GMX®

GMX Micro-20™
68020 Single-board Computer

Hardware Setup Manual

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Revision History

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INTRODUCTION

This manual contains general information on the initial setup and and checkout of the GMX Micro-20 Single-board Computer when used with the GMX Micro-20 Support ROM firmware and/or one of the optional disk operating systems. It is intended to be used in conjunction with the "GMX Micro-20 Hardware Reference Manual" (for connector pinouts, etc.) and the appropriate software manuals.

The manual is divided into two chapters. Chapter 1 deals with basic hardware requirements and configuration. It is intended primarily for users who have purchased the GMX Micro-20 board for use with their own power supply, disk drives, etc., although the information on console terminal requirements applys to all users.

Chapter 2 covers initial system checkout using the built-in diagnostic firmware. We recommend that all users become familiar with the built-in diagnostics, and that the diagnostics be used during initial system setup to verify proper operation of the board.

If you have any questions or comments concerning the setup and operation of the GMX Micro-20 or the information in this manual, please contact us at the address or phone number listed on the cover page.

CHAPTER 1
HARDWARE SETUP

This chapter covers the basic hardware requirements for operating the GMX Micro-20 with 020Bug and/or a disk operating system. Refer to appendix C for the locations of connectors and jumper areas.

SECTION 1: POWER SUPPLY

The board requires a source of well filtered and regulated +5 and +12 Volts D.C. Connect a suitable supply to D.C. power connector P8, which uses the same mating connector and pinout as a standard 5 1/4" disk drive. Appendix A shows the pinout of connector P8.

SECTION 2: SERIAL ADAPTER BOARD

The serial adapter board provides line drivers and, if needed, the appropriate additional supply voltages to convert the TTL level signals on the GMX Micro-20 board to match an interface standard such as RS-232. A 50-pin ribbon cable connects the adapter to the main board at connector P2. Be sure to observe proper polarity (pin 1) when connecting the serial adapter board.

CAUTION: In most cases, an adapter board MUST be used between the GMX Micro-20 serial I/O connector (P2) and external devices such as terminals.Severe damage to the board will result if non-TTL level signals (such as RS-232) are connected directly to connector P2.

Refer to the "Hardware Reference Manual" and the serial adapter board manual for more information.

SECTION 3: SYSTEM CONSOLE TERMINAL

3-1: Console Terminal Requirements

At least one standard ASCII serial terminal must be connected to the board. Additional terminals may be connected; however, for initial operation only the console terminal is required. The console terminal must be configured for eight (8) data bits, space parity (bit 8 always 0), and one stop bit. The terminal baud rate must be set to 19,200 (19.2K) baud unless the default baud rate of the Support ROM has been changed. Refer to the section on console baud rate selection for information on changing the default baud rate.

3-2: Console Terminal Connections

The console terminal connects to serial port #0 on the GMX Micro-20. If the standard 25-pin RS-232 adapter board is used, port

#0 is accessed at connector P1 on the adapter. P1 on the 25-pin adapter is wired as DCE and a "straight" 3 or 4 wire cable can be used to connect the terminal. If a different serial adapter board is being used, refer to the adapter board documentation for connector location and pinout.

In many cases, only transmit data, receive data, and signal ground are required. However, handshaking will be needed if the terminal is not capable of continuous data reception at the baud rate being used. The CTS handshake input can be used to start and stop output from the GMX Micro-20 to the terminal. When CTS is asserted (high), output is enabled, when CTS is deasserted (low), output is disabled.

The software also supports XON/XOFF (DC1/DC3) handshake for both input and output. If XON/XOFF is used, hardware handshake is not required.

3-3: Console Baud Rate Selection

The default console baud rate is 19,200 (19.2K) baud. If the console terminal is not capable of operation 19.2K baud, the Support ROM must be altered to change the default baud rate. A one-byte value in the ROM determines the default baud rate for the console terminal used by the ROM firmware and optional disk operating systems.

The baud rate byte is the fifth byte (address $0004) in PROM #4 of the PROM set. PROM #4 is located at U-13 on the GMX Micro-20 board and contains the 8 high-order data bits, D24-D31. The PROMs are normally shipped with byte 5 set to all ones ($FF). This is the unprogrammed state, so any desired value can be programmed at this location without reprogramming the entire device.

To change the default console baud rate, locate the desired rate in the table (Figure 3-1) and reprogram the PROM with the value shown in the table. If PROM programming facilities are unavailable, contact the factory for information on obtaining custom PROM sets.

CONSOLE TERMINAL DEFAULT BAUD RATE BYTE			
BAUD RATE	BYTE	BAUD RATE	BYTE
75	$00	1800	$AA
110	$11	2000	$77
134.5	$22	2400	$88
150	$33	4800	$99
300	$44	9600	$BB
600	$55	19,200	$CC
1200	$66		

Figure 3-1

3-4:Console Data Format

The console port is configured, by default, to the following transmission format: 8 data bits, space parity (bit 8 is always zero), and 1 stop bit. All of the software uses this format for the console terminal. The transmission format for the console port is fixed, and can not be modified by the user. The other three ports also default to this format, but can be changed if necessary.

SECTION 4: RESET and ABORT SWITCHES

The board has provisions for connecting remotely mounted reset and abort switches. The reset switch resets the processor, and any other devices connected to the processor's reset line. The abort switch generates a level 7 autovector interrupt to the processor, and is generally used during software debugging to interrupt a running program. The abort switch also functions as a single-step switch when the hardware single-step mode is enabled.

Appendix B shows the necessary connections for reset and abort switches. See the "Hardware Reference Manual" and the software documentation for more detailed information on switch functions.

SECTION 5: REMOTE INDICATOR LEDs

The board has provisions for remote mounting of a HALT LED , and an LED for power-on indication. The remote HALT LED duplicates the function of the on-board HALT LED (LED 1), while the power-on LED provides an indication that +5VDC is applied to the board.

There are no provisions for a remote status LED (LED 2); however, one can be provided by removing the on-board LED and wiring a remote LED directly to the board.

Appendix B shows the necessary connections for remote LEDs. Refer to the "Hardware Reference Manual" for more detailed information.

SECTION 6: DIP-SWITCH OPTIONS

The first two sections of DIP-Switch S1 (S1-1 and S1-2) select the basic operating mode of the 020Bug Debugger/Diagnostic package.

Switch S1-1 enables or disables the interactive portion of 020Bug. If S1-1 is ON (closed), 020Bug enters the interactive mode on power-up or reset. This is the normal mode for using 020Bug. If S1-1 is OFF (open), 020Bug is disabled, and the system will switch to the disk operating system firmware (if present) on power-up or reset.

Switch S1-2 enables the auto-selftest mode used at the factory

for testing the boards. If S1-2 is ON (CLOSED), the board enters the auto-selftest mode on power-up or reset. For normal operation, S1-2 should be OFF (OPEN), disabling the auto-selftests. See Chapter 2 for more information on the selftest features.

Switches S1-3, S1-4, and S1-5 may be used by the optional disk operating system support firmware. Their functions are described in the DOS documentation.

For initial checkout, set the DIP-Switch as shown in figure 6-1.

Recommended Initial DIP-Switch Settings

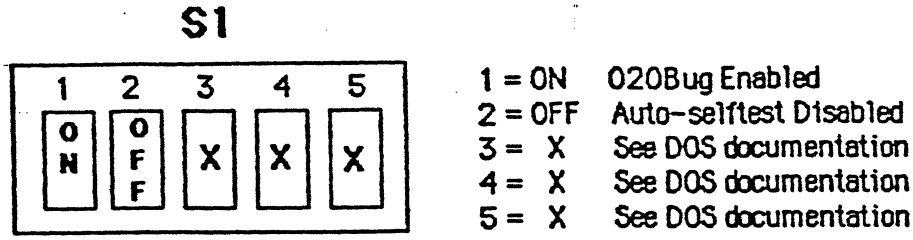


Figure 6-1

SECTION 7: JUMPER OPTIONS

The GMX Micro-20 is shipped with most of the jumper options properly set. Those options that may need to be reconfigured are discussed in the appropriate sections of this manual. Refer to the "Hardware Reference Manual" for detailed information on jumper functions. Figure 7-1 summarizes the standard jumper configuration.

Initial Jumper Configuration	
Jumper	**Configuration**
JA-1A	As required by EPROMs used
JA-1B	Jumper 7 & 8, 9 & 10
JA-2	Jumper 1 & 2
JA-3	Jumper 1 & 2
JA-4	No Jumper
JA-5	Jumper 3 & 4
JA-6	As required by EPROMs used
JA-7	Jumper 1 & 2, 3 & 4
JA-8	As required by floppy disk drive

Figure 7-1

SECTION 8: FLOPPY DISK DRIVES

This section covers the basic requirements for floppy disk drives. For more detailed information on drive requirements, refer to the operating system documentation.

8-1: Floppy Disk Drive Requirements

In order to use one of the optional disk operating systems, at least one floppy disk drive must be connected to the GMX Micro-20. The board supports one or two 5 1/4" floppy disk drives and most standard drives can be used.

The drives must be capable of stepping at the minimum stepping rate defined by the floppy disk controller on the GMX Micro-20 and by the operating system software. The mimimum stepping rate available is 12 milliseconds/step. Refer to the operating system documentation for operating system default stepping rates.

The GMX Micro-20 supports any combination of the following drive formats: single or double-density, single or double-sided, and 48 or 96 TPI (Tracks Per Inch). The format (number of sides, density, etc.) of a least one drive (drive #0) must match the format of the supplied operating system disks.

8-2: Floppy Disk Drive Configuration

Follow the drive manufacturers instructions when programming the drives.

If a single floppy disk drive is used, program the drive as Drive #0. If two drives are used, program the first as Drive #0, and the second as Drive #1.

If only one drive is used, it must have its terminating resistor (usually a resistor pack) in place. If two drives are used, the terminating resistor MUST be removed from one of the drives. Remove the terminator from the drive that will be the last drive on the cable connecting the drives to the board.

If only one drive is used, and the drive has a head load solenoid, configure the drive for "head-load with drive select" operation. If two drives with head-load solenoids are used, configure both for "head-load with motor-on".

8-3: Floppy Disk Ready Option

Most of the floppy disk drives currently available have a "drive ready" output on pin 34 of the interface cable. This output is used as a signal that the drive is selected and ready to transfer data.

If the drives being used have this output, the Drive Ready Option (JA-8) on the GMX Micro-20 should be enabled by jumpering pins 1 and 2 of JA-8. If one or both drives do not have a "ready" output, the option must be disabled by jumpering pins 2 and 3 of JA-8.

Note: Some older drives use a different pin for their "drive ready" output. If the drive's "ready" output is not on pin 34 of the interface cable, the Drive Ready Option must be disabled.

8-4: Floppy Disk Drive Connections

Floppy disk interface connector P4 is used to connect the drive(s) to the GMX Micro-20. The pinout of this connector matches the industry standard drive pinout, and a standard 34-pin ribbon cable can be used.

Be sure to observe proper polarity (pin 1) when connecting the drives to the board.

Since the GMX Micro-20 uses the same power supply voltages as a standard 5 1/4" disk drive, both can be powered by the same supply; provided that the supply's current limits are not exceeded. If both the board and drive(s) are powered by the same supply, separate cables to the power supply (rather than a "daisy-chain" arrangement) should be used.

SECTION 9: SASI INTERFACE

The SASI interface is used to connect intelligent peripheral controllers (e.g. hard disk controllers) to the GMX Micro-20. The type of controller and drive(s) that can be used is determined by the disk operating system.

This section describes the basic requirements for devices connected to the SASI interface. Refer to the operating system documentation for specific information on controller and drive compatibility.

9-1: SASI Controller Requirements

The controller(s) used must be compatible with both the hardware and the operating system software. Due to timing restrictions, some of the available devices that use the SASI interface are not compatible with the GMX Micro-20. Unless user written driver software is used, only those controllers listed in the operating system documentation can be used.

At the time of this writing, the only SASI controllers that have been tested and are known to work with the GMX Micro-20 are the OMTI 20C-1 (OMTI, Campbell Ca.) and the XEBEC 1410 and 1410A (XEBEC SYSTEMS, Inc. Sunnyvale Ca.) The OMTI 5000 Series controllers are NOT compatible. For current information on controller compatibility, contact GMX Inc.

9-2: SASI Controller Configuration

Refer to the controller manufacturer's documentation when configuring SASI controllers.

There are normally only four options on the SASI controllers which must be configured for use with the GMX Micro-20: controller select, sector size, interface termination, and parity.

Controller select and sector size must be set according to the information in the operating system documentation.

If only one SASI controller is to be connected, it must have its terminating resistors (usually a resistor pack) installed. If more than one controller is connected, the terminators must be removed from all but one controller. A terminator should only be installed in the last controller on the cable.

The GMX Micro-20 does not support the parity option on the SASI data bus; parity must be disabled on all controllers.

9-3: SASI Controller Connections

SASI interface connector P5 is used to connect the drive(s) to the GMX Micro-20. The pinout of this connector matches the industry standard controller pinout, and a standard 50-pin ribbon cable can be used.

Be sure to observe proper polarity (pin 1) when connecting the controller(s) to the board.

Most SASI controllers use the same power supply voltages as the GMX Micro-20, and they may use the same power supply; provided that the supply's current limits are not exceeded. If one supply is used, separate cables to the power supply (rather than a "daisy-chain" arrangement) should be used.

SECTION 10: PARALLEL INTERFACE

The parallel interface is normally used to drive a parallel printer. This section describes the basic requirements for connecting a device with a Centronics type parallel interface as an output device.

The parallel port may also be used for input, although user written software may be required to use the port for input.

10-1: Parallel Interface Requirements

The standard driver software provided by GMX Inc. can be used with most printers that have a standard Centronics type parallel interface.

10-2: Parallel Interface Configuration

Usually no special configuration is required, other than to be sure that the printer is configured for parallel operation. Some printers use the same connector for parallel and serial I/O and, if connected to the parallel port while in the serial mode, could damage the GMX Micro-20.

10-3: Parallel Interface Option Jumpers

Two jumper areas (JA-3 and JA-7) select the data and handshake direction for the parallel interface. Both jumper areas must be set for output when the port is used to drive a printer.

To configure the port for output, jumper JA-3 pins 1 and 2, jumper JA-7 pins 1 and 2, and jumper JA-7 pins 3 and 4.

CHAPTER 2
SYSTEM CHECKOUT

This chapter covers the procedures for initial system checkout. It includes information on the built-in confidence tests and hardware diagnostics.

SECTION 11: HARDWARE DIAGNOSTICS

11-1: Initial Power-up Test

With the console terminal connected, and the DIP-switch set as described in Chapter 1, apply power to the GMX Micro-20. The status LED should come ON, then go OFF, and the 020Bug sign-on message should appear on the terminal, followed by the prompt:

```
020Bug>
```

If the 020Bug sign-on message and prompt do not appear, check the Halt (LED1) and status (LED2) LEDs. If neither is lit, the problem is probably in the power supply, the terminal configuration, or the connections to the terminal. Recheck the connections to the board and the terminal configuration.

If the diagnostic LED (LED2) is flashing, the power-up confidence tests have detected an error condition. Refer to the section on confidence tests for more information.

If the Halt LED is lit, the processor has halted due to a system fault. This may be caused by incorrect installation of the PROMs (be sure the PROMs are installed in the correct sockets), a short on the board (check around the board mounting screws if the board is mounted on a drive or cabinet), or a hardware failure. Refer to the hardware manual for more information on the halt condition.

Once the prompt is obtained, 020Bug is ready to accept commands from the console. The next step should be to run the 020Bug Diagnostics to verify that the board is functioning properly.

11-2: Confidence Tests

The Support ROM firmware includes a group of tests that check basic functions of the board. These tests are always run at power-up or reset, regardless of the mode selected by the DIP-Switches.

In order to provide a fault indication, even if the fault prevents normal communication through the console terminal, the confidence tests use the Status LED (LED 2) to signal the fault through a series of coded flashes.

If one of the confidence tests fails, a 4-bit code is "flashed" to indicate the nature of the fault. The code is transmitted most-significant bit first in the following form:

A series of short flashes equals a zero (0)

A steady "ON" equals a one (1)

A short off period separates individual "bits" in the message. The message repeats continuously, with a longer off period separating individual messages. For example:

Flash - Steady - Flash - Flash - Long Pause...(repeat)

translates to 0100 binary. Figure 11-1 lists the error codes and their descriptions.

Note: LED 2 is connected to the floppy disk controller side select line and will also flash during normal disk operation. The confidence tests are run immediately after power-up or reset and this is the only time the error codes are valid.

CONFIDENCE TEST ERROR CODES	
CODE	ERROR DESCRIPTION
0000	Not used
0001	68020 Register Error
0010	68020 Instruction Error
0011	Reset Failure
0100	PROM Checksum Error
0101	Addressing Mode Error
0110	Exception Failed To Occur
0111	Wrong Exception Generated
1000	Status Register Interrupt Bit Stuck
1001	Unexpected Interrupt
1010	Memory Error
1011	Unexpected Bus Error
1100	Serial Device (DUART) Error
1101	Reserved for future use memory alignment error
1110	Reserved for future use console output inhibited
1111	Reserved for future use

new (CTS low)

Figure 11-1

11-3: 020Bug Diagnostics

In addition to the confidence tests, which are always run at power-up or reset, 020Bug includes a set of hardware diagnostic commands that check various board functions. These diagnostics can be executed as commands from 020Bug, or automatically if the Auto-self test is enabled (S1-2, ON).

The diagnostics should be run during initial checkout, and any time a hardware problem is suspected. The diagnostics can be run individually, or as a group. The following command sequence will run all of the diagnostics. Refer to the "020Bug User's Manual" for a description of the individual tests.

To run the 020Bug diagnostics, enter the following commands (<cr> = carriage return):

```
SD<cr>
```

020Bug should respond with the diagnostic directory prompt:

```
M20Diag>
```

Then enter the self-test command:

```
ST<cr>
```

As each test is run, 020Bug will print the name of the test, followed by a pass/fail message. When all of the tests are completed successfully, the diagnostic prompt is again displayed.

11-4: Selftest Loop Mode

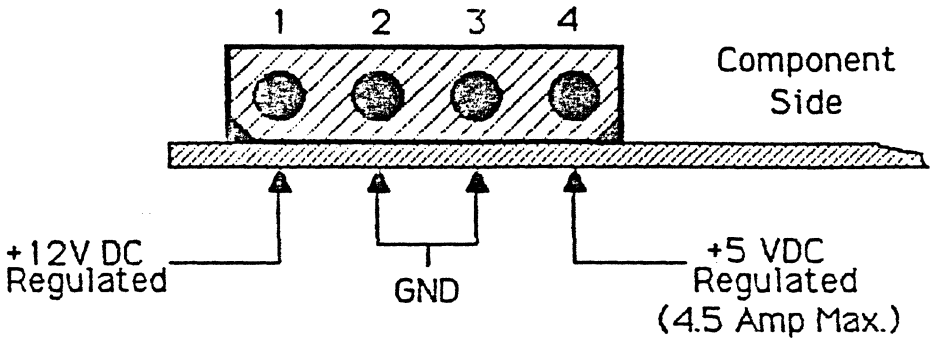
The Selftest Loop Mode provides a means of repeatedly executing the 020Bug selftest commands without operator intervention. This mode runs the same tests as the 020Bug "ST" command, but in a slightly different way. In the Selftest Loop Mode the tests run in a loop, repeating until an error occurs or the test is stopped. If an error is detected the status LED (LED 2) begins flashing to indicate that an error has occurred.

Unlike the confidence tests, the status LED does not indicate the nature of the error, but simply that an error has occurred. The normal selftest error reporting (on the console terminal) does however indicate what error has been detected.

The Selftest Loop Mode can be entered in one of two ways. The command "STL<cr>" in the 020Bug diagnostic directory will initiate this mode of operation. Once started, the tests will run until an error occurs or the test is stopped with the "break" key or by a reset.

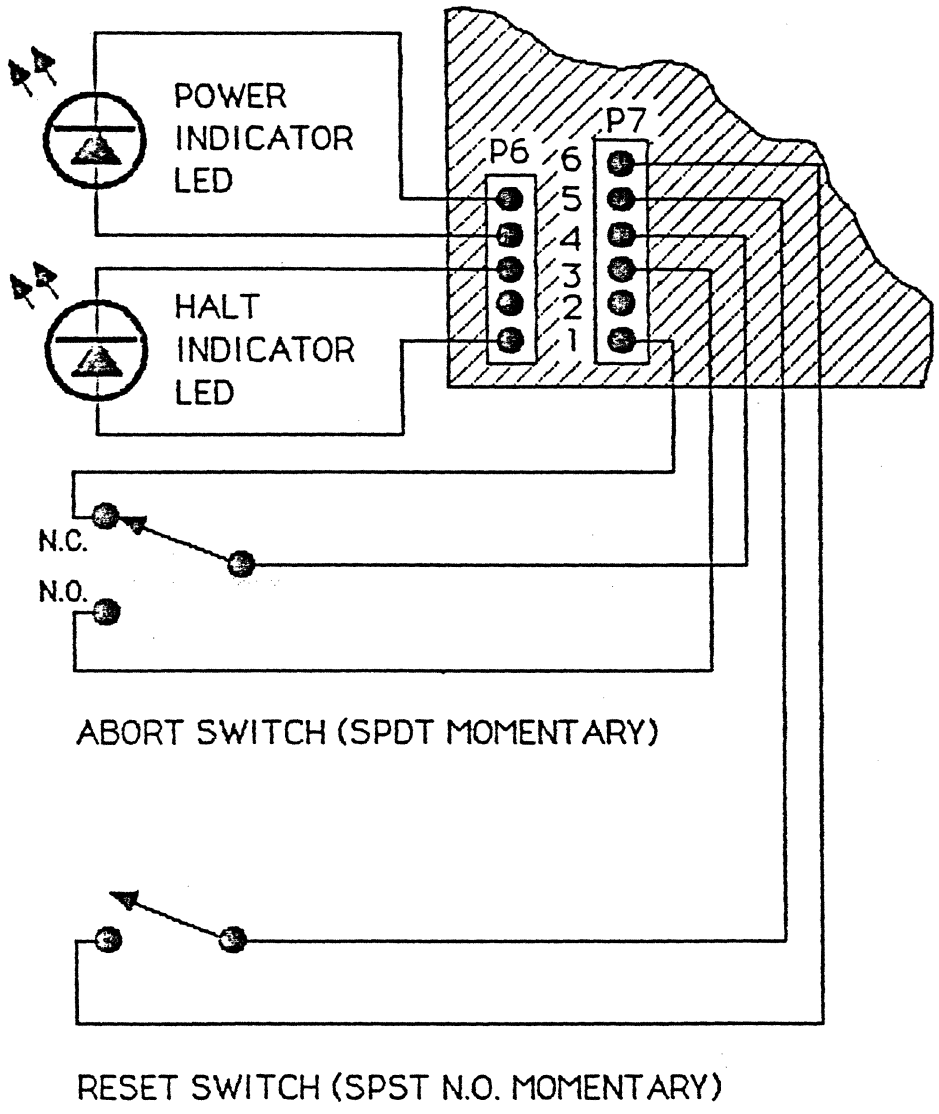
If DIP-Switch S1-2 is place in the ON (closed) position, the Selftest Loop Mode is entered automatically on power-up or reset. To restore normal operation, return S1-2 to the OFF (open) position and reset or power-down the board.

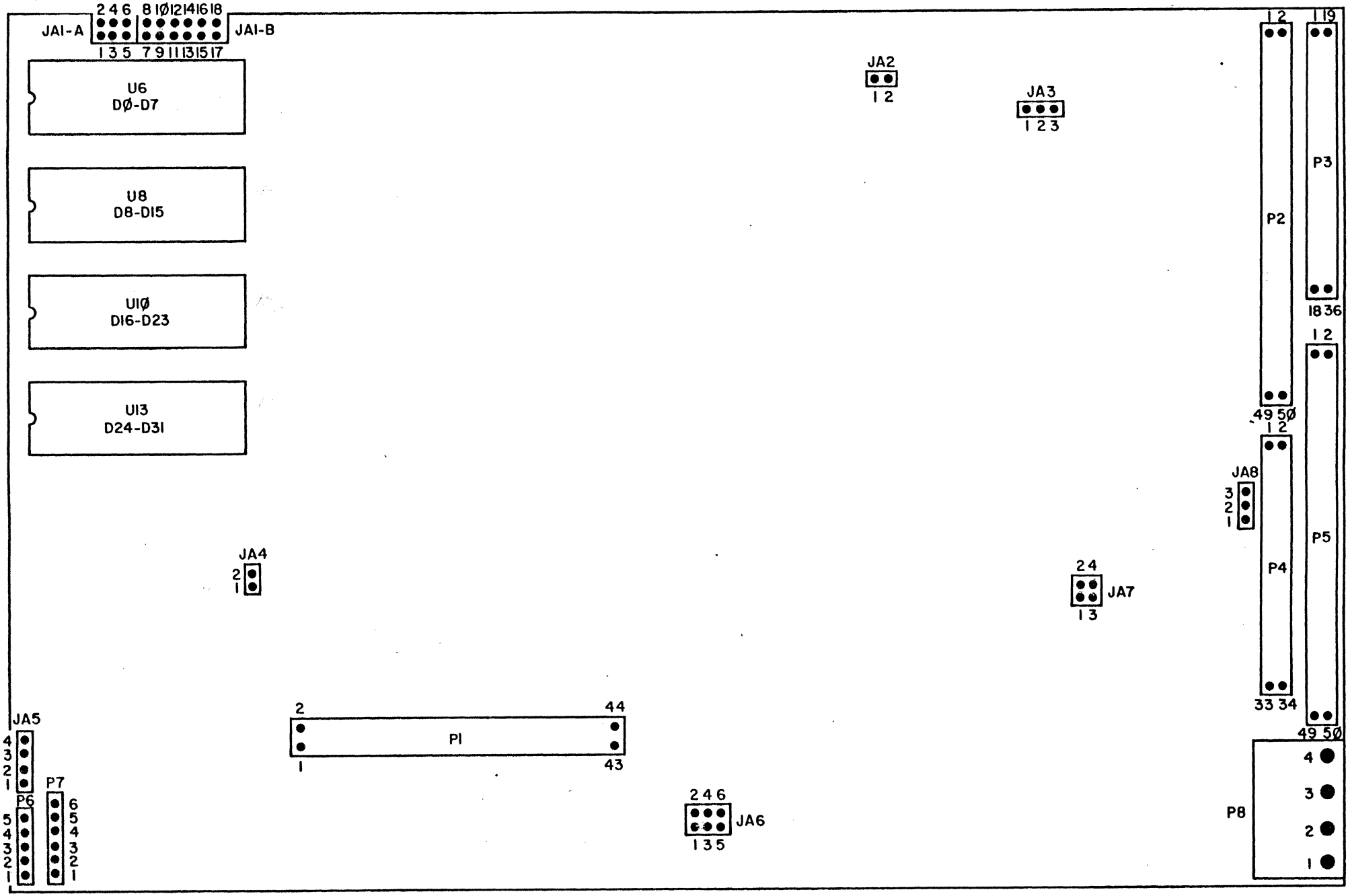
DC Power Connector P8



Note: Current requirements for the +12 Volt DC supply depend on the serial adapter board used.

Switch and LED Connection Diagram





GMX MICRO-20 JUMPER AND CONNECTOR PINOUTS