will unconditionally generate a subroutine call or a return in the 80C167 microcontroller are as follows:

CALLR	CALLS	PCALL	
RET	RETI	RETP	RETS

Instructions that conditionally generate a subroutine call or a return in the 80C167 microcontroller are as follows:

CALLA	CALLI

Changing How Data is Displayed

There are common fields and features that allow you to further modify displayed data to suit your needs. You can make common and optional display selections in the Disassembly property page (the Disassembly Format Definition overlay).

You can make selections unique to the 80C167 support to do the following tasks:

- Change how data is displayed across all display formats
- Change the interpretation of disassembled cycles
- Display exception vectors

There are no optional fields for this support package. Refer to the information on basic operations for descriptions of common fields.

Optional Display Selections

You can make optional selections for disassembled data. In addition to the common selections (described in the information on basic operations), you can change the displayed data in the following ways:

- Specify the bus width and the number of address lines to be used
- Specify the mode of operation

Bus width. Using the Custom fields you must select one of four modes of operation:

Bus Mode	16-bit MUX
	16-bit DEMUX
	8-bit MUX
	8-bit DEMUX

Number of address lines. Using the Custom fields you must select the number of address lines to be used. There are four possible selections:

Address Lines	A15 – A0
	A17 – A0
	A19 – A0
	A23 – A0

Write Configuration. Using the Custom fields you must select the write configuration that the microcontroller is to use. There are two possible selections:

Write Mode	WR
	WRL-WRH

In WR Mode pin WR~ retains its normal function. In WRL-WRH mode pin WR~ acts as WRL~, and pin WRH~ acts as Byte High Enable.

Bus Arbitration. Using the Custom fields you must set the bus arbitration to Disabled or Enabled, depending on the microcontroller mode you are using.

Marking Cycles

The disassembler has a Mark Opcode function that allows you to change the interpretation of a cycle type. Using this function, you can select a cycle and change it to one of the following cycle types:

Opcode	marks the current sequence as an opcode fetch cycle.
Extension	marks the current sequence as an extension.
Data Read	marks the current sequence as a Data read.
Pec Read	marks the current sequence as a Pec read.
Flush	marks the current sequence as flush.
Undo Mark	removes all marks from the current sequence.

The Menu item Opcode appears only for an even address, and the item Undo Mark appears only for a marked sequence. In the 8-bit mode, odd extensions will not have any mark options assigned to them. Only even extensions will have the option of Opcode.

Opcode. If the current sequence is an Opcode, the mark option menu will have the selections Flush, Extension, Data Read, and Pec Read.

Extension. If the current sequence is an Extension, the mark option menu will have the selections Flush, Opcode, Data Read, and Pec Read.

In the 8-bit mode, odd Extensions will not have any mark options assigned to them. Only even Extensions will have the option of Opcode.

Data Read. If the current sequence is a Data Read, the mark option menu will have the selections Flush, Opcode, Extension, and Pec Read.

Flush. If the current sequence is a Flush, the mark option menu will have the selections Opcode, Extension, Data Read, and Pec Read, in addition to the Undo mark option.

Data Write. If the current sequence is a Data Write, the mark option menu will have a Pec Write selection.

Low Data Write. If the current sequence is a Low Data Write, the mark option menu will have a Pec Low Write selection.

High Data Write. If the current sequence is a High Data Write, the mark option menu will have a Pec High Write selection.

Undo Mark. If the current sequence is marked, the mark option menu will have an Undo Mark selection.

Information on basic operations contains more details on marking cycles.

Displaying Exception Labels

The exception table must reside in external memory for the exception cycles to be visible to the disassembler.

Refer to the *C167 User's Manual*, Siemens, August 1994, for descriptions of the exception labels.

The support will label all of the exception vector reads with the following labels:

CC1INT	CC2INT	CC3INT	CC4INT
CC5INT	CC6INT	CC7INT	CC8INT
CC9INT	CC10INT	CC11INT	CC12INT
CC13INT	CC14INT	CC15INT	CC16INT
CC17INT	CC18INT	CC19INT	CC20INT
CC21INT	CC22INT	CC23INT	CC24INT
CC25INT	CC26INT	CC27INT	CC28INT
CC29INT	CC30INT	CC31INT	
T0INT	T1INT	T7INT	
T8INT	T2INT	T3INT	
T4INT	T5INT	T6INT	
CRINT	ADCINT	ADEINT	
S0INT	S0TINT	S0TBINT	
S0RINT	S0EINT	SCTINT	
SCRINT	SCEINT	PWMINT	
XPOINT	XP1INT		
XP2INT	XP3INT		

Specifications

Specifications

This chapter contains the following information:

- Probe adapter description
- Specification tables
- Dimensions of the probe adapter
- Channel assignment tables
- Description of how the module acquires 80C167 signals
- List of other accessible microcontroller signals and extra probe channels

Probe Adapter Description

The probe adapter is nonintrusive hardware that allows the logic analyzer to acquire data from a microcontroller in its own operating environment with little effect, if any, on that system. Information on basic operations contains a figure showing the logic analyzer connected to a typical probe adapter. Refer to that figure while reading the following description.

The probe adapter consists of a 144 pin EIAJ QFP test clip that attaches to the microcontroller and the probe adapter circuit board that contains circuitry to buffer the signals and bus switching electronics. The probe adapter connects to the microcontroller in the SUT. Signals from the microcontroller-based system flow from the probe adapter to the channel groups and through the probe signal leads to the logic analyzer module.

All circuitry on the probe adapter is powered from the supplied power adapter.

The probe adapter accommodates the Siemens SAB-C167 microcontroller in a 144-pin metric PQFP package.

Probe Adapter Configuration

The probe adapter has one jumper that is used to select between multiplexed and demultiplexed address modes. Figure 3–1 shows the MUX/DEMUX jumper location on the probe adapter.

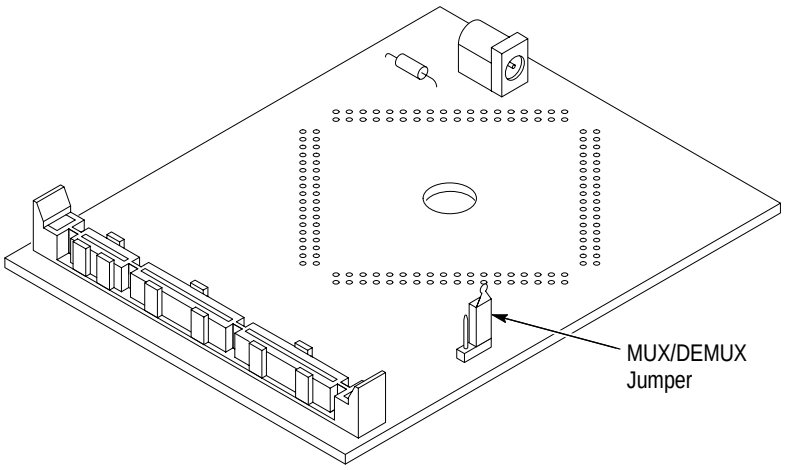


Figure 3–1: Jumper locations on the probe adapter

Probe Adapter Specifications

These specifications are for a probe adapter connected between a compatible Tektronix logic analyzer and a SUT. Table 3–1 shows the electrical requirements the SUT must produce for the support to acquire correct data. Table 3–2 shows the environmental specifications of the probe adapter. Table 3–3 shows the certifications and compliances that apply to the probe adapter. Figure 3–2 shows the dimensions of the probe adapter.

Table 3–1: Electrical specifications

Characteristics	Requirements
Probe adapter power supply requirements	
Voltage	90-265 VAC
Current	1.1 A maximum at 100 VAC
Frequency	47-63 Hz
Power	25 W maximum
SUT clock	
Clock rate	Maximum specified 20 MHz Maximum tested: 5 MHz

Table 3–1: Electrical specifications (cont.)

Characteristics	Requirements	
Minimum setup time required	5 ns	
Minimum hold time required	0 ns	
	Specification	
Measured typical SUT signal loading	**AC load**	**DC load**
Port0 (15-0)	7 pF	1 – 74FCT162244ET, 1 – 74FCT162260AT
Port1 (15-0)	3.5 pF	1 – 74FCT162244ET
Port4 (7-0)	7 pF	2 – 74FCT162260AT
RD~, WR~, ALE, BHE~	7 pF	2 – 74FCT162244ET
RSTIN~, RSTOUT~, HLDA~	3.5 pF	1 – 74FCT162244ET
Port2 (15-0)	3.5 pF	1 – 74FCT162244ET
Port7 (7-0)	3.5 pF	1 – 74FCT162244ET
Port8 (7-0)	3.5 pF	1 – 74FCT162244ET
NMI~, CLKOUT, READY~, EA~, CS4~, CS3~, CS2~, CS1~, CS0~	3.5 pF	1 – 74FCT162244ET
T2IN, T3IN, T4IN, CAPIN, MRST, MTSR, TXD0, RXD0	3.5 pF	1 – 74FCT162244ET

NOTE. *In Table 3–1, for the 102/136-channel module the electrical loading on one podlet is 20 kΩ in parallel with 2 pF.*

For the 96-channel module the electrical loading on one podlet is 100 kΩ in parallel with 10 pF.

Table 3–2 shows the environmental specifications.

Table 3–2: Environmental specifications*

Characteristic	Description
Temperature	
Maximum operating	+50° C (+122° F) †
Minimum operating	0° C (+32° F)
Non-operating	–55° C to +75° C (–67° to +167° F)
Humidity	10 to 95% relative humidity
Altitude	
Operating	4.5 km (15,000 ft) maximum
Non-operating	15 km (50,000 ft) maximum
Electrostatic immunity	The probe adapter is static sensitive

*** Designed to meet Tektronix standard 062-2847-00 class 5.**

† Not to exceed 80C167 microcontroller thermal considerations. Forced air cooling might be required across the CPU.

Table 3–3: Certifications and compliances

EC Compliance	There are no current European Directives that apply to this product.

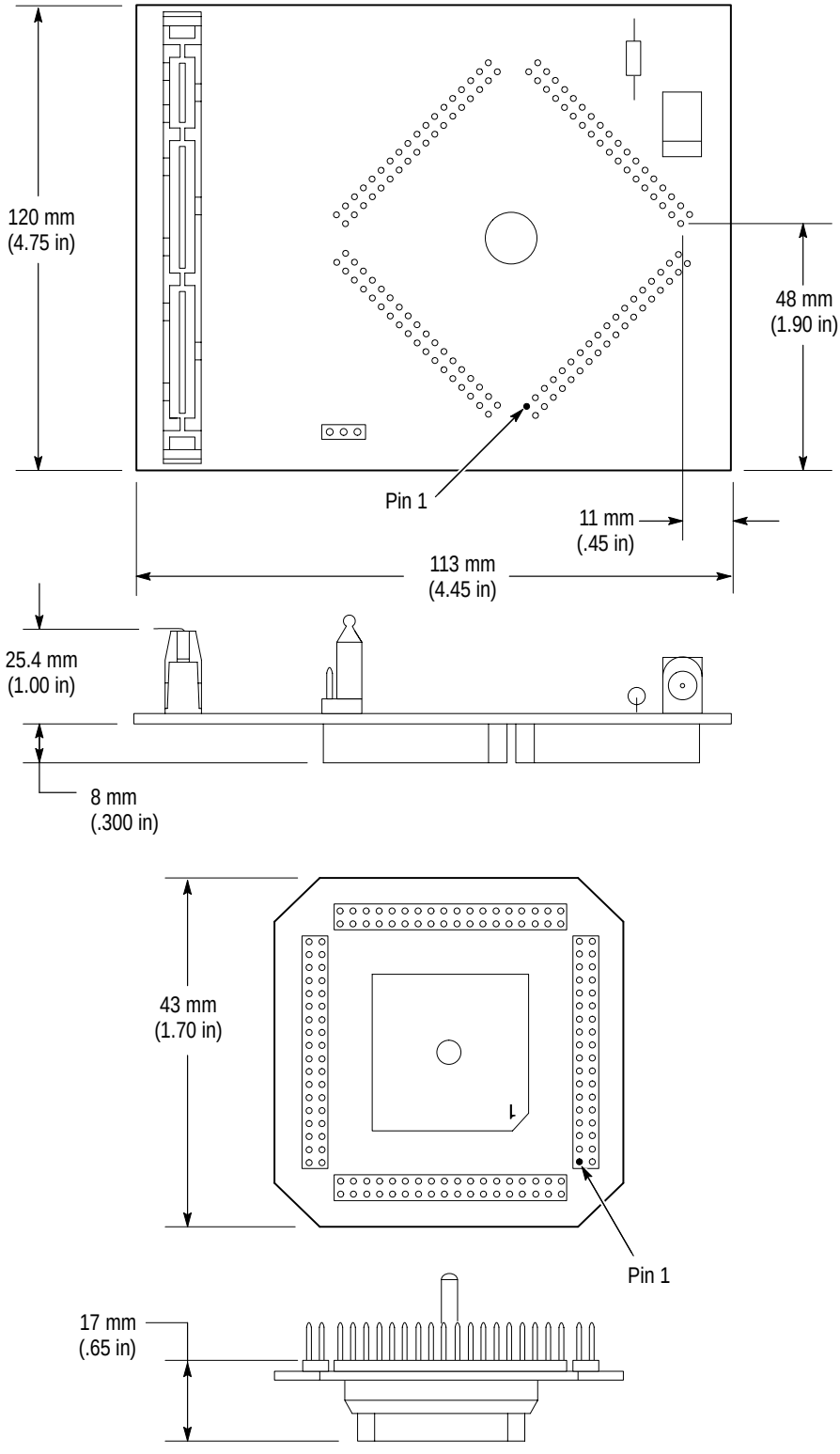


Figure 3–2: Dimensions of the probe adapter

Probe Adapter Channel Assignments

Channel assignments shown in Table 3–4 through Table 3–12 use the following conventions:

- All signals are required by the support unless otherwise indicated.
- Channels are shown starting with the most significant bit (MSB) descending to the least significant bit (LSB).
- Channel group assignments are for all modules unless otherwise indicated.
- A tilde (~) following a signal name indicates an active low signal.
- An equals sign (=) following a signal name indicates that it is double probed.

Table 3–4 shows the probe section and channel assignments for the Address group and the microcontroller signal to which each channel connects. By default, this channel group is displayed in hexadecimal.

Table 3–4: Address group channel assignments

Bit order	Section:channel	80C167 signal name
23	A2:7	A23
22	A2:6	A22
21	A2:5	A21
20	A2:4	A20
19	A2:3	A19
18	A2:2	A18
17	A2:1	A17
16	A2:0	A16
15	A1:7	A15
14	A1:6	A14
13	A1:5	A13
12	A1:4	A12
11	A1:3	A11
10	A1:2	A10
9	A1:1	A9
8	A1:0	A8
7	A0:7	A7
6	A0:6	A6
5	A0:5	A5

Table 3–4: Address group channel assignments (cont.)

Bit order	Section:channel	80C167 signal name
4	A0:4	A4
3	A0:3	A3
2	A0:2	A2
1	A0:1	A1
0	A0:0	A0

Table 3–5 shows the probe section and channel assignments for the Data group and the microcontroller signal to which each channel connects. By default, this channel group is displayed in hexadecimal.

Table 3–5: Data group channel assignments

Bit order	Section:channel	80C167 signal name
15	D1:7	D15
14	D1:6	D14
13	D1:5	D13
12	D1:4	D12
11	D1:3	D11
10	D1:2	D10
9	D1:1	D9
8	D1:0	D8
7	D0:7	D7
6	D0:6	D6
5	D0:5	D5
4	D0:4	D4
3	D0:3	D3
2	D0:2	D2
1	D0:1	D1
0	D0:0	D0

Table 3–6 shows the probe section and channel assignments for the Control group and the microcontroller signal to which each channel connects. By default, this channel group is displayed symbolically.

Table 3–6: Control group channel assignments

Bit order	Section:channel	80C167 signal name
6	C2:7	BHE~
5	C2:6	WR~
4	C2:5	RD~
3	C2:4	ALE
2	C2:2	RSTIN~
1	C2:1	HLDA~
0	C2:0	RSTOUT~

Table 3–7 shows the probe section and channel assignments for the Port2 (15-8) group and the microcontroller signal to which each channel connects.

The channel assignments of Port2 are not stored as acquisition data, and can not be used for triggering.

You must double probe the Port2 channel assignments if you want to store them in the acquisition, or use them for triggering.

Table 3–7: Port2 channel group assignments

Bit order	Section:channel	80C167 signal name
15	A3:7	P2.15 *
14	A3:6	P2.14 *
13	A3:5	P2.13 *
12	A3:4	P2.12 *
11	A3:3	P2.11 *
10	A3:2	P2.10 *
9	A3:1	P2.9 *
8	A3:0	P2.8 *
7	C0:7	P2.7 *
6	C0:6	P2.6 *
5	C0:5	P2.5 *

Table 3–7: Port2 channel group assignments (cont.)

Bit order	Section:channel	80C167 signal name
4	C0:4	P2.4 *
3	C0:3	P2.3 *
2	C0:2	P2.2 *
1	C0:1	P2.1 *
0	C0:0	P2.0 *

*** Signal not required for disassembly.**

Table 3–8 shows the probe section and channel assignments for the Misc0 group and the microcontroller signal to which each channel connects.

The channel assignments of Misc0 are not stored as acquisition data, and they can not be used for triggering.

You must double probe the Misc0 channel assignments if you want to store them in the acquisition, or use them for triggering.

Table 3–8: Misc0 group channel assignments

Bit order	Section:channel	80C167 signal name
8	C3:7	CS4~ *
7	C3:6	CS3~ *
6	C3:5	CS2~ *
5	C3:4	CS1~ *
4	C3:3	CS0~ *
3	C3:2	CLKOUT *
2	C3:1	NMI~ *
1	C3:0	EA~ *
0	C2:3	READY~ *

*** Signal not required for disassembly.**

Table 3–9 shows the probe section and channel assignments for the Misc1 group and the microcontroller signal to which each channel connects.

The channel assignments of Misc1 are not stored as acquisition data, and they can not be used for triggering.

You must double probe the Misc1 channel assignments if you want to store them in the acquisition, or use them for triggering.

Table 3–9: Misc1 group channel assignments

Bit order	Section:channel	80C167 signal name
7	D3:7	T2IN *
6	D3:6	T3IN *
5	D3:5	T4IN *
4	D3:4	CAPIN *
3	D3:3	MRST *
2	D3:2	MTSR *
1	D3:1	TXD0 *
0	D3:0	RXD0 *

*** Signal not required for disassembly.**

Table 3–10 shows the probe section and channel assignments for the Port7 (7-0) group and the microcontroller signal to which each channel connects.

The channel assignments of Port7 are not stored as acquisition data, and they can not be used for triggering.

You must double probe the Port7 channel assignments if you want to store them in the acquisition, or use them for triggering.

Table 3–10: P7 (7-0) channel group assignments

Bit order	Section:channel	80C167 signal name
7	D2:7	CC31IO *
6	D2:6	CC30IO *
5	D2:5	CC29IO *
4	D2:4	CC28IO *

Table 3–10: P7 (7-0) channel group assignments (cont.)

Bit order	Section:channel	80C167 signal name
3	D2:3	POUT3 *
2	D2:2	POUT2 *
1	D2:1	POUT1 *
0	D2:0	POUT0 *

*** Signal not required for disassembly.**

Table 3–11 shows the probe section and channel assignments for the Port8 (7-0) group and the microcontroller signal to which each channel connects.

The channel assignments of Port8 are not stored as acquisition data, and they can not be used for triggering.

You must double probe the Port8 channel assignments if you want to store them in the acquisition, or use them for triggering.

Table 3–11: P8 (7-0) channel group assignments

Bit order	Section:channel	80C167 signal name
7	C1:7	P8.7 *
6	C1:6	P8.6 *
5	C1:5	P8.5 *
4	C1:4	P8.4 *
3	C1:3	P8.3 *
2	C1:2	P8.2 *
1	C1:1	P8.1 *
0	C1:0	P8.0 *

*** Signal not required for disassembly.**

Table 3–12 shows the probe section and channel assignments for the clock probes (not part of any group) and the 80C167 signal to which each channel connects.

Table 3–12: Clock channel assignments

Section:channel	80C167 signal name
CK:3	BHE~ =
CK:2	WR~ =
CK:1	RD~ =
CK:0	ALE =

= Indicates the signal is double probed

How Data is Acquired

This part of this chapter explains how the module acquires 80C167 signals using the TMS 600 software and probe adapter. This part also provides additional information on microcontroller signals accessible on or not accessible on the probe adapter, and on extra probe channels available for you to use for additional connections.

Custom Clocking

A special clocking program is loaded to the module every time you load the 80C167 support. This special clocking is called Custom.

With Custom clocking, the module logs in signals from multiple groups of channels at different times as they become valid on the 80C167 bus. The module then sends all the logged-in signals to the trigger machine and to the memory of the module for storage.

In Custom clocking, the module clocking state machine generates one master sample for each microcontroller bus cycle, no matter how many clock cycles are contained in the bus cycle.

Figure 3–3 shows the multiplexed bus timing, and the sample point and master sample point.

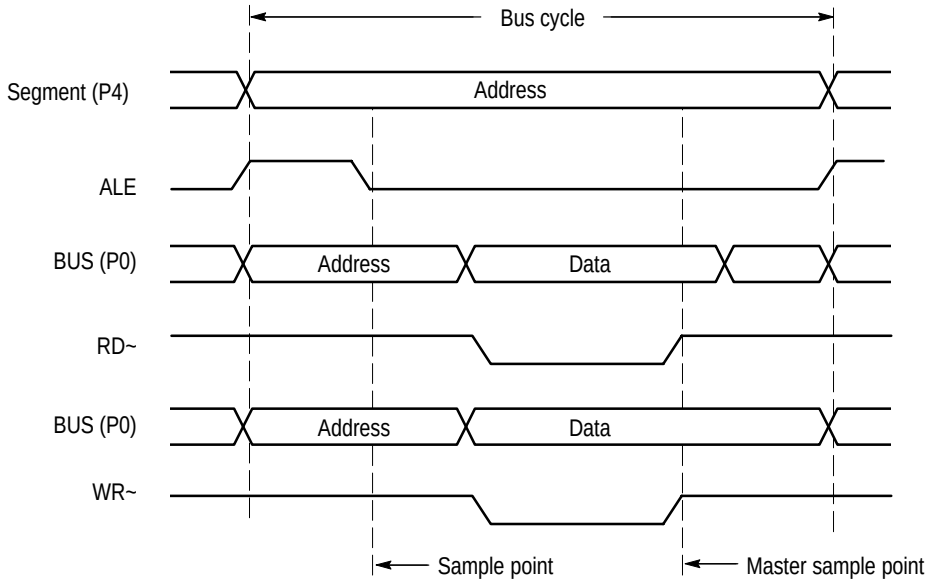


Figure 3–3: 80C167 multiplexed bus timing

Figure 3–4 shows the demultiplexed bus timing and the sample and master sample point.

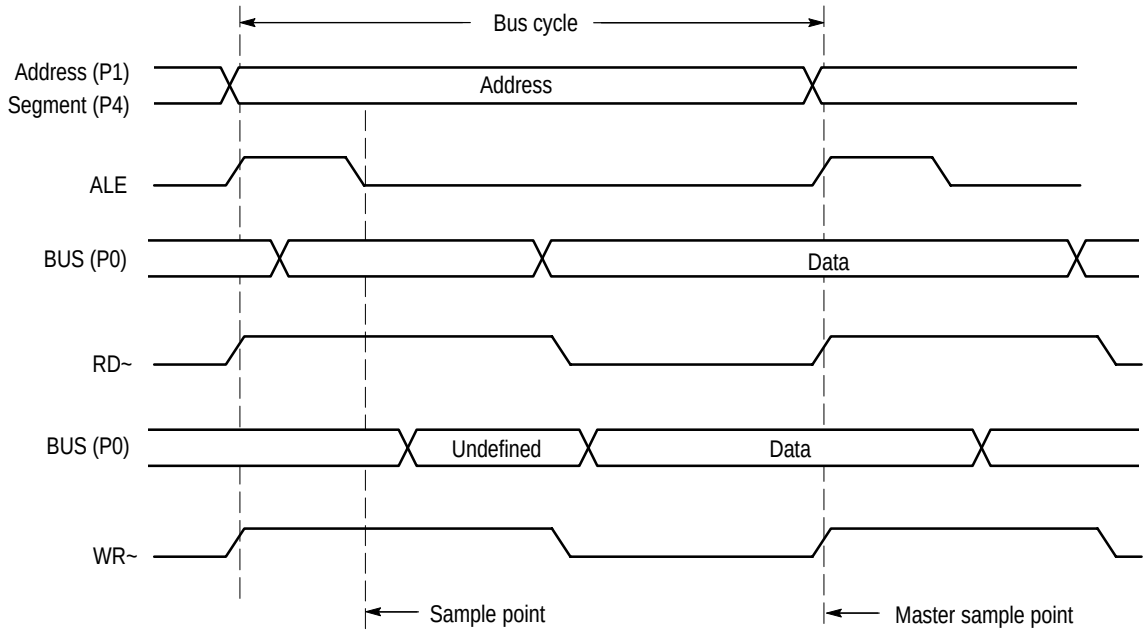


Figure 3–4: 80C167 demultiplexed bus timing

Clocking Options

The clocking algorithm for the 80C167 support allows for the custom clocking options of Alternate Bus Master Cycles Excluded, Alternate Bus Master Cycles Included, and Write Mode.

Alternate Bus Master Cycles Excluded. DMA cycles are not acquired. This is the default selection.

Alternate Bus Master Cycles Included. DMA cycles are acquired. All bus cycles, including Alternate Bus Master cycles and Backoff cycles, are logged in.

The signals ALE, RD~, and WR~ are used as clocks. The signals HLDA~, RSTIN~ and RSTOUT are used as qualifiers only.

The sampling of the address is done at the falling edge of ALE. During a READ/FETCH cycle the data is sampled at the rising edge of RD~. During a WRITE cycle the data is sampled on the rising edge of WR~.

Write Mode. The write mode custom clocking option has two selections, WR, and WRL-WRH.

If you select WR, pin WR~ retains all of the normal functions. If you select WRL-WRH mode, pin WR~ acts as WRL~, and pin WRH~ acts as byte high enable.

Alternate Microprocessor Connections

You can connect to microcontroller signals that are not required by the support so that you can do more advanced timing analysis. These signals might or might not be accessible on the probe adapter board. The following paragraphs and tables list signals that are or are not accessible on the probe adapter board.

For a list of signals required or not required for disassembly, refer to the channel assignment tables beginning on page 3–6. Remember that these channels are already included in a channel group. If you do connect these channels to other signals, you should set up another channel group for them.

Signals On the Probe Adapter

The following signals are on the probe adapter but are not acquired.

P5.0 through P5.15	P6.5
P3.0 through P3.4	P6.7

Extra Channels

All probes are connected to the probe adapter. You can disconnect channel probes not required by the support to make alternate connections. The channel assignment tables in this chapter indicate channels not required for disassembly.

Remember that these channels are already included in a channel group. If you do connect these channels to other signals, you should set up another channel group for them.

80C167 Microcontroller Signal Names to 144 pin EIAJ QFP test clip pinout

You may want to connect to signals with other equipment, such as an oscilloscope, while analyzing activity in your SUT. You can connect to 80C167 microcontroller signals through the 144 pin EIAJ QFP test clip.

The pin out of the 144 pin EIAJ QFP test clip is mapped one-to-one with the pin out of the 80C167.

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.

Maintenance

Maintenance

This section contains information on the following topics:

- Probe adapter circuit description
- Replacing signal leads
- Replacing the fuse

Probe Adapter Circuit Description

The TMS 600 support uses a 144 pin EIAJ QFP test clip that interfaces between the probe adapter and the microcontroller on the SUT.

The probe adapter has a jumper to select between the multiplexed and demultiplexed modes of operation.

The probe adapter uses the 74FCT162260AT 12-bit tri-port bus exchanger to switch the address lines between Port0 and Port1. The probe adapter uses the 74FCT162244ET 16-bit buffer to buffer the other signal lines between the microcontroller and the logic analyzer.

Replacing Signal Leads

Information on basic operations describes how to replace signal leads (individual channel and clock probes).

Replacing the Fuse

If the fuse on the 80C167 probe adapter opens (burns out), you can replace it with a 5 A, 125 V fuse. Figure 4–1 shows the location of the fuse on the probe adapter.

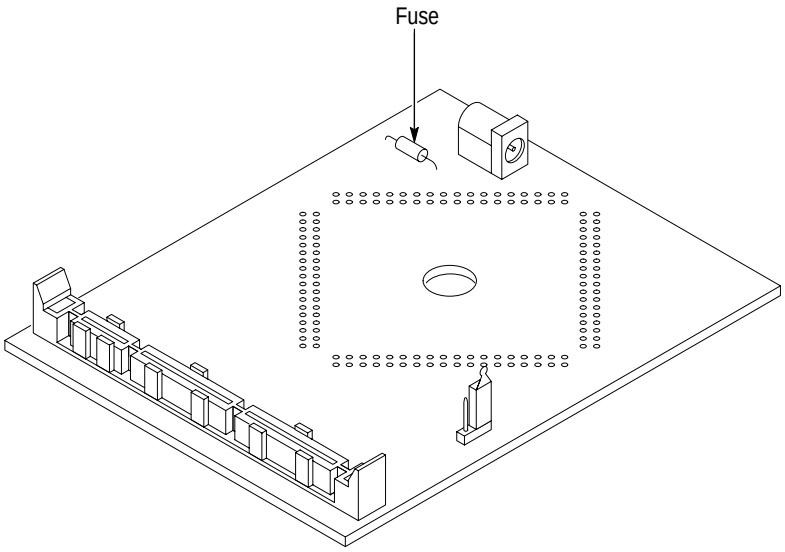


Figure 4–1: Location of the fuse

Replaceable Electrical Parts

Replaceable Electrical Parts

This chapter contains a list of the replaceable electrical components for the TMS 600 80C167 microcontroller support. 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.

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

Using the Replaceable Electrical Parts List

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

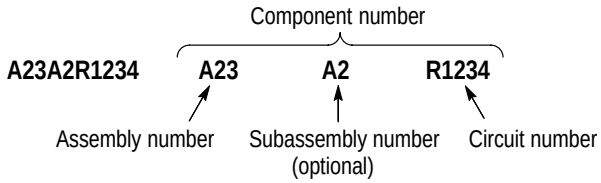
Parts list column descriptions

Column	Column name	Description
1	Component number	The component number appears on diagrams and circuit board illustrations, located in the diagrams section. Assembly numbers are clearly marked on each diagram and circuit board illustration in the *Diagrams* section, and on the mechanical exploded views in the *Replaceable Mechanical Parts* list section. The component number is obtained by adding the assembly number prefix to the circuit number (see Component Number illustration following this table). The electrical parts list is arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts). Chassis-mounted parts have no assembly number prefix, and they are located at the end of the electrical parts list.
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 entry indicates the part is good for all serial numbers.
5	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.
6	Mfr. code	This indicates the code number of the actual manufacturer of the part.
7	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.

Component Number



Read: Resistor 1234 (of Subassembly 2) of Assembly 23

List of Assemblies

A list of assemblies is located at the beginning of the electrical parts list. The assemblies are listed in numerical order. When a part's complete component number is known, this list will identify the assembly in which the part is located.

Chassis Parts

Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts List.

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
05276	ITT POMONA ELECTRONICS	1500 E NINTH ST	POMONA, CA 91766–3835
14310	AULT INC	7300 BOONE AVE NORTH BROOKLINE PARK	MINNEAPOLIS, MN 55428
26742	METHODE ELECTRONICS INC	BACKPLAIN DIVISION 7444 WEST WILSON AVE	CHICAGO, IL 60656–4548
53387	3M COMPANY	ELECTRONICS PRODUCTS DIV 3M AUSTIN CENTER	AUSTIN, TX 78769–2963
61857	SAN–O INDUSTRIAL CORP	91–3 COLIN DRIVE	HOLBROOK, NY 11741
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001
S3109	FELLER U.S. CORPORATION	72 VERONICA AVE UNIT #4	SOMERSET, NJ 08873
TK2449	SINGATRON ENTERPRISE CO LTD	13925 MAGNOLIA AVE	CHINO, CA 91710
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001

Replaceable electrical parts list

Component number	Tektronix part number	Serial no. effective	Serial no. discont'd	Name & description	Mfr. code	Mfr. part number
A01	131–4530–00			CONN,HDR:PCB,MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION,	00779	104344–1
A01	131–5527–00			JACK,POWER DC:PCB,MALE,RTANG,2MM PIN,11MM H(0.433) X 3.5MM(0.137) TAIL,9MM(0.354) W,TIN,W/SWI	TK2449	DJ–005–A
A01	131–5879–00			45002–36101:PCB,45002–36101,FEMALE,STR,2 X 18,0.1 CTR,0.325 H X 0.125 TAIL,10 GOLD,	53387	929852–01–18–10
A01	131–5947–00			CONN,BOX:PCB,MICRO–STRIP,FEMALE,STR,100 POS,0.05 CTR,W/GRD PLANE,0.320 H X 0.125 TAIL,LAT	00779	121289–7
A01	159–0059–00			FUSE,WIRE LEAD:5A,125V	61857	SPI–5A
	010–0610–00			PROBE ADAPTER:SAB–C167,PQFP–144,SOLDERED,TMS600 OPT 01	80009	010–0610–00
	103–0407–00			ADAPTER,QFP:ADAPTER,SAB–C167,MALE,STR,144 POS,0.65MM CTR,EIJ QFP 31.2 OVERALL LEAD SPACING,2	05276	5773
	119–5061–01			POWER SUPPLY:25W,5V 5A,CONCENTRIC 2MM,90–265V,47–63 HZ IEC,15X8.6X5 CM, UL,CSA, TUV,IEC,SELF	14310	SW108KA0002F01
	131–4356–00			CONN,SHUNT:SHUNT/SHORTING,FEMALE,1 X 2,0.1 CTR,0.63 H,BLK,W/HANDLE,JUMPER,	26742	9618–302–50
	161–0104–00			CA ASSY,PWR:3,18 AWG,98 L,250V/10AMP,98 INCH,RTANG,IEC320,RCPT X STR,NEMA 15–5P,W/CORD GRIP,	S3109	ORDER BY DESCRIPTION
	174–3418–00			CA ASSY,RF:TLC,MICRO–STRIP,TLC,50 OHM,FEP,PROP DELAY 1.4NS,12.0 L,100 POS,PLUG,LATCHING BOT	00779	1–340014–0
	671–3882–00			CIRCUIT BD ASSY:SAB–C167, PQFP–144, 389–2371–00 WIRED,TMS600 OPT 01	80009	671–3882–00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATION

SYMBOLS

Graphic symbol and class designation letters are based on ANSI Y32.14, 1973 in terms of positive logic. logic symbols are depicted according to the manufacturer's data book information (not according to function).

Letter symbols for quantities used in electrical science and electrical engineering are based on ANSI Y10.5, 1968.

Drafting practices, line conventions, and lettering conform to ANSI Y14.12, 1966 and ANSI Y14.2, 1973.

Abbreviations are based on ANSI Y1.1, 1972.

You can inquire about these ANSI standards by contacting:

American National Standard Institute
1430 Broadway
New York, New York 10018

COMPONENT VALUES

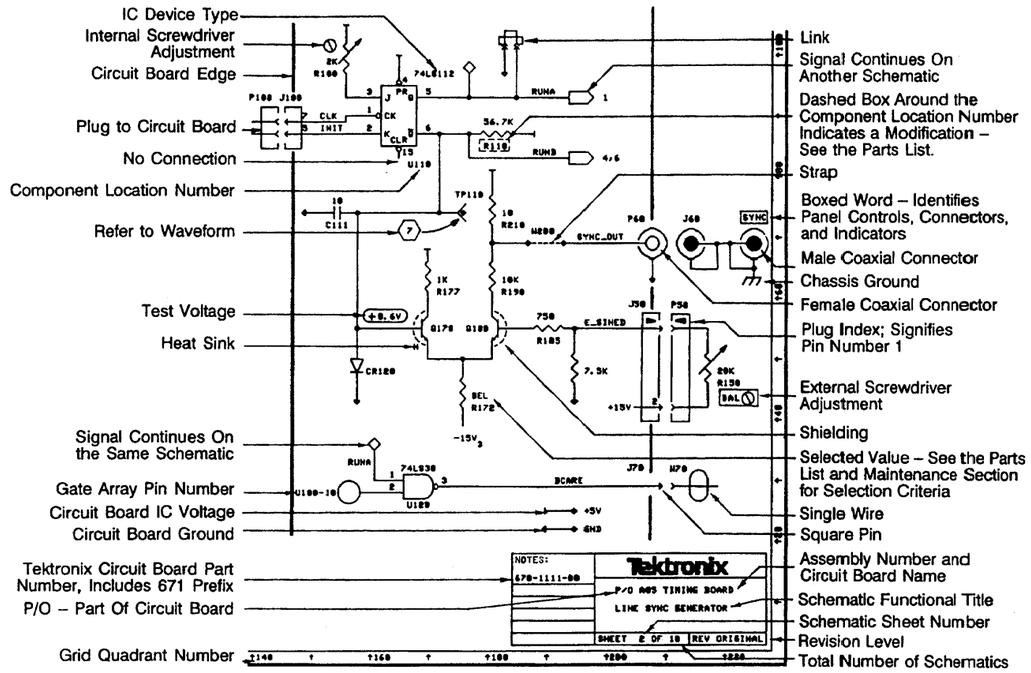
Electrical components shown on the diagram are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF)
Values less than one are in microfarads (μF)

Resistors = Ohms (Ω)

ACTIVE-LOW SIGNAL INDICTORS

A common convention used for indicating an active-low signal (a signal performing its intended function when it is in a low state) is an overbar, as shown in the signal name $\overline{\text{RESET}}$. The overbar may be used in this manual whenever a reference is given to an active-low signal. However, the same active-low signal. However, the same active-low signal is indicated on the schematic with a tilde (~), or a slash (*) following the signal name (e.g., RESET ‘ or RESET*).



The information and special symbols below may appear in this manual.

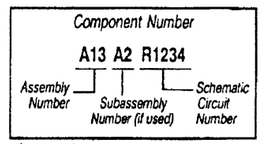
ASSEMBLY NUMBERS

Each assembly in the instrument is assigned as assembly number e.g., A5). The assembly number appears in the title of each:

- schematic diagram (lower right corner)
- circuit board component location look up table (when shown).
- schematic or circuit board component location look up table (when shown).

The Replaceable Electrical Parts list is arranged by assemblies in numerical order. The components are listed alphabetically by component location numbers. Look at the following example to see how to construct a component number.

COMPONENT NUMBER EXAMPLE

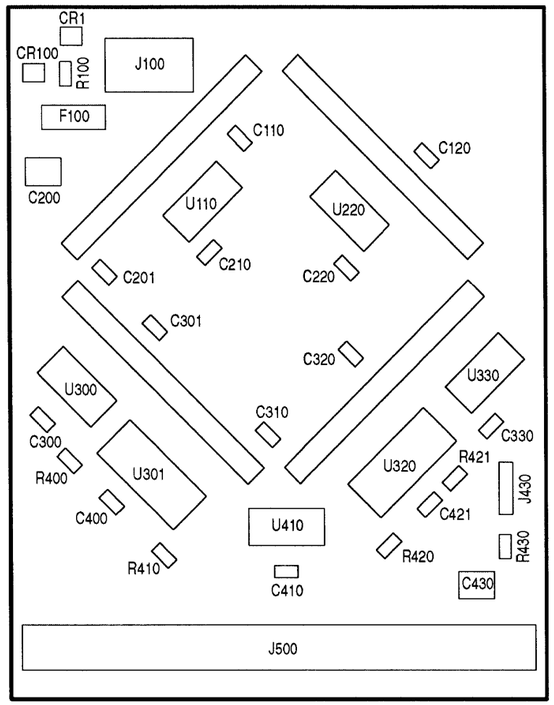


Chassis mounted components have no Assembly Number prefix – see end of Replaceable Parts List.

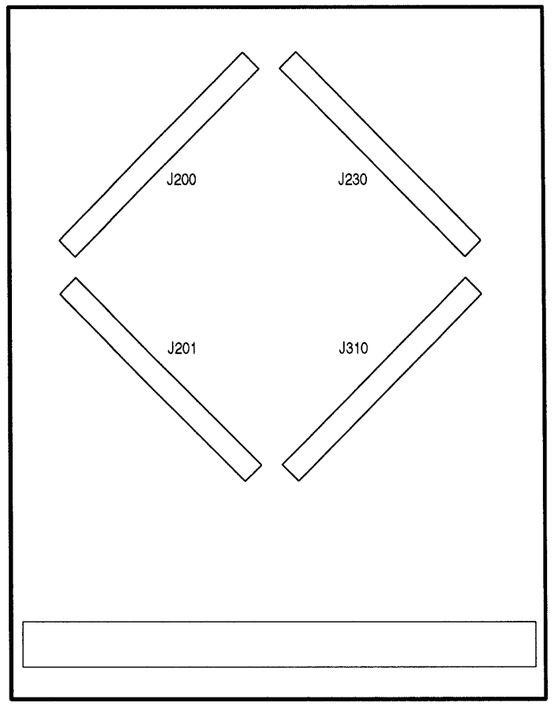
GRID COORDINATES

The schematic diagram(s) and circuit board component location illustration both have grids. A look up table (when shown) provides grid coordinates for ease of locating components. There may be two tables for each assembly: one for the circuit board component location illustration and one for the schematic diagram(s).

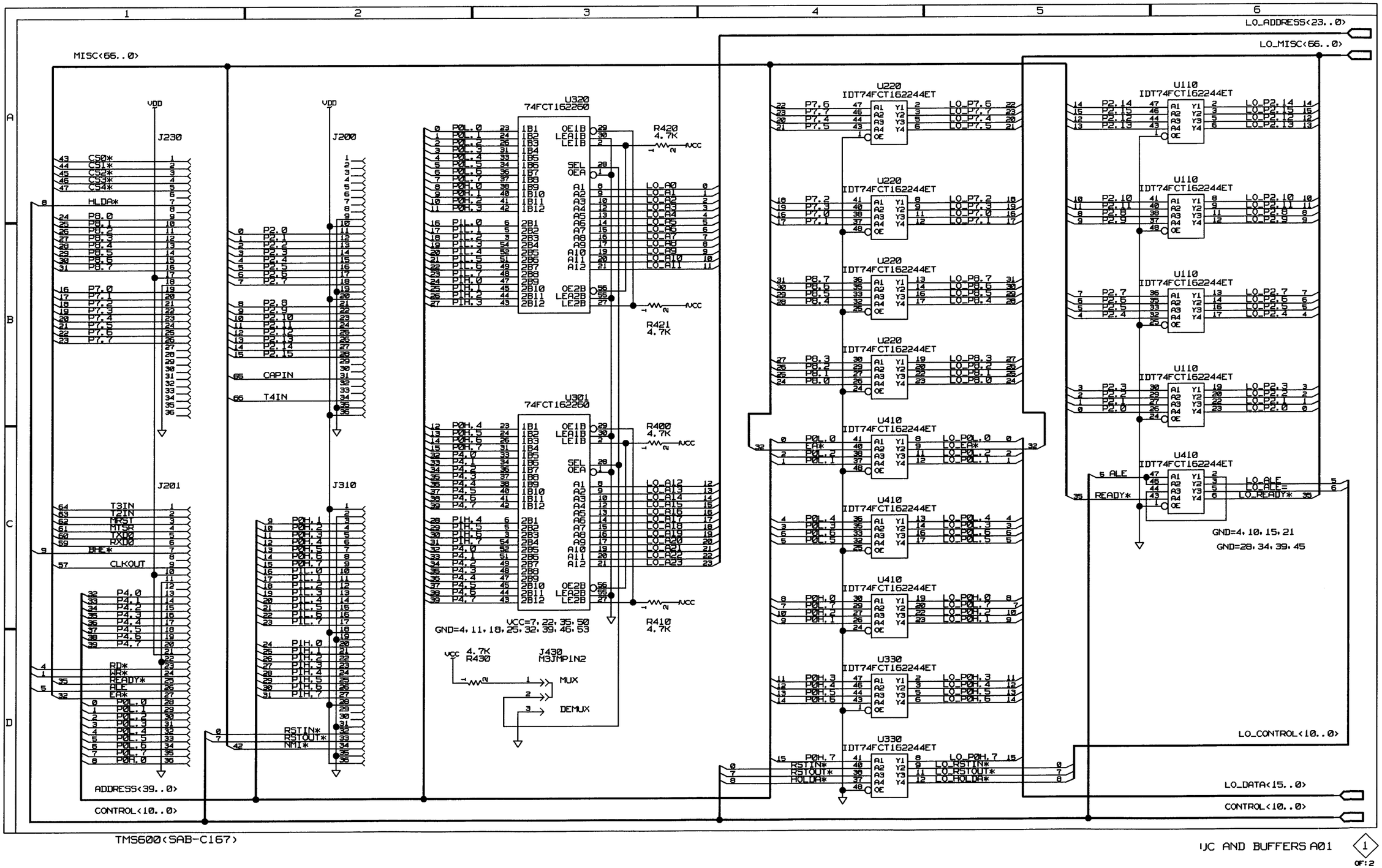
Front

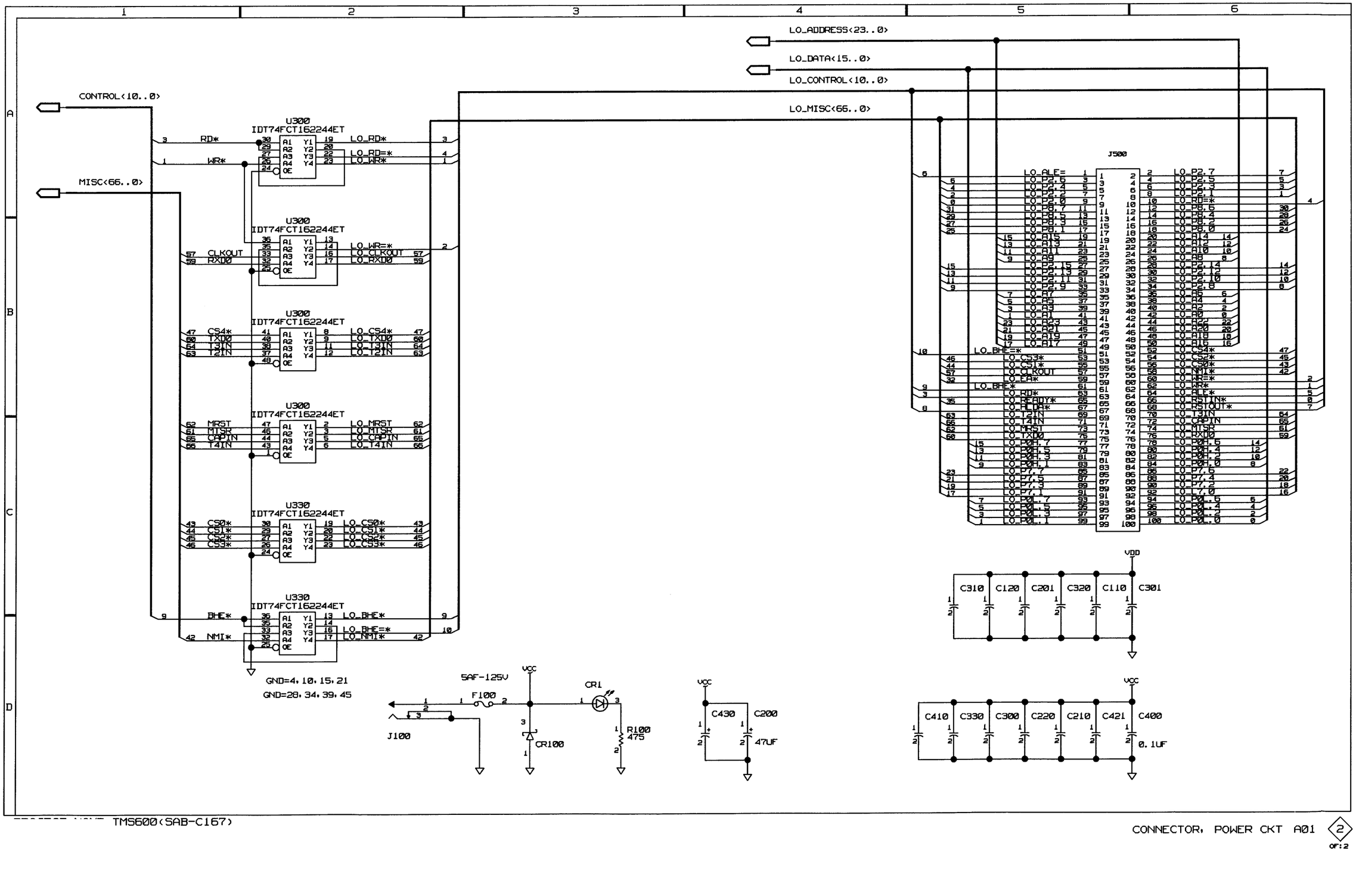


Rear



A01 SAB-C167 probe adapter board component locations


MISC<66..0>
LO_ADDRESS<23..0>
LO_MISC<66..0>
J230
J200
J201
J310
J430
M3JMP1N2
MUX
DEMUX
U320
74FCT162260
U301
74FCT162260
R420
4.7K
R421
4.7K
R400
4.7K
R410
4.7K
R430
4.7K
VCC=7, 22, 35, 50
GND=4, 11, 18, 25, 32, 39, 46, 53
U220
IDT74FCT162244ET
U110
IDT74FCT162244ET
U410
IDT74FCT162244ET
U330
IDT74FCT162244ET
GND=4, 10, 15, 21
GND=28, 34, 39, 45
ADDRESS<39..0>
CONTROL<10..0>
LO_CONTROL<10..0>
LO_DATA<15..0>
CONTROL<10..0>
TMS600<SAB-C167>
IJC AND BUFFERS A01
1
OF:2



TMS600(SAB-C167)

CONNECTOR, POWER CKT A01

Replaceable Mechanical Parts

Replaceable Mechanical Parts

This chapter contains a list of the replaceable mechanical components for the TMS 600 80C167 microcontroller support. 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.

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

Using the Replaceable Mechanical Parts List

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

Chassis Parts

Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts List.

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
14310	AULT INC	7300 BOONE AVE NORTH BROOKLINE PARK	MINNEAPOLIS, MN 55428
S3109	FELLER U.S. CORPORATION	72 VERONICA AVE UNIT #4	SOMERSET, NJ 08873
26742	METHODE ELECTRONICS INC	BACKPLAIN DIVISION 7444 WEST WILSON AVE	CHICAGO, IL 60656–4548
05276	ITT POMONA ELECTRONICS	1500 E NINTH ST	POMONA, CA 91766–3835
53387	3M COMPANY	ELECTRONICS PRODUCTS DIV 3M AUSTIN CENTER	AUSTIN, TX 78769–2963
61857	SAN–O INDUSTRIAL CORP	91–3 COLIN DRIVE	HOLBROOK, NY 11741
TK2449	SINGATRON ENTERPRISE CO LTD	13925 MAGNOLIA AVE	CHINO, CA 91710
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON, OR 97077–0001

Replaceable mechanical parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
					LOW-PROFILE PROBE ADAPTER		
1–0	010–0610–00			1	PROBE ADAPTER, SAB-C167 (80C167), SOCKETED, PROBE ADAPTER, TMS 600	80009	010–0610–00
–1	131–5947–00			1	CONN, BOX: PCB, MICRO–STRIP, FEMALE, STR, 100 POS, 0.05 CTR, W/GRD PLANE, 0.320 H X 0.125 TAIL	00779	121289–7
–2	159–0059–00			1	FUSE, WIRE LEAD: 5A, 125V (F1670)	61857	SP1–5A
–3	131–5527–00			1	JACK, POWER DC: PCB, MALE, RTANG, 2MM PIN	TK2449	DJ–005–A
–4	131–4356–00			1	CONN,SHUNT:SHUNT/SHORTING,FEMALE,1 X 2,0.1 CTR,0.63 H,BLK,W/HANDLE,JUMPER,	26742	9618–302–50
–5	131–4530–00			1	CONN, HDR: PCB, MALE, STR, 1 X 3, 0.1 CTR, 0.230 MLG X 0.120 TAIL, 30 GOLD, BD RETENTION	00779	104344–1
–6	131–5879–00			4	45002–36101: PCB, 45002–36101, FEMALE, STR, 2 X 18, 0.1 CTR, 10 GOLD	53387	929852–01–18–10
–7	103–0407–00			1	ADAPTER,QFP:ADAPTER,SAB–C167,MALE,STR,144 POS,0.65MM CTR,EIJ QFP 31.2 OVERALL LEAD SPACING,2	05276	5773
					STANDARD ACCESSORIES		
	070–9800–00			1	MANUAL, TECH: INSTRUCTION, SAB-C167, DISSASEMBLER, TMS 600	80009	070–9800–00
	070–9803–00			1	MANUAL, TECH: TLA 700 SERIES MICRO SUPPORT INSTALLATION	80009	070–9803–00
	119–5061–01			1	POWER SUPPLY: 25W, 5V 5A, CONCENTRIC 2MM, 90–265V, 47–63HZ (NOT SHOWN)	14310	SW106KA002F01
	174–3418–00			1	CA ASSY,RF:TLC,MICRO–STRIP,TLC,50 OHM,FEP,PROP DELAY 1.4NS,12.0 L,100 POS,PLUG,LATCHING BOT	00779	1–340014–0
	161–0104–00			1	CA ASSY, PWR: 3, 18 AWG, 98 L, 250V/10AMP, 98 INCH, RTANG, IEC320, RCPT X STR, NEMA 15–5P, W/CORD GRIP	S3109	ORDER BY DESCRIPTION
					OPTIONAL ACCESSORIES		
	070–9802–00			1	MANUAL, TECH: BASIC OPS MICRO SUP ON DAS/TLA 500 SERIES LOGIC ANALYZERS	80009	070–9802–00
	671–3882–00			1	CIRCUIT BD ASSY:SAB–C167, PQFP–144, 389–2371–00 WIRED,TMS600 OPT 01	80009	671–3882–00
	161–0104–06			1	CA ASSY, PWR: 3, 1.0MM SQ, 250V/10AMP, 2.5 METER, RTANG, IEC320, RCPT, EUROPEAN, SAFETY CONTROLLED (OPT A1)	S3109	ORDER BY DESCRIPTION
	161–0104–07			1	CA ASSY, PWR: 3, 1.0MM SQ, 240V/10AMP, 2.5 METER, RTANG, IEC320, RCPT X 13A, FUSED, UK PLUG, (13A FUSE), UNITED KINGDOM, SAFETY CONTROL (OPT A2)	S3109	ORDER BY DESCRIPTION
	161–0104–05			1	CA ASSY, PWR: 3, 1.0MM SQ, 250V/10AMP, 2.5 METER, RTANG, IEC320, RCPT, AUSTRALIA, SAFETY CONTROLLED (OPT A3)	S3109	ORDER BY DESCRIPTION
	161–0167–00			1	CA ASSY, PWR: 3, 0.75MM SQ, 250V/10AMP, 2.5 METER, RTANG, IEC320, RCPT, SWISS, NO CORD GRIP, SAFETY CONTROLLED (OPT A5)	S3109	ORDER BY DESCRIPTION

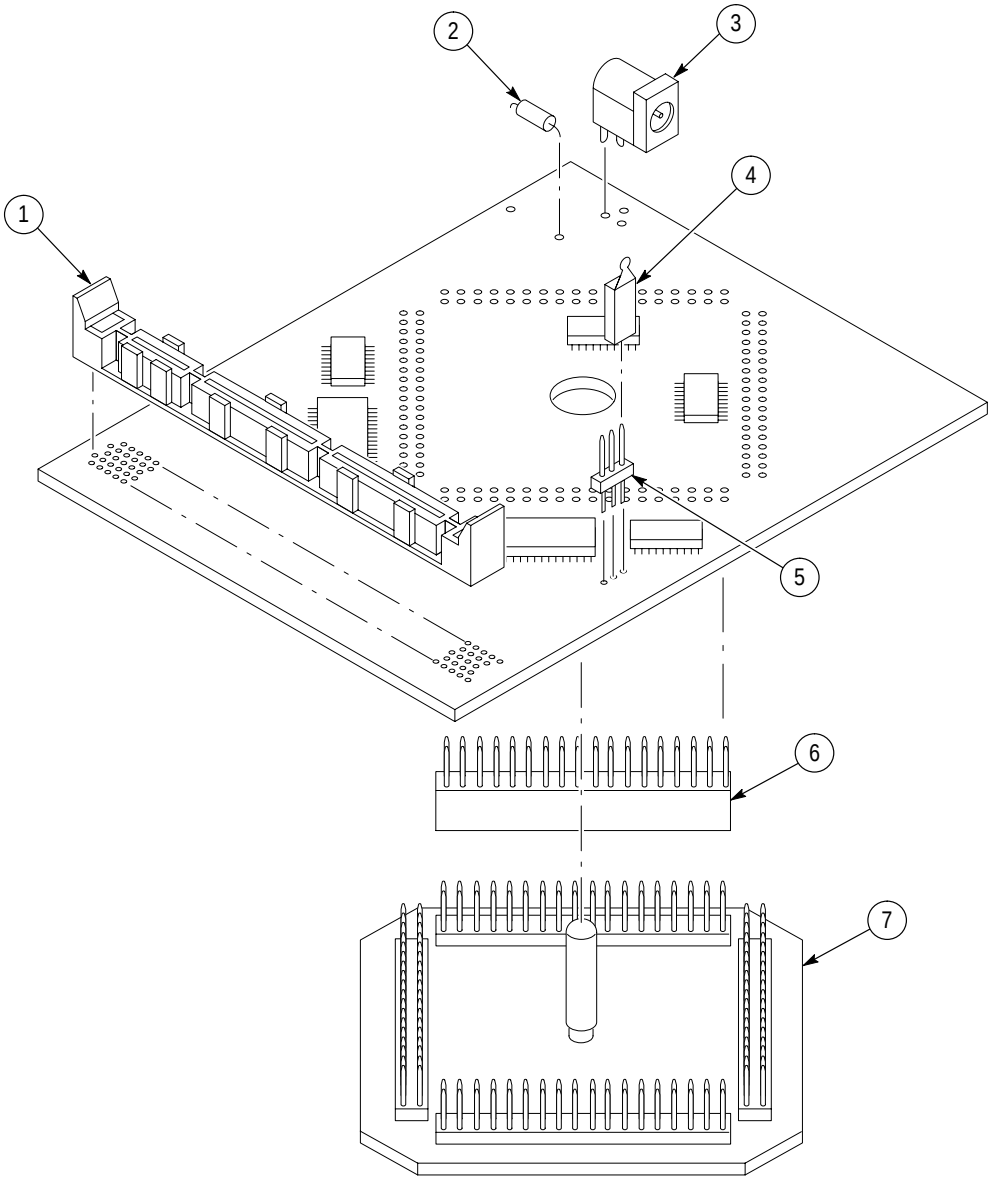


Figure 1: 80C167 probe adapter exploded view

Replaceable mechanical parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
2–1	174–3418–00			1	CA ASSY,RF:TLC,MICRO–STRIP,TLC,50 OHM	00779	1–340014–0

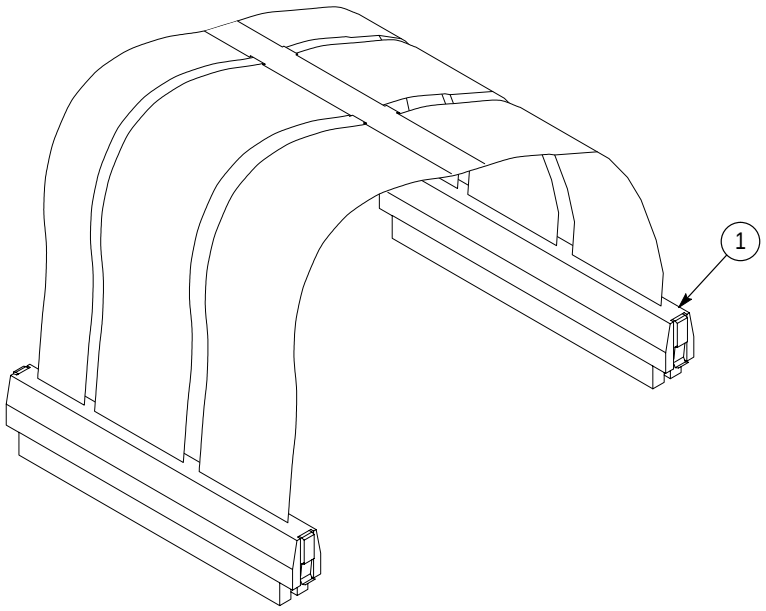


Figure 2: High density probe cable

Replaceable mechanical parts list

Fig. & index number	Tektronix part number	Serial no. effective	Serial no. discont'd	Qty	Name & description	Mfr. code	Mfr. part number
3–0	010– 0582–00			1	ADAPTER, PROBE: 192–CHANNEL, HIGH DENSITY PROBE	80009	010058200
–1	380–1095–00			1	HOUSING, HALF: UPPER, 192 CHANNEL HIGH DENSITY PROBE	80009	380109500
–2	211–0152–00			4	SCR, ASSEM WSHR: 4–40 X 0.625, PNH, BRS, NP, POZ	TK0435	ORDER BY DESC
–3	131–5947–00			2	CONN BOX: CPCB, MICRO–STRIP; FEMALE, STR,100 POS, 0.05 CTR, W/GRD PLANE, 0.320 H X 0.124 TAIL, LATCHING, 4 ROW, 0.05 PCB, STAGGER (J150, J250)	80009	131594700
–4	671–3395–00			1	CKT BD ASSY: 192–CHANNELS, HIGH DENSITY PROBE	80009	671339500
–5	380–1096–00			1	HOUSING, HALF: LOWER, 192 CHANNEL HIGH DENSITY PROBE	80009	380109600
–6	348–0070–01			2	PAD, CUSHIONING: 2.03 X 0.69 X 0.18 SI RBR	85471	ORDER BY DESC
–7	131–4917–00			8	CONN, HDR CPCB, MALE, STR, 1 X 2, 0.1 CTR, 0.235 MLF X 0.110 TAIL, 20 BOLD, TUBE, HIGH TEMP (J300, J340, J400, J440, J500, J640, J600)	53387	131491700
–8	131–5267–00			5	CONN, HDR CPCB, MALE, STR, 2 X 40.O.1 CTR, 0.234 MLG X 0.110 TAIL, 30 GOLD (J310, J320, J330, J350, J360, J370, J410, J420, J430, J450, J460, J470, J510, J520, J530, J550, J560, J570, J610, J620, J630, J650, J660, J670)	53387	131526700

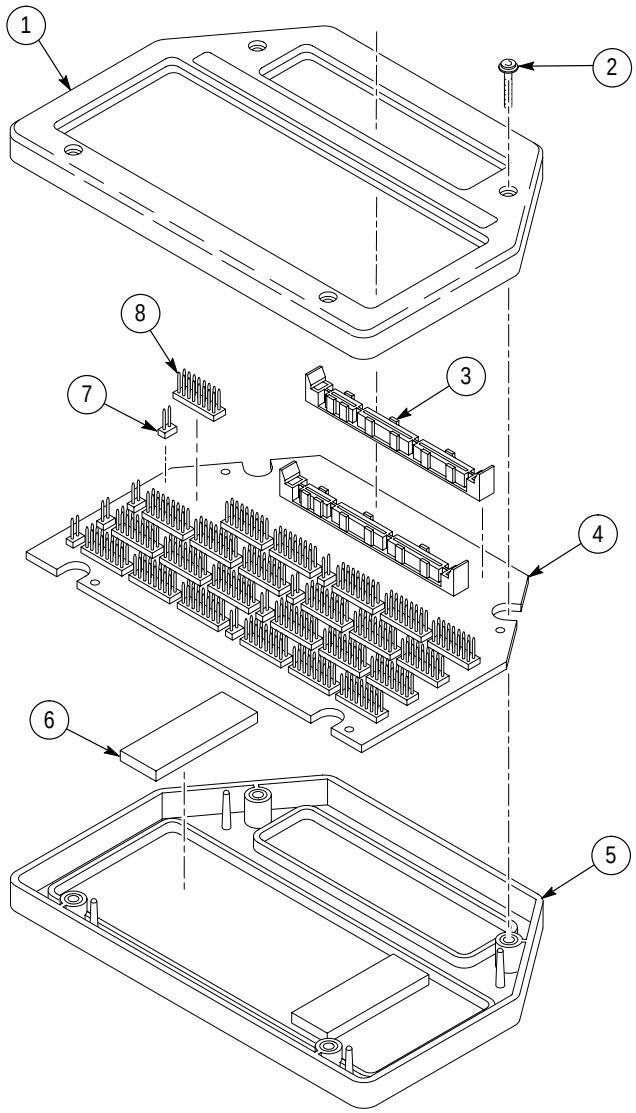


Figure 3: 192-Channel High-Density Probe exploded view

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