# Instruction Manual

Tektronix

# TMS 221
# MCF5204 Microprocessor Support

## 071-0042-01

**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.

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

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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

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

**Ground the Product.** This product is indirectly grounded through the grounding conductor of the mainframe power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

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

**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: Microprocessor Support Documentation

This instruction manual contains specific information about the TMS 221 MCF5204 microprocessor support package 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 microprocessor support packages on the logic analyzer for which the TMS 221 MCF5204 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 microprocessor support packages, 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 microprocessor support packages is included with each product. Each logic analyzer has basic information describing how to perform tasks common to support packages 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 your system under test
- Setting up the logic analyzer to acquire data
- Acquiring and viewing disassembled data

## 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 microprocessor supports user manual.
- The term “MCF5204” refers to all supported variations of the MCF5204 microprocessor unless otherwise noted.
- In the information on basic operations, the term “XXX” or “P54C” used in field selections and file names must be replaced with MCF5204. This is the name of the microprocessor in field selections and file names you must use to operate the MCF5204 support.

- The term “logic analyzer” refers to the Tektronix logic analyzer for which this product was purchased.
- The term “SUT” (system under test) refers to the microprocessor-based system from which data will be acquired.
- An asterisk (*) 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 questions about using Tektronix measurement products, call toll free in North America:<br>1-800-TEK-WIDE (1-800-835-9433 ext. 2400)<br>6:00 a.m. – 5:00 p.m. Pacific time<br><br>Or contact us by e-mail:<br>tm_app_supp@tek.com<br><br>For product support outside of North America, contact your local Tektronix distributor or sales office. |
| Service Support | Tektronix offers extended warranty and calibration programs as options on many products. Contact your local Tektronix distributor or sales office.<br><br>For a listing of worldwide service centers, visit our web site. |
| For other information | In North America:<br>1-800-TEK-WIDE (1-800-835-9433)<br>An operator will direct your call. |
| To write us | Tektronix, Inc.<br>P.O. Box 1000<br>Wilsonville, OR 97070-1000<br>USA |
| Website | Tektronix.com |

# Getting Started

# Getting Started

This chapter contains information on the TMS 221 microprocessor support, and information on connecting your logic analyzer to your system under test.

## Support Description

The TMS 221 microprocessor support package disassembles data from systems that are based on the Motorola MCF5204 microprocessor.

The TMS 221 supports the MCF5204 microprocessor in a 100-pin TQFP package.

To use this support efficiently, you need to have the items listed in the information on basic operations as well as the *MCF5204 User's Manual*, Motorola, 1995.

## Logic Analyzer Software Compatibility

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

## Logic Analyzer Configuration

For use with a TLA 700 Series the TMS 221 support requires a minimum of one 98-channel module.

For use with a DAS 9200 Series the TMS 221 support requires a minimum of one 96-channel module.

## Requirements And Restrictions

You should review the general requirements and restrictions of microprocessor supports in the information on basic operations as they pertain to your system under test.

You should 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 MCF5204 support requirements and restrictions.

**System Clock Rate.** The TMS 221 support can acquire data from the MCF5204 microprocessor at speeds of up to 33 MHz[1]; it has been tested to 25 MHz.

**Hardware Reset.** If a hardware reset occurs in your MCF5204 system during an acquisition, the disassembler may acquire an invalid sample.

**Cache Invalidation.** Correct disassembly is not guaranteed for microprocessor systems that run cache invalidations concurrent with burst cycles. Data for these cycles will not be disassembled and will be labeled as Cache Invalidation cycles.

**Disabling The Internal Cache.** To disassemble acquired data, you must disable the internal cache. Disabling the cache makes all instruction prefetches visible on the bus so they can be acquired and disassembled.

**Big-Endian Byte Ordering.** The disassembler always uses Big-Endian byte ordering for instruction disassembly. Big-Endian byte ordering is when the most significant data byte is located at the highest address.

**Data Reads And Writes.** The disassembler will not link data reads and writes with the instructions which cause them.

## Configuring The Probe Adapter

**Configuring The Chip Select Module Switch.** The probe adapter has a DIP switch that must be set according to the chip select module configuration of the MCF5204. Use Table 1–1 to configure the chip select DIP switch. By default all switches are off.

**Table 1–1: DIP switch settings**

| Switch | Description |
|---|---|
| S1 | CS0* |
| S2 | CS1* |
| S3 | CS2* |
| S4 | CS3* |
| S5 | CS4* |
| S6 | CS5* |

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

**Table 1–1: DIP switch settings (cont.)**

| Switch | Description |
|---|---|
| S7 | Not used |
| S8 | Not used |

**Examples Of Switch Settings.** The following example shows two possible settings:

Please note: S1 is closest to the S100 silk screen, and the ON position is the position closest to the edge of the probe adapter.

- Example 1

  If CS0*, CS3* and CS5* are configured for zero wait state, and CS1*, CS2* and CS4* are configured for non-zero wait state, the DIP switch settings would be:

  S1 – ON (CS0*)
  S2 – OFF (CS1*)
  S3 – OFF (CS2*)
  S4 – ON (CS3*)
  S5 – OFF (CS4*)
  S6 – ON (CS5*)
  S7 – Not used
  S8 – Not used

- Example 2

  If CS0* is configured for asynchronous transfer mode, CS1* and CS2* are configured with 3-wait states, CS3* is configured for zero wait state, and CS4* and CS5* are not used, the DIP switch settings would be:

  S1 – OFF (CS0*)
  S2 – OFF (CS1*)
  S3 – OFF (CS2*)
  S4 – ON (CS3*)
  S5 – OFF (CS4*)
  S6 – OFF (CS5*)
  S7 – Not used
  S8 – Not used

## Connecting To A System Under Test With A Probe Adapter

To connect the logic analyzer to a SUT (system under test) using the probe adapter and test clip, 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 microprocessor, 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 microprocessor and probe adapter.*

2. To discharge your stored static electricity, touch the ground connector located on the logic analyzer.

### Connect The Test Clip To The Probe Adapter

To connect the test clip to the probe adapter follow these steps:

3. Line up pin 1 on the test clip, to pin 1 on the connector located on the bottom of the probe adapter circuit board, as shown in Figure 1–1.

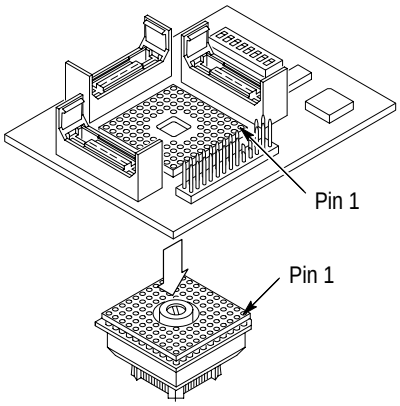



**Figure 1–1: Connecting the test clip to the probe adapter**

### Connect The P6434 Probes To The Probe Adapter

To connect the P6434 probes to the probe adapter follow these steps:

***CAUTION.*** *Incorrect handling of the P6434 probe while connecting it to the probe adapter can result in damage to the probe or to the mating connector on the probe adapter. To avoid damaging the probe and probe adapter, always position the probe perpendicular to the mating connector and gently connect the probe.*

4. Refer to Figure 1–2, and connect the P6434 probes to the probe adapter. Match the channel groups and numbers on the probe labels to the corresponding connectors on the probe adapter.
5. Position the probe tip perpendicular to the mating connector and gently connect the probe as shown in Figure 1–2.
6. When connected, push down the latch releases on the probe to set the latch.

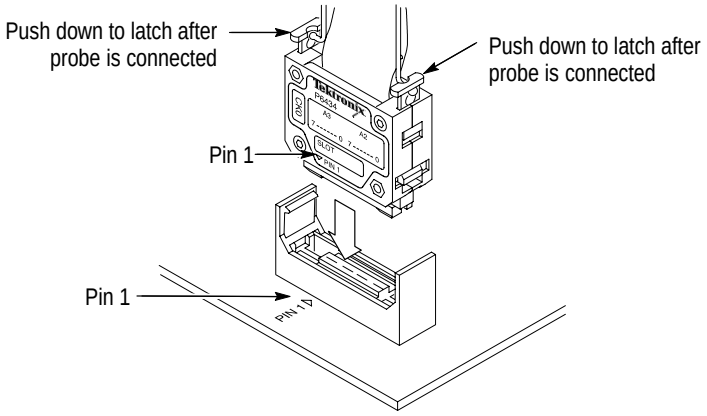



**Figure 1–2: Connecting P6434 probes to the probe adapter**

### Connect The Probe Adapter Assembly To The System Under Test

To connect the probe adapter assembly (probe adapter and test clip) to your SUT follow these instructions:

7. Inspect the microprocessor on you SUT for bent or broken leads. Verify that the leads on the microprocessor are clean and free from dirt, dust, or any foreign material.
8. Inspect the pins of the test clip for bent or broken contacts. Verify that the leads on the test clip are clean and free from dirt, dust or any foreign material.
9. Verify that the locking devise on the test clip is not locked by turning the locking device counter-clockwise with a small screwdriver .

**10.** Place the probe adapter onto the SUT as shown in Figure 1–3.

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

*Center the clip on the microprocessor and apply an equal downward force on all four sides of the clip. It is important to keep the TQFP test clip parallel to the microprocessor to avoid damage to the SUT or TQFP test clip.*

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

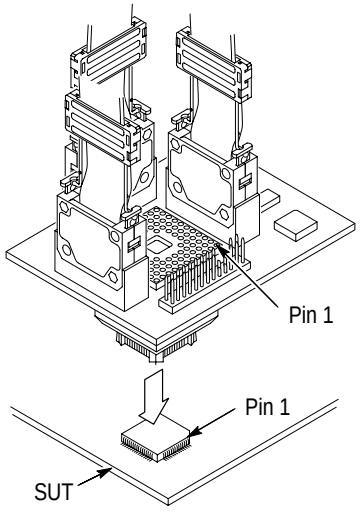



**Figure 1–3: Placing the probe adapter onto the SUT**

**11.** Lock the test clip to the microprocessor by turning the locking knob clockwise with a small screwdriver.

***CAUTION.*** *The test clip was designed to be used on one and only one microprocessor. Because of the tight tolerances required for QFP test clip connectivity, the test clip that attaches to the microprocessor has a soft plastic collar that conforms to the unique shape of the target microprocessor.*

*To avoid faulty and unreliable connections, it is HIGHLY recommended that the test clip IS NOT used on any other microprocessor then the one it was originally connected to.*

***CAUTION.*** *The probe adapter board might slip off or slip to one side of the microprocessor because of the extra weight of the probes. This can damage the microprocessor and the SUT.*

*To prevent this from occurring, stabilize the probe adapter by placing a non-conductive object (such as non-conductive foam) between the probe adapter and the SUT.*

### Removing The Probe Adapter From The SUT

To remove the probe adapter from the sut follow these steps:

1. Unlock the test clip from the microprocessor by turning the locking knob counter-clockwise with a small screwdriver.
2. Gently lift and pull the probe adapter off of the microprocessor.

## Connecting To A System Under Test Without A Probe Adapter

You can use the channel and clock probes and leadsets with a commercial test clip (or adapter) to make connections between the logic analyzer and your SUT. To connect probes to MCF5204 signals in 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 microprocessor, 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 microprocessor.*

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. Table 1–2 through Table 1–8 lists the channel probes the MCF5204 signal pins on the test clip or in the SUT to connect to.

   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.
4. Align pin 1 or A1 of your test clip with the corresponding pin 1 or A1 of the MCF5204 microprocessor in your SUT and attach the clip.

## Channel Assignments

The following channel assignment tables show the probe section and channel assignments, and the signal to which each channel connects.

Channel assignments shown in Table 1–2 through Table 1–8 use the following conventions:

- All signals are required by the support unless indicated otherwise.
- 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 noted.
- An asterisk (*) following a signal name indicates an active low signal.
- An equals sign (=) following a signal name indicates that it is double probed.

By default, the Address group is displayed in hexadecimal.

**Table 1–2: Address group channel assignments**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 31 | A3:7 | NC |
| 30 | A3:6 | NC |
| 29 | A3:5 | NC |
| 28 | A3:4 | NC |
| 27 | A3:3 | NC |
| 26 | A3:2 | NC |
| 25 | A3:1 | NC |
| 24 | A3:0 | NC |
| 23 | A2:7 | NC |
| 22 | A2:6 | NC |
| 21 | A2:5 | A21/PP1 |
| 20 | A2:4 | A20/PP0 |
| 19 | A2:3 | A19 |
| 18 | A2:2 | A18 |
| 17 | A2:1 | A17 |
| 16 | A2:0 | A16 |

**Table 1–2: Address group channel assignments (cont.)**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 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 |
| 4 | A0:4 | A4 |
| 3 | A0:3 | A3 |
| 2 | A0:2 | A2 |
| 1 | A0:1 | A1 |
| 0 | A0:0 | A0 |

By default, the Data group is displayed in hexadecimal.

**Table 1–3: Data group channel assignments**

| Bit order | Section:channel | MCF5204 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 |

**Table 1–3: Data group channel assignments (cont.)**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 1 | D0:1 | D1 |
| 0 | D0:0 | D0 |

By default, the Control group is displayed symbolically. The symbol table file name is 5204_Ctrl.

**Table 1–4: Control group channel assignments**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 2 | C2:3 | RESET* |
| 1 | C2:1 | RE* |
| 0 | C2:2 | WE* |

By default, the Chip Select (Chip_Sel) group is displayed in binary. The symbol table file name is 5204_CS.

**Table 1–5: Chip Select group channel assignments**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 5 | C3:7 | CS5* |
| 4 | C3:6 | CS4* |
| 3 | C3:5 | CS3* |
| 2 | C3:4 | CS2* |
| 1 | C3:3 | CS1* |
| 0 | C3:2 | CS0* |

By default, the Intr group is not visible.

**Table 1–6: Intr group channel assignments**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 3 | C1:7 | IRQ3* † |
| 2 | C1:6 | IRQ2* † |
| 1 | C1:5 | IRQ1* † |
| 0 | C1:4 | IRQ0 † |

† **Signal not required for disassembly.**

By default, the Misc group is not visible.

**Table 1–7: Misc group channel assignments**

| Bit order | Section:channel | MCF5204 signal name |
|---|---|---|
| 4 | C3:1 | CLK |
| 3 | C3:0 | ATS* † |
| 2 | C2:0 | DTACK* |
| 1 | C2:7 | UWE*/UDS* † |
| 0 | C2:6 | LWE*/LDS* † |

† **Signal not required for disassembly.**

Table 1–8 lists the probe section and channel assignments for the clock probes. The clock probes are not part of any group.

**Table 1–8: Clock channel assignments**

| Section:channel | MCF5204 signal name |
|---|---|
| CK:0 | CLK = |
| CK:1 | ZERO* |
| CK:2 | A0 = |
| CK:3 | A1 = |

Table 1–9 lists the pinout of J320, the Background Debug Mode (BDM) connector.

**Table 1–9: BDM connector pinout**

| MCF5204 signal name | BDM connector pin number |
|---|---|
| NC (Developer Reserved) | 1 |
| BKPT* | 2 |
| GND | 3 |
| DSCLK | 4 |
| GND | 5 |
| NC (Developer Reserved) | 6 |
| RESET* | 7 |
| DSI | 8 |
| VCC (+5V) § | 9 |
| DSO | 10 |

**Table 1–9: BDM connector pinout**

| MCF5204 signal name | BDM connector pin number |
|---|---|
| GND | 11 |
| PST3 | 12 |
| PST2 | 13 |
| PST1 | 14 |
| PST0 | 15 |
| DDATA3 | 16 |
| DDATA2 | 17 |
| DDATA1 | 18 |
| DDATA0 | 19 |
| GND | 20 |
| NC (Motorola reserved) | 21 |
| NC (Motorola reserved) | 22 |
| GND | 23 |
| CLK_CPU ‡ | 24 |
| Vcc_CPU § | 25 |
| NC | 26 |

‡ **Connected to CLK on the microprocessor.**

§ **Connected to Vcc on the probe adapter.**

## CPU To Mictor Connections

To probe the microprocessor you will need to make connections between the CPU and the Mictor pins of the P6434 Mass Termination Probe. Refer to the P6434 Mass Termination Probe manual, Tektronix part number 070-9793-xx, for more information on mechanical specifications. Table 1–10 through Table 1–12 show the CPU pin to Mictor pin connections.

Tektronix uses a counter-clockwise pin assignment. Pin-1 is located at the top left, and pin-2 is located directly below it. Pin-20 is located on the bottom right, and pin-21 is located directly above it.

AMP uses an odd side-even side pin assignment. Pin-1 is located at the top left, and pin-3 is located directly below it. Pin-2 is located on the top right, and pin-4 is located directly below it.

***NOTE.*** *When designing Mictor connectors into your SUT, always follow the Tektronix pin assignment.*

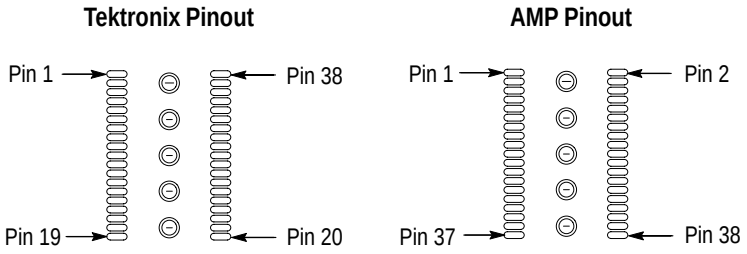



**Figure 1–4: Pin assignments for a Mictor connector (component side)**

Please pay close attention to the caution below.

***CAUTION.*** *To protect the CPU and the inputs of the module, it is recommended that a 180Ω resistor is connected in series between each ball pad of the CPU and each pin of the Mictor connector. The resistor must be no farther away from the ball pad of the CPU than 1/2-inch.*

**Table 1–10: CPU to Mictor connections for Mictor A pins**

| Tektronix Mictor A pin number | AMP Mictor A pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 1 | 1 | NC | NC | NC |
| 2 | 3 | NC | NC | NC |
| 3 | 5 | CLOCK:0 | CLK= | 87 |
| 4 | 7 | A3:7 | Not Used | Not Used |
| 5 | 9 | A3:6 | Not Used | Not Used |
| 6 | 11 | A3:5 | Not Used | Not Used |
| 7 | 13 | A3:4 | Not Used | Not Used |
| 8 | 15 | A3:3 | Not Used | Not Used |
| 9 | 17 | A3:2 | Not Used | Not Used |
| 10 | 19 | A3:1 | Not Used | Not Used |
| 11 | 21 | A3:0 | Not Used | Not Used |
| 12 | 23 | A2:7 | Not Used | Not Used |
| 13 | 25 | A2:6 | Not Used | Not Used |
| 14 | 27 | A2:5 | A21 | 28 |

**Table 1–10: CPU to Mictor connections for Mictor A pins (cont.)**

| Tektronix Mictor A pin number | AMP Mictor A pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 15 | 29 | A2:4 | A20 | 27 |
| 16 | 31 | A2:3 | A19 | 26 |
| 17 | 33 | A2:2 | A18 | 25 |
| 18 | 35 | A2:1 | A17 | 22 |
| 19 | 37 | A2:0 | A16 | 21 |
| 20 | 38 | A0:0 | A0 | 99 |
| 21 | 36 | A0:1 | A1 | 100 |
| 22 | 34 | A0:2 | A2 | 1 |
| 23 | 32 | A0:3 | A3 | 4 |
| 24 | 30 | A0:4 | A4 | 5 |
| 25 | 28 | A0:5 | A5 | 6 |
| 26 | 26 | A0:6 | A6 | 7 |
| 27 | 24 | A0:7 | A7 | 8 |
| 28 | 22 | A1:0 | A8 | 11 |
| 29 | 20 | A1:1 | A9 | 12 |
| 30 | 18 | A1:2 | A10 | 13 |
| 31 | 16 | A1:3 | A11 | 14 |
| 32 | 14 | A1:4 | A12 | 15 |
| 33 | 12 | A1:5 | A13 | 18 |
| 34 | 10 | A1:6 | A14 | 19 |
| 35 | 8 | A1:7 | A15 | 20 |
| 36 | 6 | CLOCK:1 | Not Used | § |
| 37 | 4 | NC | NC | NC |
| 38 | 2 | NC | NC | NC |
| 39 | 39 | GND | GND | GND |
| 40 | 40 | GND | GND | GND |
| 41 | 41 | GND | GND | GND |
| 42 | 42 | GND | GND | GND |
| 43 | 43 | GND | GND | GND |

**= Double probe**

**Table 1–11: CPU to Mictor connections for Mictor C pins**

| Tektronix-Mictor C pin number | AMP Mictor C pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 1 | 1 | NC | NC | NC |
| 2 | 3 | NC | NC | NC |
| 3 | 5 | CLOCK:3 | A1= | 100 |
| 4 | 7 | C3:7 | CS5* | 92 |
| 5 | 9 | C3:6 | CS4* | 91 |
| 6 | 11 | C3:5 | CS3* | 90 |
| 7 | 13 | C3:4 | CS2* | 36 |
| 8 | 15 | C3:3 | CS1* | 35 |
| 9 | 17 | C3:2 | CS0* | 34 |
| 10 | 19 | C3:1 | CLK | 87 |
| 11 | 21 | C3:0 | ATS* | 50 |
| 12 | 23 | C2:7 | UWE*/UDS* | 43 |
| 13 | 25 | C2:6 | LWE*/LDS* | 44 |
| 14 | 27 | C2:5 | TIN/PP2 | 32 |
| 15 | 29 | C2:4 | TOUT/PP3 | 33 |
| 16 | 31 | C2:3 | RESET* | 77 |
| 17 | 33 | C2:2 | WE* | 29 |
| 18 | 35 | C2:1 | RE* | 47 |
| 19 | 37 | C2:0 | DTACK* | 51 |
| 20 | 38 | C0:0 | Not Used | Not Used |
| 21 | 36 | C0:1 | Not Used | Not Used |
| 22 | 34 | C0:2 | MTMOD3 | 89 |
| 23 | 32 | C0:3 | TCLK | 76 |
| 24 | 30 | C0:4 | DSCLK/TRST | 86 |
| 25 | 28 | C0:5 | DSI/TDI | 85 |
| 26 | 26 | C0:6 | DSO/TDO | 84 |
| 27 | 24 | C0:7 | BKPT*/TMS | 88 |
| 28 | 22 | C1:0 | TXD/PP4 | 41 |
| 29 | 20 | C1:1 | RXD/PP5 | 42 |
| 30 | 18 | C1:2 | CTS*/PP6 | 48 |
| 31 | 16 | C1:3 | RTS*/PP7 | 49 |
| 32 | 14 | C1:4 | IRQ0* | 37 |
| 33 | 12 | C1:5 | IRQ1* | 38 |
| 34 | 10 | C1:6 | IRQ2* | 39 |
| 35 | 8 | C1:7 | IRQ3* | 40 |

**Table 1–11: CPU to Mictor connections for Mictor C pins (cont.)**

| Tektronix-Mictor C pin number | AMP Mictor C pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 36 | 6 | NC | NC | GND |
| 37 | 4 | NC | NC | NC |
| 38 | 2 | NC | NC | NC |
| 39 | 39 | GND | GND | GND |
| 40 | 40 | GND | GND | GND |
| 41 | 41 | GND | GND | GND |
| 42 | 42 | GND | GND | GND |
| 43 | 43 | GND | GND | GND |

**= Double probe**

**Table 1–12: CPU to Mictor connections for Mictor D pins**

| Tektronix Mictor D pin number | AMP Mictor D pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 1 | 1 | NC | NC | NC |
| 2 | 3 | NC | NC | NC |
| 3 | 5 | NC | NC | NC |
| 4 | 7 | D3:7 | PST3 | 83 |
| 5 | 9 | D3:6 | PST2 | 82 |
| 6 | 11 | D3:5 | PST1 | 79 |
| 7 | 13 | D3:4 | PST0 | 78 |
| 8 | 15 | D3:3 | DDATA3 | 98 |
| 9 | 17 | D3:2 | DDATA2 | 97 |
| 10 | 19 | D3:1 | DDATA1 | 94 |
| 11 | 21 | D3:0 | DDATA0 | 93 |
| 12 | 23 | D2:7 | Not Used | Not Used |
| 13 | 25 | D2:6 | Not Used | Not Used |
| 14 | 27 | D2:5 | Not Used | Not Used |
| 15 | 29 | D2:4 | Not Used | Not Used |
| 16 | 31 | D2:3 | Not Used | Not Used |
| 17 | 33 | D2:2 | Not Used | Not Used |
| 18 | 35 | D2:1 | Not Used | Not Used |
| 19 | 37 | D2:0 | Not Used | Not Used |

**Table 1–12: CPU to Mictor connections for Mictor D pins (cont.)**

| Tektronix Mictor D pin number | AMP Mictor D pin number | LA channel | MCF5204 signal name | MCF5204 pin number |
|---|---|---|---|---|
| 20 | 38 | D0:0 | D0 | 75 |
| 21 | 36 | D0:1 | D1 | 72 |
| 22 | 34 | D0:2 | D2 | 71 |
| 23 | 32 | D0:3 | D3 | 70 |
| 24 | 30 | D0:4 | D4 | 69 |
| 25 | 28 | D0:5 | D5 | 68 |
| 26 | 26 | D0:6 | D6 | 65 |
| 27 | 24 | D0:7 | D7 | 64 |
| 28 | 22 | D1:0 | D8 | 63 |
| 29 | 20 | D1:1 | D9 | 62 |
| 30 | 18 | D1:2 | D10 | 61 |
| 31 | 16 | D1:3 | D11 | 58 |
| 32 | 14 | D1:4 | D12 | 57 |
| 33 | 12 | D1:5 | D13 | 56 |
| 34 | 10 | D1:6 | D14 | 55 |
| 35 | 8 | D1:7 | D15 | 54 |
| 36 | 6 | CLOCK:2 | A0= | 99 |
| 37 | 4 | NC | NC | NC |
| 38 | 2 | NC | NC | NC |
| 39 | 39 | GND | GND | GND |
| 40 | 40 | GND | GND | GND |
| 41 | 41 | GND | GND | GND |
| 42 | 42 | GND | GND | GND |
| 43 | 43 | GND | GND | GND |

**= Double probe**

# Operating Basics

# Setting Up the Support

The information in this section is specific to the operations and functions of the TMS 221 MCF5204 support on any Tektronix logic analyzer for which it can be purchased.

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 Groups

The software automatically defines channel groups for the support. The channel groups for the MCF5204 support are Address, Data, Control, Chip Select, Intr., and Misc. If you want to know which signal is in which group, refer to the channel assignment tables beginning on page 1–8.

## How Data Is Acquired

This part of the chapter explains how the module acquires MCF5204 signals using the TMS 221 software. This part also provides additional information on extra probe channels available for you to use for additional connections.

## Clocking Options

The TMS 221 support offers a microprocessor-specific clocking mode for the MCF5204 microprocessor. This clocking mode is the default selection whenever you load the MCF5204 support.

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.

## Custom Clocking

A special clocking program is loaded to the module every time you load the TMS 221 support. This special clocking is called custom symbols.

The TMS 221 support custom clocking machine has eleven states and is developed around the following five basic states:

START, WAIT, BURST, EXT_TRN, and WRITE

The asserted ATS* signal is identified as a valid bus cycle start. Because ATS* can be disabled by programming IRQ0* signal during the RESET cycle, ATS* is not used in this CSM, and a workaround method is adopted.

Instead of the ATS* signal, signals RE* and WE* are used to initiate CSM activity. All valid bus cycles except BURST mode can be acquired with this workaround.

In the MCF5204 microprocessor BURST cycles can occur on any access where the size of the memory operand is greater then the port size. Bursting can only occur on a READ access with internal termination on any address of BURST mode supported memory.

In BURST cycle the RE* signal is asserted for the entire bus cycle so it can not be used in burst beat acquisition. The change in the lower two bits of the address lines are used to acquire valid burst beats. Address lines A1 (for WORD PORT) and A0 (for BYTE PORT) are used as qualifiers along with DTACK* (External/Internal termination identification), RE*, WE*, and ZERO* (to identify ZERO wait state bus cycles – derived on the probe adapter). WAIT and BURST states are duplicated to handle all possible burst beat combination.

In all of the following states, the login groups acquired are listed in parentheses (xx). A description of each of the TMS 221 supports five basic states follow:

**START.** Assertion of RE* or WE* signals will activate the CSM. If it is a write cycle the CSM enters WRITE STATE, and if it is a non-zero wait state (external or internal) read cycle enters WAIT00 (AC) state. The CSM enters the EXT_TRN (AC) state if the microprocessor encounters a DTACK* signal. If the microprocessor is in zero wait state internal termination read cycle mode, it will acquire address, data and control signals, and do a master and then wait for the next bus cycle.

**WAIT (00, 01, 10, 11).** If the MCF5204 microprocessor is in burst/wait, or wait state with burst, then CSM enters the WAIT state. If DTACK* is active the microprocessor enters the EXT_TRN state. If DTACK* is inactive and RE* is active with no change in A0= and A1=, then the microprocessor is in wait state, and continues to be in wait state (D). If there are changes in A1= and A0= while RE* is asserted, it indicates that the microprocessor is in BURST and enters one of the

BURST (BURST00, BURST01, BURST10, BURST11) states (M). If DTACK* is inactive along with RE* upon disassertion the microprocessor completes the read bus cycle and returns to the START state (M).

In the MCF5204 there is no external signal on the bus to indicate a Zero Wait State cycle. A signal ZERO* is derived on the probe adapter with the help of CS[5-0]* signals, and used as a qualifier. This signal is valid when any one of the memory region is configured for ZERO Wait state operation.

The address space of the MCF5204 must be configured in any one of the six possible chip select signals CS[5-0]*. All these signals are logically ORed with a PAL chip. Use the DIP switch on the probe adapter to select the particular chip select for the memory region that is configured for Zero Wait state.

**EXT_TRN.** If DTACK* is active in START or WAIT states, the CSM enters this state. If RE* is active then valid data is acquired and retained in the same state until RE* is disasserted (D). If RE* is disasserted then the read bus cycle is complete, and the CSM goes back to the start state (M).

**WRITE.** Assertion of the WE* signal in the START state enters this state. If WE* is active, then data is acquired and retained in the same state until WE* is disasserted (D). If WE* is disasserted then the write bus cycle is complete and the CSM goes back to the start state (M).

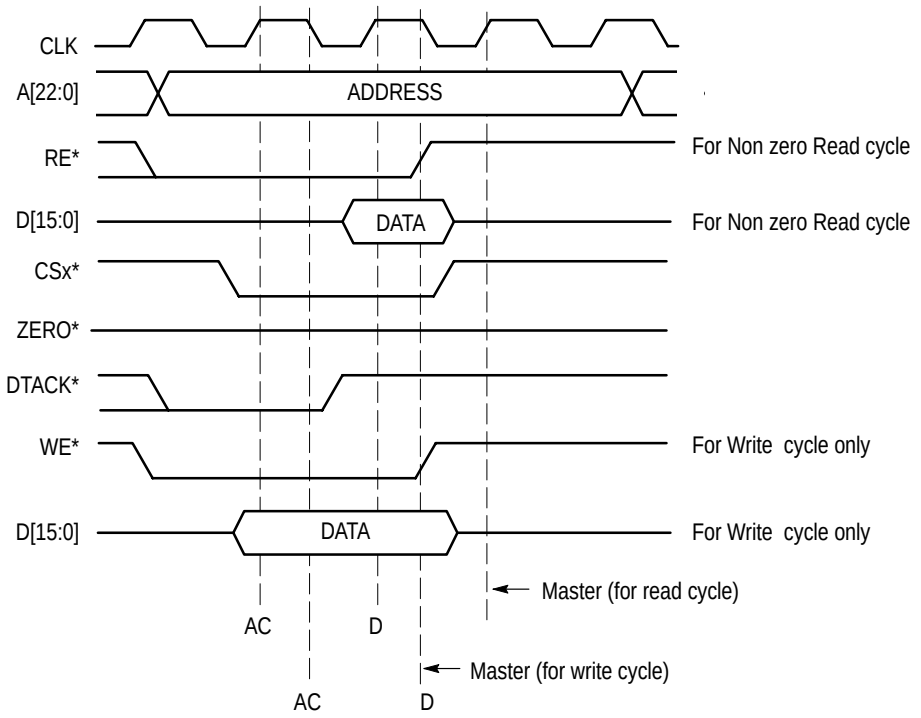



**Figure 2–1: MCF5204** Read/Write bus timing with external terminination and one wait state

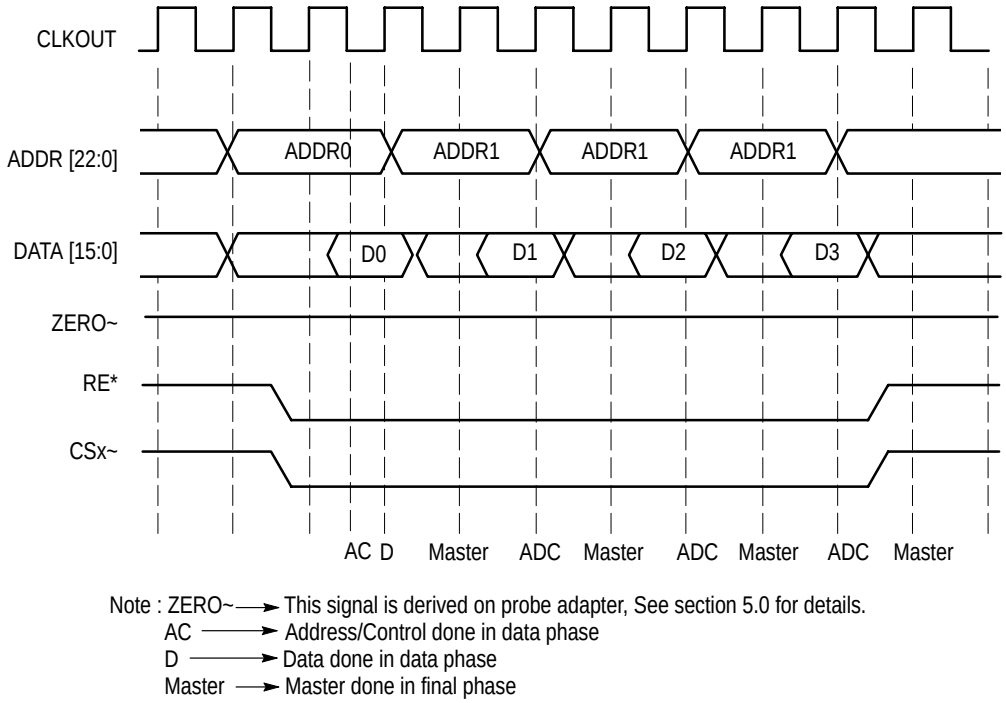



**Figure 2–2: MCF5204** Burst cycle bus timing with one wait state

## Symbols

The TMS 221 support supplies symbol table files. Each file replaces specific channel group values with symbolic values when Symbolic is the radix for the channel group.

Symbol tables are generally not for use in timing or MCF5204_T support disassembly.

Table 2–1 lists the name and bit pattern for the symbols in the file 5204_Ctrl, the Control channel group symbol table.

**Table 2–1: Control group symbol table definitions**

| | Control group value |
|---|---|
| Symbol | RESET* WE* RE* |
| RESET CYCLE | 0 1 1 |
| READ/FETCH | 1 1 0 |

**Table 2–1: Control group symbol table definitions (cont.)**

| Symbol | Control group value<br>RESET* WE* RE* |
|---|---|
| DATA_WRITE | 1 0 1 |
| INVALID | 1 1 1 |

Table 2–2 lists the name and bit pattern for the symbols in the file 5204_CS, the Chip Select channel group symbol table.

**Table 2–2: Chip Select group symbol table definitions**

| Symbol | Control group value<br>CS5* CS4* CS3* CS2* CS1* CS0* |
|---|---|
| CHIP SELECT–5 REGION | 0 X X X X X |
| CHIP SELECT–4 REGION | 1 0 X X X X |
| CHIP SELECT–3 REGION | 1 1 0 X X X |
| CHIP SELECT–2 REGION | 1 1 1 0 X X |
| CHIP SELECT–1 REGION | 1 1 1 1 0 X |
| CHIP SELECT–0 REGION | 1 1 1 1 1 0 |
| INVALID CHIP SELECT REGION | 1 1 1 1 1 1 |

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

## Acquiring Data

Once you load the MCF5204 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 2–10.*

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 2–3 shows these special characters and strings, and gives a description of what they represent.

**Table 2–3: Meaning of special characters in the display**

| Character or string displayed | | Description |
|---|---|---|
| >><br>m | On the TLA 700<br>On the DAS 9200 | 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 2–4 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 2–4: Cycle type definitions**

| Cycle type | Definition |
|---|---|
| ( DATA READ ) | Read cycle |
| ( DATA WRITE ) | Write cycle |
| ( UNKNOWN ) | The combination of control bits is unexpected and/or unrecognized |
| ( RESET STATE ) | If RESET* signal is low it indicates a RESET state |
| ( ALL CHIP SELECTS DISABLED ) | This will be displayed if all chip select regions are high example: CS5*–CS0* = 111111 |
| ( CACHE BURST FILL ) § | Data burst fill to cache |
| ( EXTENSION ) § | This cycle is an extension to a preceding instruction cycle |
| ( FLUSH ) § | The cycle was fetched but not executed |

§ **Computed cycle types.**

Figure 2–3 shows an example of the Hardware display.

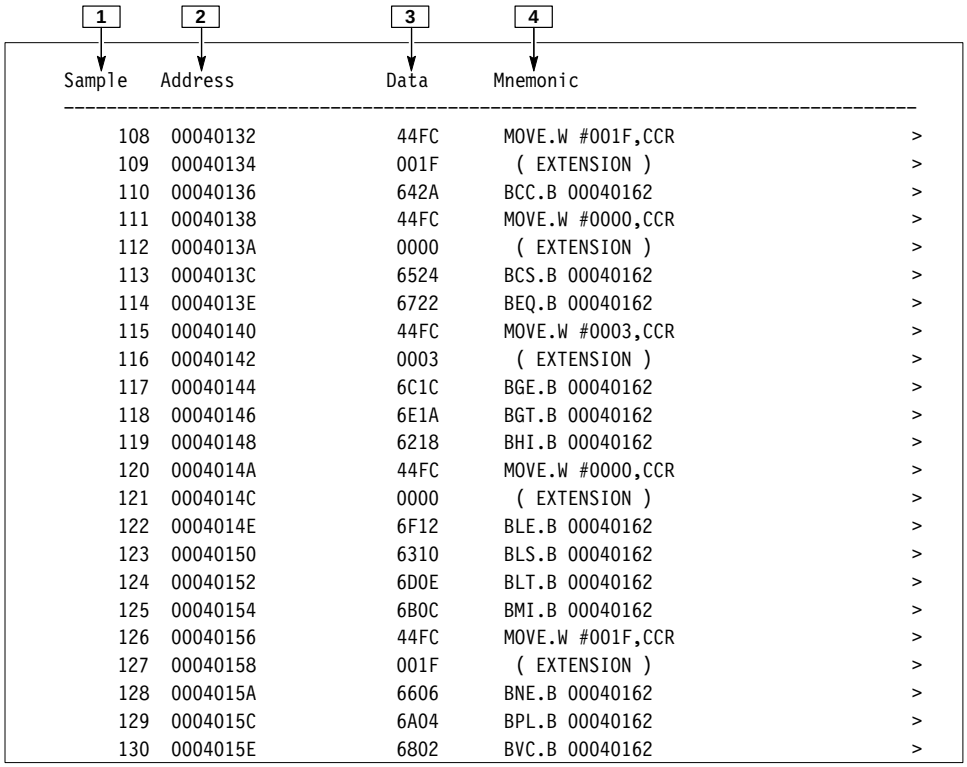



**Figure 2–3: Hardware display format**

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

2 **Address Group.** Lists data from channels connected to the MCF5204 address bus.

3 **Data Group.** Lists data from channels connected to the MCF5204 data bus.

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

### Software Display Format

The Software display format shows only the first fetch of executed instructions. 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 shows only the first fetch of instructions that change the flow of control, branches are not taken and are not displayed.

Instructions that unconditionally generate a change in the flow of control in the MCF5204 microprocessor are:

| | | |
|---|---|---|
| BRA | JSR | STOP |
| BSR | RTE | TRAP |
| JMP | RTS | HALT |

Instructions that conditionally generate a change in the flow of control in the MCF5204 microprocessor are:

Bcc

### 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 unconditionally generate a subroutine call or a return in the MCF5204 microprocessor are:

| | | | |
|---|---|---|---|
| BSR | RTE | STOP | HALT |
| JSR | RTS | TRAP | |

### Signals On The Probe Adapter But Not Acquired

The following signals are present on the probe adapter, but not acquired by the disassembler software:

| | | |
|---|---|---|
| TCLK | HIZ/PST0 | MTMOD3 |

If you would like to view these signals, an alternate probing method must be used.

## 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 MCF5204 support to do the following tasks:

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

## 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.

The MCF5204 microprocessor support product has these additional fields:

**Vector Base Register.** You can specify the starting address of the vector base register in hexadecimal. The default starting address is 0x00000000.

**CS5* Base Address.** Enter the base address of chip select region 5 in this 32-bit field. The default value is 0x00000000.

**CS4* Base Address.** Enter the base address of chip select region 4 in this 32-bit field. The default value is 0x00000000.

**CS3* Base Address.** Enter the base address of chip select region 3 in this 32-bit field. The default value is 0x00000000.

**CS2* Base Address.** Enter the base address of chip select region 2 in this 32-bit field. The default value is 0x00000000.

**CS1* Base Address.** Enter the base address of chip select region 1 in this 32-bit field. The default value is 0x00000000.

**CS0* Base Address.** Enter the base address of chip select region 0 in this 32-bit field. The default value is 0x00000000.

**Burst Mode (CS5*–CS0*).** The burst configuration of the chip select regions are selected from the list provided. The list box consists of all of the possible burst configurations. Each selection is made up of a 6-character string composed of "B's" for burst mode, and "N's" for Non-burst mode. The most significant bit signifies the status of chip select region 5, while the least significant bit signifies the status of chip select region 0, as shown in Examples 2-1 through 2-3.

| | |
|---|---|
| B | Burst mode |
| N | Non-burst mode |

Default value: NNNNNN

Example 2-1:

BNBNNB

Chip select regions: 5, 3, and 0, are burst mode
Chip select regions: 4, 2, and 1, are non-burst mode

Example 2-2:

BBBBBB

Chip select regions: 5, 4, 3, 2, 1, and 0, are burst mode

Example 2-3:

NNNNNN

Chip select regions: 5, 4, 3, 2, 1, and 0, are non-burst mode

**Port Size.** The port size configuration is selected from the list provided. The list box consists of all the possible burst configurations. Each selection is made up of a 6-character string composed of "B's" for byte, and "W's" for word. Byte is a 8-bit port, while word is 16-bit, as shown in Examples 2-4 through 2-6.

| | |
|---|---|
| B | 8-bit byte size port |
| W | 16-bit word size port |

Default value: WWWWWW

Example 2-4:

BWWWBW

Region 5, and 1, are 8-bit byte size, and the rest are 16-bit word size.

Example 2-5:

WBWBWB

Regions 5, 3, and 1, are 16-bit word size
Regions 4, 2, and 0, are 8-bit byte size

Example 2-6:

WWWWWW

All regions are 16-bit word size

***NOTE.*** *If overlapping address ranges are programmed into the chip select registers, only one chip select will be asserted. The chip select registers are prioritized from CS5* to CS0*, with CS5* receiving the highest priority.*

*This convention is different from previous Motorola products.*

## 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 – The first word of an instruction
- Extension – A subsequent word of an instruction
- Flush – An opcode or extension that is fetched but not executed
- Data Read – Mark cycle as a Data Read cycle
- Undo Mark – Remove all marks from the current sequence

## Displaying Exception Vectors

The disassembler can display exception vectors.

You can relocate the table by entering the starting address in the Vector Base Register field. The Vector Base Register field provides the disassembler with the offset address. Enter an eight-digit hexadecimal value corresponding to the offset of the base address of the exception table. The Vector Table Size field lets you specify a three-digit hexadecimal size for the table.

These fields are located in the Disassembly property page (Disassembly Format Definition overlay).

Table 2–5 lists the MCF5204 exception vectors.

**Table 2–5: Exception vectors**

| Exception number | Location in table (in hexadecimal) | Displayed exception name |
|---|---|---|
| 0 | 000 | ( INITIAL STACK POINTER ) |
| 1 | 004 | ( INITIAL PROGRAM COUNTER ) |
| 2 | 008 | ( ACCESS ERROR VECTOR ) |
| 3 | 00C | ( ADDRESS ERROR VECTOR ) |
| 4 | 010 | ( ILLEGAL INSTRUCTION VECTOR ) |
| 5 | 014 | ( RESERVED VECTOR #14H ) |
| 6 | 018 | ( RESERVED VECTOR #18H ) |
| 7 | 01C | ( RESERVED VECTOR #1CH ) |
| 8 | 020 | ( PRIV VIOLATION VECTOR ) |
| 9 | 024 | ( TRACE VECTOR ) |
| 10 | 028 | ( UNIMPLEMENTED LINE-A OPCODE ) |
| 11 | 02C | ( UNIMPLEMENTED LINE-F OPCODE ) |
| 12 | 030 | ( DEBUG INTERRUPT VECTOR ) |
| 13 | 034 | ( RESERVED VECTOR #34H ) |
| 14 | 038 | ( FORMAT ERROR VECTOR ) |
| 15 | 03C | ( UNINIT INTERRUPT VECTOR ) |
| 16-23 | 040-05C | ( RESERVED VECTOR #40H  #5CH ) |

**Table 2–5: Exception vectors (cont.)**

| Exception number | Location in table (in hexadecimal) | Displayed exception name |
|---|---|---|
| 24 | 060 | ( SPURIOUS INTERRUPT VECTOR ) |
| 25-31 | 064-07C | ( ILP 1-7 AUTOVECTOR ) |
| 32-47 | 080-08C | ( TRAP #0t-#15t VECTOR ) |
| 48-63 | 0C0-0FC | ( RESERVED VECTOR #C0-#FC ) |
| 64-255 | 100-3FC | ( USER INT VECTOR #64t-#255t ) |

# Specifications

# Specifications

## Specification Tables

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.

Figure 3–1 shows the dimensions of the probe adapter. Figure 3–2 shows the dimensions of the test clip.

**Table 3–1: Electrical specifications**

| Characteristics | Requirements | |
|---|---|---|
| SUT DC power requirements | | |
| Voltage | 4.75–5.25 VDC | |
| Current | $I_{max}$ 131.5 mA<br>$I_{typ}$ 87 mA | |
| SUT clock rate | | |
| Maximum specified clock rate | 33 MHz | |
| Tested clock rate | 25 MHz | |
| Minimum setup time required | | |
| TLA 700 | 2.5 ns | |
| DAS 9200 | 5 ns | |
| Minimum hold time required | | |
| TLA 700 | 0 ns | |
| DAS 9200 | 0 ns | |
| Typical signal loading | | |
| TLA 700 MICTOR load (ML) § | 20 KΩ in parallel with 2 pF | |
| TLA 700 podlet load (CL) § | 20 KΩ in parallel with 2 pF | |
| DAS 9200 MICTOR load (ML) | 100 KΩ in parallel with 12 pF | |
| DAS 9200 podlet load (CL) | 100 KΩ in parallel with 10 pF | |
| **Characteristics** | **Specification** | |
| Measured typical SUT signal loading | **AC load** | **DC load** |
| UWE*/UDS*, LWE*/LDS*, TIN/PP2, TOUT/PP3 | 14 pF + 1 ML § | 1 ML |
| PST0, PST1, PST2, PST3 | 20 pF + 1 ML | 1 ML |
| DDATA0, DDATA1, DDATA2, DDATA3 | 20 pF + 1 CL § | 1 ML + 1 CL |

**Table 3–1: Electrical specifications (cont.)**

| Characteristics | Requirements | |
|---|---|---|
| CLK | 24 pF + 1 ML | 1 ML |
| A[1–0] | 10 pF + 2 ML | 2 ML |
| CS0*, CS1*, CS2*, CS3*, CS4*, CS5* | 20 pF + 1 ML | 1 ML + 1 20V8 PAL |
| A[21–2] | 10 pF + 1 ML | 1 ML |
| D[15–0] | 8 pF + 1 ML | 1 ML |
| IRQ[3–0]* | 14 pF + 1 ML | 1 ML |
| RESET* | 13 pF + 1 ML | 1 ML |
| RE*, WE*, CTS*/PP6, RXD/PP5, | 10 pF + 1 ML | 1 ML |
| DTACK*, TXD/PP4 | 5 pF + 1 ML | 1 ML |
| ATS*, RTS*/PP7, | 15 pF + 1 ML | 1 ML |
| BKPT*/TMS | 24 pF + 1 ML | 1 ML |
| DSO/TDO, DSI/TDI, DSCLK/TRST, TCLK, MTMOD | 20 pF + 1 ML | 1 ML |

§ **ML is Mictor load, CL is clock load.**

**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 MCF5204 microprocessor thermal considerations. Forced air cooling might be required across the CPU.**

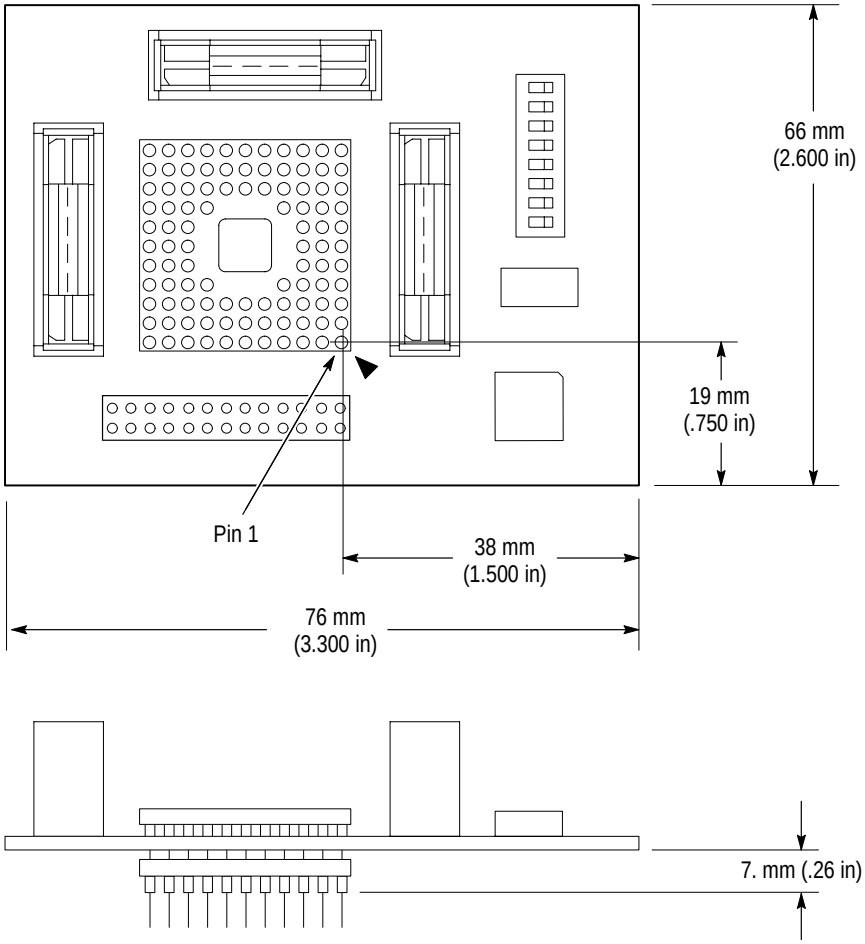



**Figure 3–1: Dimensions of the probe adapter**

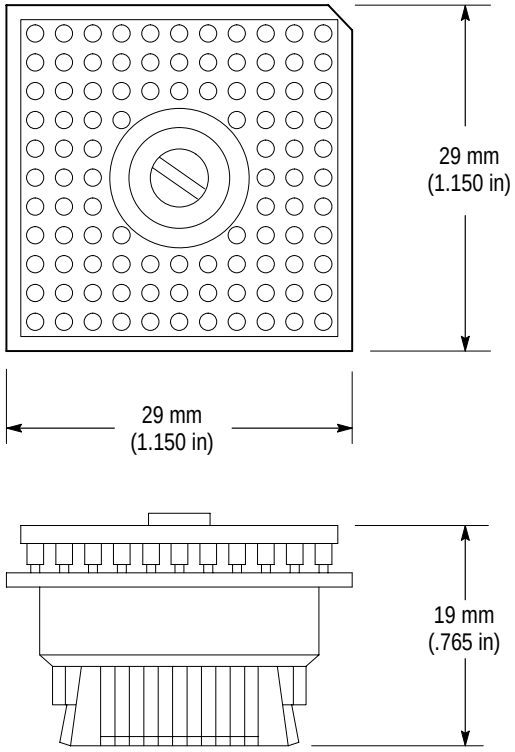



**Figure 3–2: Dimensions of the test clip**

***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

## Probe Adapter Description

The probe adapter is nonintrusive hardware that allows the logic analyzer to acquire data from a microprocessor in its own operating environment with little or no effect 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 circuit board and a socket for a MCF5204 microprocessor. The probe adapter connects to the microprocessor in the SUT. Signals from the microprocessor-based system flow from the probe adapter to the channel groups and through the probe signal leads to the module.

The probe adapter accommodates the Motorola MCF5204 microprocessor in a 100-pin TQFP package.

In the MCF5204 there is no external signal on the bus to indicate a Zero Wait State cycle. A signal ZERO* is derived on the probe adapter with the help of CS[5-0]* signals, and used as a qualifier. This signal is valid when any one of the memory region is configured for ZERO Wait state operation.

The address space of the MCF5204 must be configured in any one of the six possible chip select signals CS[5-0]*. All these signals are logically ORed with a PAL chip. Use the DIP switch on the probe adapter to select the particular chip select for the memory region that is configured for Zero Wait state.

## Replacing Signal Leads

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

# Replaceable Electrical Parts

# Replaceable Electrical Parts

This chapter contains a list of the replaceable electrical components for the TMS 221 MCF5204 microprocessor 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.

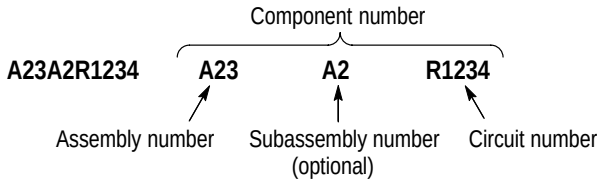
**Parts list column descriptions**

| 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).<br><br>The electrical parts list is arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts).<br><br>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<br>PO BOX 3608 | HARRISBURG, PA 17105–3608 |
| 05276 | ITT POMONA ELECTRONICS | 1500 E NINTH ST | POMONA, CA 91766–3835 |
| 09353 | C & K COMPONENTS CORP | 15 RIVERDALE AVENUE | NEWTON, MA 02158 |
| 60381 | PRECISION INTERCONNECT CORP. | 16640 SW 72ND AVE | PORTLAND, OR 97224 |
| 63058 | BERG ELECTRONICS INC. | MCKENZIE SOCKET DIV<br>910 PAGE AVE | FREMONT, CA 94538–7340 |
| 80009 | TEKTRONIX INC | 14150 SW KARL BRAUN DR<br>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 |
|---|---|---|---|---|---|---|
| – | 105–1089–00 | | | LATCH ASSY:LATCH HOUSING ASSY,VERTICAL MOUNT,0.48 H X 1.24 L,W/PCB SINGLE CLIP,P6434 | 60381 | 105–1089–00 |
| – | 131–5267–00 | | | CONN,HDR:PCB,MALE,STR,2 X 40,0.1 CTR,0.235 MLG X 0.110 TAIL,30GOLD, HIGH TEMP, | 00779 | 104326–4 |
| – | 131–6134–01 | | | CONN,RCPT:SMD,MICTOR,PCB,STR,38 POS,FEMALE,0.025 CTR,0.240 H,W/0.108 PCB HOLD DOWNS.PALLAD | 00779 | 767054–1 |
| – | 136–1317–00 | | | SOCKET,PGA:PCB,FEMALE,STR,100 POS,11 X 11,0.1 CTR,0.0.173 H X 0.273 TAIL,G/G,OPEN CENTER,L | 63058 | PGA100H115B1–1149 F |
| – | 260–5000–00 | | | SWITCH,SLIDE:SPST,DIP8 POSITION,GOLD OVER NICKEL,3A,2PF,SEALED,90HBW08S,44MM T&R | 09353 | LD08HOSK1 |
| – | 389–2489–00 | | | CICRUIT BOARD:TQFP–100,SOLDERED,TMS221 OPT 11, | 01KV9 | 389–2489–00 |
| – | 671–4253–00 | | | CKT BRD ASSY:MCF5204,TQFP–100,SOLDERED,679–4253–00 TESTED,389–2489–00 WIRED,TMS221 11 | 80009 | 671–4253–00 |

# Diagrams and Circuit Board Illustrations

This section contains the troubleshooting procedures, block diagrams, circuit board illustrations, component locator tables, waveform illustrations, and schematic diagrams.

## Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975. Abbreviations are based on ANSI Y1.1-1972.

Logic symbology is based on ANSI/IEEE Standard 91-1984 in terms of positive logic. Logic symbols depict the logic function performed and can differ from the manufacturer's data.

The tilde (~) preceding a signal name indicates that the signal performs its intended function when in the low state.

Other standards used in the preparation of diagrams by Tektronix, Inc., include the following:

- Tektronix Standard 062-2476 Symbols and Practices for Schematic Drafting
- ANSI Y14.159-1971 Interconnection Diagrams
- ANSI Y32.16-1975 Reference Designations for Electronic Equipment
- MIL-HDBK-63038-1A Military Standard Technical Manual Writing Handbook

## Component Values

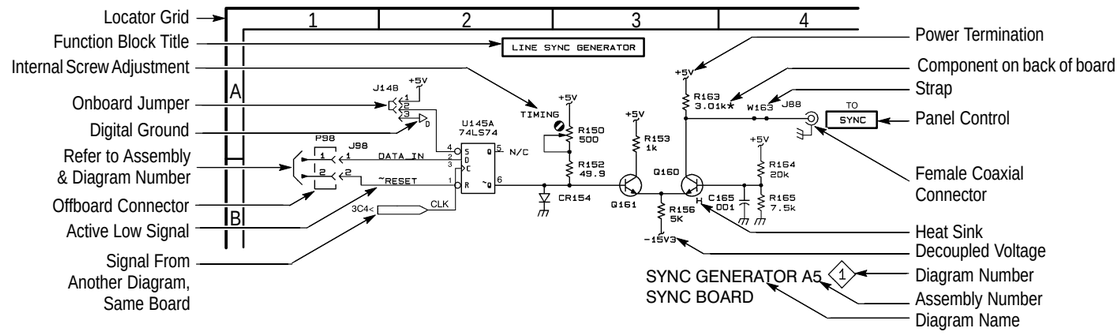
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

Resistors: Values are in Ohms (Ω).

## Graphic Items and Special Symbols Used in This Manual

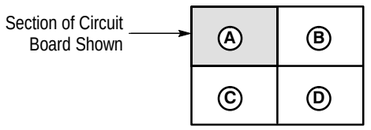
Each assembly in the instrument is assigned an assembly number (for example A5). The assembly number appears in the title on the diagram, in the lookup table for the schematic diagram, and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assembly in numerical sequence; the components are listed by component number.

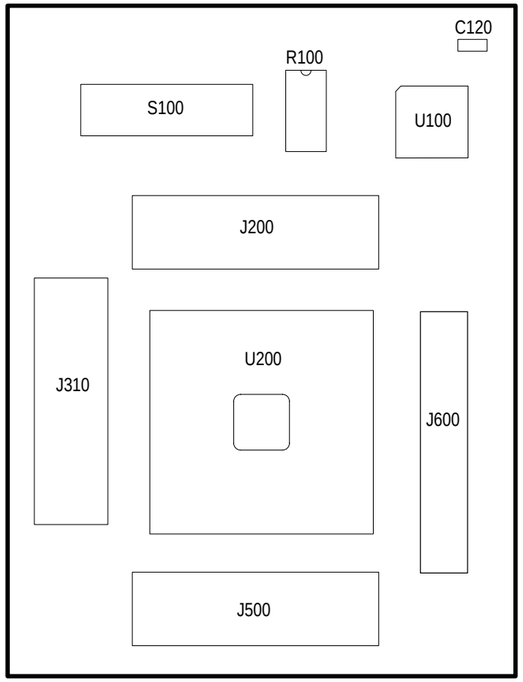


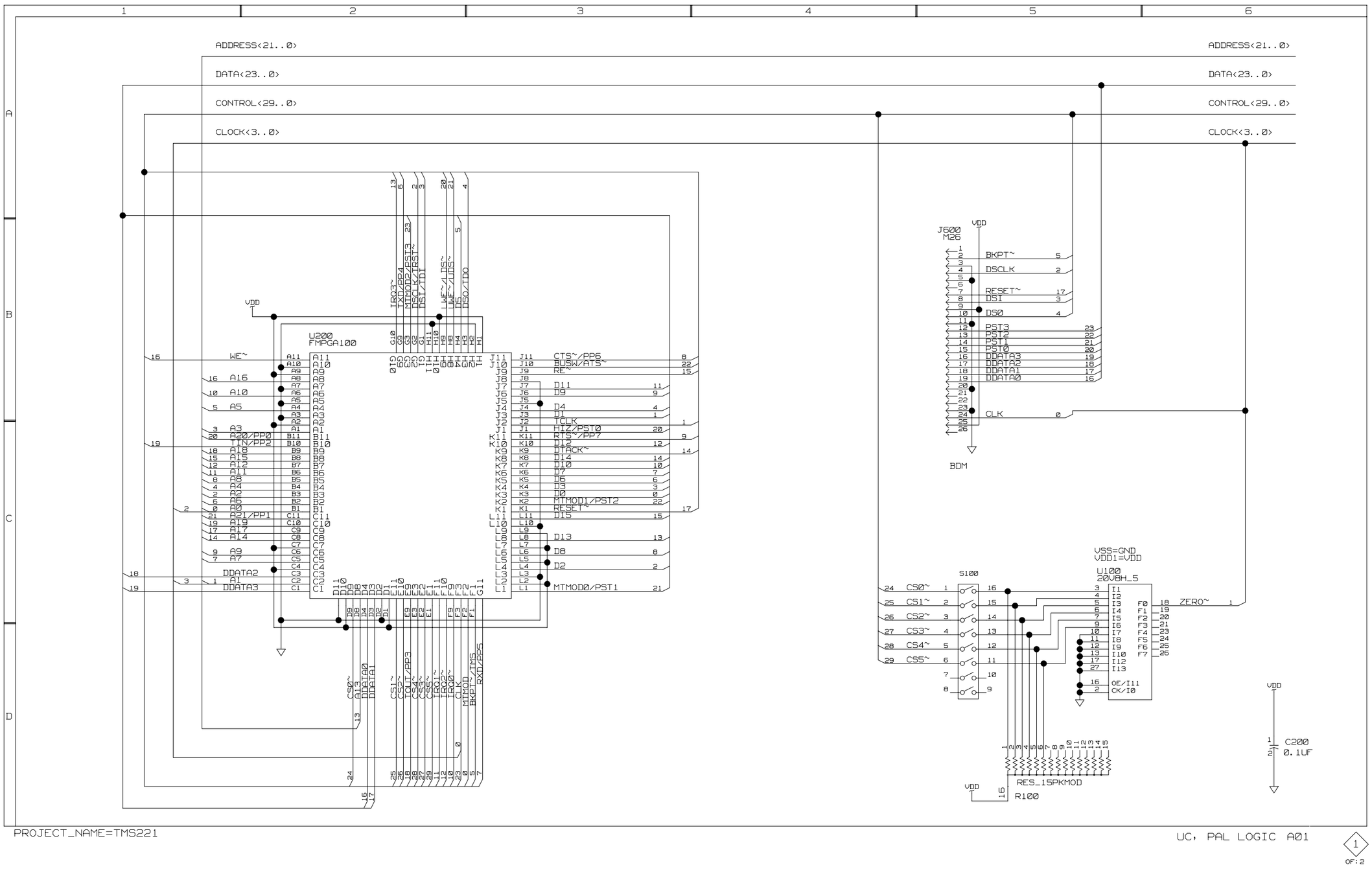

## Component Locator Diagrams

The schematic diagram and circuit board component location illustrations have grids marked on them. The component lookup tables refer to these grids to help you locate a component. The circuit board illustration appears only once; its lookup table lists the diagram number of all diagrams on which the circuitry appears.

Some of the circuit board component location illustrations are expanded and divided into several parts to make it easier for you to locate small components. To determine which part of the whole locator diagram you are looking at, refer to the small locator key shown below. The gray block, within the larger circuit board outline, shows where that part fits in the whole locator diagram. Each part in the key is labeled with an identifying letter that appears in the figure titles under component locator diagrams.




C120
R100
S100
U100
J200
J310
U200
J600
J500




PROJECT_NAME=TMS221

UC, PAL LOGIC A01

1

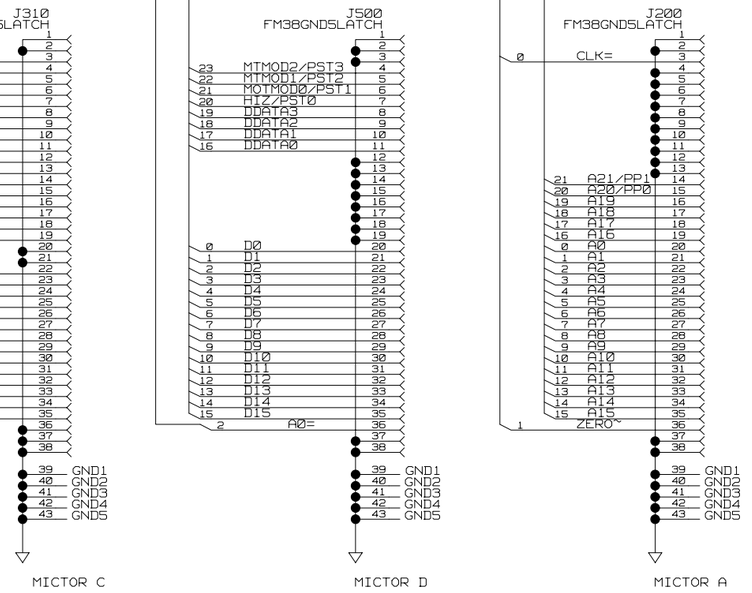
OF:2

ADDRESS<21..0>

DATA<23..0>

CONTROL<29..0>

CLOCK<3..0>




PROJECT_NAME=TMS220;11

MICTOR CONNECTORS A01

2
OF:2

# Replaceable Mechanical Parts

# Replaceable Mechanical Parts

This chapter contains a list of the replaceable mechanical components for the TMS 221 MCF5204 microprocessor 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<br>PO BOX 3608 | HARRISBURG, PA 17105–3608 |
| 05276 | ITT POMONA ELECTRONICS | 1500 E NINTH ST | POMONA, CA 91766–3835 |
| 09353 | C & K COMPONENTS CORP | 15 RIVERDALE AVENUE | NEWTON, MA 02158 |
| 60381 | PRECISION INTERCONNECT CORP. | 16640 SW 72ND AVE | PORTLAND, OR 97224 |
| 63058 | BERG ELECTRONICS INC. | MCKENZIE SOCKET DIV<br>910 PAGE AVE | FREMONT, CA 94538–7340 |
| 80009 | TEKTRONIX INC | 14150 SW KARL BRAUN DR<br>PO BOX 500 | BEAVERTON, OR 97077–0001 |

## Replaceable parts list

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discont'd | Qty | Name & description | Mfr. code | Mfr. part number |
|---|---|---|---|---|---|---|---|
| 1–0 | 010–0615–00 | | | 1 | ADAPTER, PROBE: MCF5204, TQFP–100 SOLDERED, TMS221 OPT 11 | 80009 | 010–0615–00 |
| –1 | 671–4253–00 | | | 1 | CKT BRD ASSY: MCF5204, TQFP–100, SOLDERED, 679–4253–00 TESTED, 389–2489–00 WIRED, TMS221 11 | 80009 | 671–4253–00 |
| –2 | 131–6134–01 | | | 3 | CONN, RCPT: SMD, MICTOR, PCB, STR, 38 POS, FEMALE, 0.025 CTR, 0.240 H, W/0.108 PCB HOLD DOWNS. PALLAD | 00779 | 767054–1 |
| –3 | 105–1089–00 | | | 3 | LATCH ASSY: LATCH HOUSING ASSY, VERTICAL MOUNT, 0.48 H X 1.24 L, W/PCB SINGLE CLIP, P6434 | 60381 | 105–1089–00 |
| –4 | 260–5000–00 | | | 1 | SWITCH, SLIDE: SPST, DIP8 POSITION, GOLD OVER NICKEL, 3A, 2PF, SEALED | 09353 | LD08HOSK1 |
| –5 | 131–5267–00 | | | 1 | CONN, HDR: PCB, MALE, STR, 2 X 40,0.1 CTR, 0.235 MLG X 0.110 TAIL, 30GOLD, HIGH TEMP | 00779 | 104326–4 |
| –6 | 103–0411–00 | | | 1 | ADAPTER, TQFP: TEST CLIP, 100 PIN TQFP, 0.50 MM LEAD PITCH, MCF5202/03, 100 POS | 05276 | MODEL 6150 |
| –7 | 136–1317–00 | | | 1 | SOCKET, PGA: PCB, FEMALE, STR, 100 POS, 11 X 11, 0.1 CTR, 0.0.173 H X 0.273 TAIL, G/G, OPEN CENTER | 63058 | PGA100H115B1–1149 F |
| | 070–9803–00 | | | 1 | MANUAL, TECH: INSTRUCTION, MICROPROCESSOR SUPPORT, PKG INSTALLATION, TLA700 SERIES, LOGIC ANALYZER | TK2548 | 070–9803–00 |
| | 071–0042–00 | | | 1 | MANUAL, TECH: INSTRUCTION, MCF5204, TMS221 | TK2548 | 071–0042–00 |
| | | | | | **OPTIONAL ACCESSORIES** | | |
| | 070–9802–00 | | | 1 | MANUAL, TECH: BASIC OPS MICRO SUP ON DAS/TLA 500 SERIES LOGIC ANALYZERS | 80009 | 070–9802–00 |

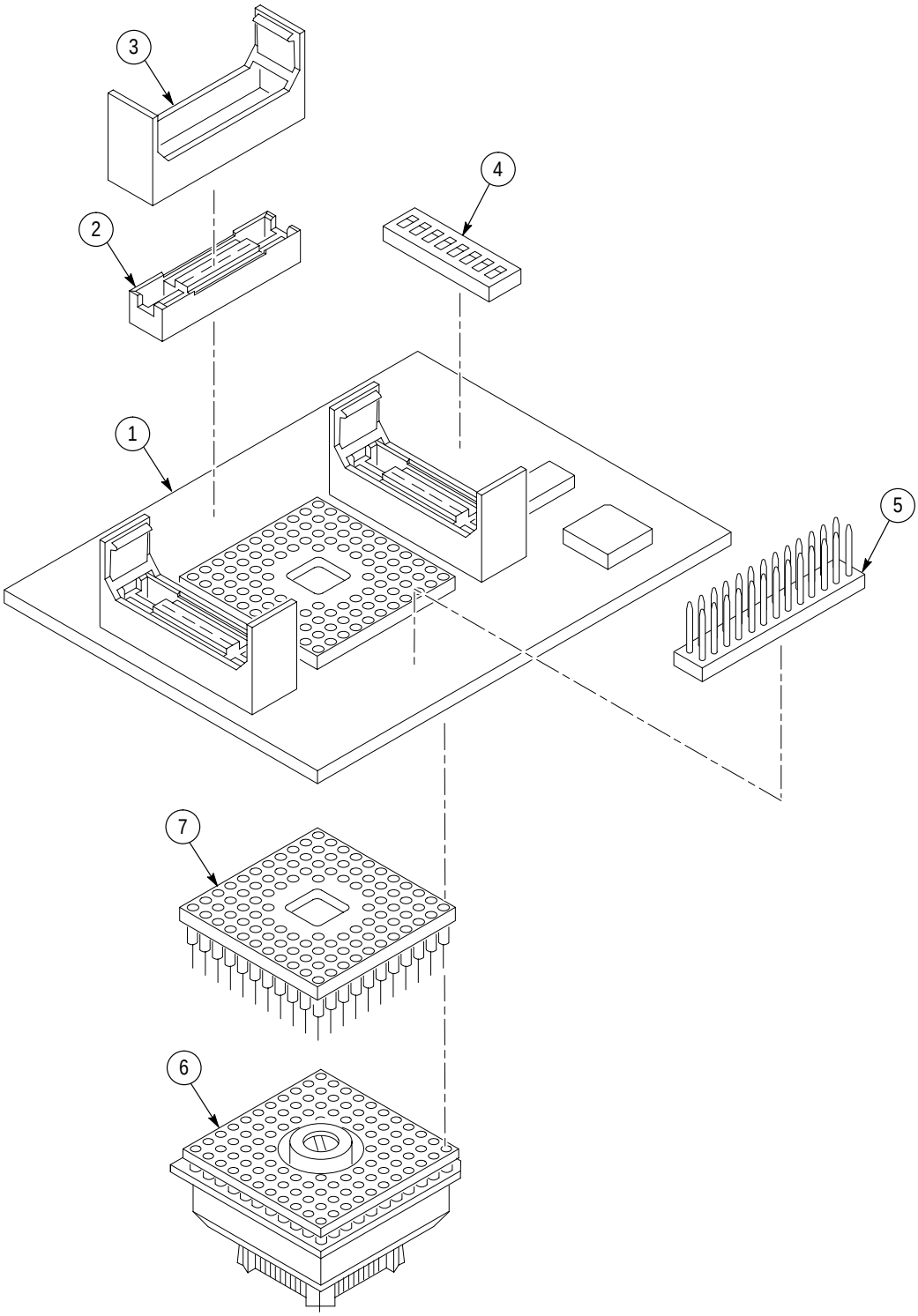



**Figure 6–1: MCF5204 probe adapter exploded view**

# Index

# Index

## Numbers



## A



## B



## C



## D

## E



## H



## I



## L



## M



## P



## Q



## R

## S



## T



## V



## W



## X