6012 User's Manual

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OCTAGON SYSTEMS CORPORATION®

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TRADEMARKS

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IMPORTANT!

Please read before installing your product.

Octagon's products are designed to be high in performance while consuming very little power. In order to maintain this advantage, CMOS circuitry is used.

CMOS chips have specific needs and some special requirements that the user must be aware of. Read the following to help avoid damage to your card from the use of CMOS chips.

Using CMOS Circuitry in Industrial Control

Industrial computers originally used LSTTL circuits. Because many PC components are used in laptop computers, IC manufacturers are exclusively using CMOS technology. Both TTL and CMOS have failure mechanisms, but they are different. This section describes some of the common failures which are common to all manufacturers of CMOS equipment. However, much of the information has been put in the context of the Micro PC.

Octagon has developed a reliable database of customer-induced, field failures. The average MTBF of Micro PC cards exceeds 11 years, yet there are failures. Most failures have been identified as customer-induced, but there is a small percentage that cannot be identified. As expected, virtually all the failures occur when bringing up the first system. On subsequent systems, the failure rate drops dramatically.

- Approximately 20% of the returned cards are problem-free. These cards, typically, have the wrong jumper settings or the customer has problems with the software. This causes frustration for the customer and incurs a testing charge from Octagon.

- Of the remaining 80% of the cards, 90% of these cards fail due to customer misuse and accident. Customers often cannot pinpoint the cause of the misuse.

- Therefore, 72% of the returned cards are damaged through some type of misuse. Of the remaining 8%, Octagon is unable to determine the cause of the failure and repairs these cards at no charge if they are under warranty.

The most common failures on CPU cards are over voltage of the power supply, static discharge, and damage to the serial and parallel ports. On expansion cards, the most common failures are static discharge, over voltage of inputs, over current of outputs, and misuse of the CMOS circuitry with regards to power supply sequencing. In the case of the video cards, the most common failure is to miswire the card to the flat panel display. Miswiring can damage both the card and an expensive display.

- **Multiple component failures** - The chance of a random component failure is very rare since the average MTBF of an Octagon card is greater than 11 years. In a 7 year study,

Octagon has never found a single case where multiple IC failures were not caused by misuse or accident. It is very probable that multiple component failures indicate that they were user-induced.

- **Testing "dead" cards** - For a card that is "completely nonfunctional", there is a simple test to determine accidental over voltage, reverse voltage or other "forced" current situations. Unplug the card from the bus and remove all cables. Using an ordinary digital ohmmeter on the 2,000 ohm scale, measure the resistance between power and ground. Record this number. Reverse the ohmmeter leads and measure the resistance again. If the ratio of the resistances is 2:1 or greater, fault conditions most likely have occurred. A common cause is miswiring the power supply.

- **Improper power causes catastrophic failure** - If a card has had reverse polarity or high voltage applied, replacing a failed component is not an adequate fix. Other components probably have been partially damaged or a failure mechanism has been induced. Therefore, a failure will probably occur in the future. For such cards, Octagon highly recommends that these cards be replaced.

- **Other over-voltage symptoms** - In over-voltage situations, the programmable logic devices, EPROMs and CPU chips, usually fail in this order. The failed device may be hot to the touch. It is usually the case that only one IC will be overheated at a time.

- **Power sequencing** - The major failure of I/O chips is caused by the external application of input voltage while the Micro PC power is off. If you apply 5V to the input of a TTL chip with the power off, nothing will happen. Applying a 5V input to a CMOS card will cause the current to flow through the input and out the 5V power pin. This current attempts to power up the card. Most inputs are rated at 25 mA maximum. When this is exceeded, the chip may be damaged.

- **Failure on power-up** - Even when there is not enough current to destroy an input described above, the chip may be destroyed when the power to the card is applied. This is due to the fact that the input current biases the IC so that it acts as a forward biased diode on power-up. This type of failure is typical on serial interface chips.

- **Serial and parallel** - Customers sometimes connect the serial and printer devices to the Micro PC while the power is off. This can cause the failure mentioned in the above section, *Failure upon power-up*. Even if they are connected with the Micro PC on, there can be another failure mechanism. Some serial and printer devices do not share the same power (AC) grounding. The leakage can cause the serial or parallel signals to be 20-40V above the Micro PC ground, thus, damaging the ports as they are plugged in. This would not be a problem if the ground pin is connected first, but there is no guarantee of this. Damage to the printer port chip will cause the serial ports to fail as they share the same chip.

- **Hot insertion** - Plugging cards into the card cage with the power on will usually not cause a problem. (**Octagon urges that you do not do this!**) However, the card may be damaged if the right sequence of pins contacts as the card is pushed into the socket. This usually damages bus driver chips and they may become hot when the power is applied. This is one of the most common failures of expansion cards.

- **Using desktop PC power supplies** - Occasionally, a customer will use a regular desktop PC power supply when bringing up a system. Most of these are rated at 5V at 20A or more. Switching supplies usually require a 20% load to operate properly. This means 4A or more. Since a typical Micro PC system takes less than 2A, the supply does not regulate properly. Customers have reported that the output can drift up to 7V and/or with 7-8V voltage spikes. Unless a scope is connected, you may not see these transients.

- **Terminated backplanes** - Some customers try to use Micro PC cards in backplanes that have resistor/capacitor termination networks. CMOS cards cannot be used with termination networks. Generally, the cards will function erratically or the bus drivers may fail due to excessive output currents.

- **Excessive signal lead lengths** - Another source of failure that was identified years ago at Octagon was excessive lead lengths on digital inputs. Long leads act as an antenna to pick up noise. They can also act as unterminated transmission lines. When 5V is switch onto a line, it creates a transient waveform. Octagon has seen submicrosecond pulses of 8V or more. The solution is to place a capacitor, for example 0.1 µF, across the switch contact. This will also eliminate radio frequency and other high frequency pickup.

TABLE OF CONTENTS

PREFACE

This manual provides all the information required to install, configure, and operate the 6012 Micro PC Control Card. It is part of Octagon's Micro PC user manual series. To receive the Micro PC User Manual Binder, please return the reply card included with your Control Card.

By using this manual, you will be able to:

- Interface the 6012 Control Card to your PC and the Micro PC expansion cards.
- Set up communications between the 6012 card and a PC.
- Gain an understanding of the operation and various options allowed in the 6012 Control Card.

CONVENTIONS USED IN THIS MANUAL

1. Information which appears on your screen (output from your system, commands or data that you key in) is shown in a different type face.

   ```
   Octagon 5012A/6012 BIOS Vers. x.xx
   Copyright (c) 1991-1996 Octagon Systems, Corp.
   All Rights Reserved.
   ```

2. Italicized refers to information that is specific to your particular system or program, e.g.,

   Enter *filename*

   means enter the name of your file.

3. Warnings always appear in this format:

   WARNING: The warning message appears here.

4. Paired angle brackets are used to indicate a specific key on your keyboard, e.g., <ESC> means the escape key; <CTRL> means the control key; <F1> means the F1 function key.

5. All addresses are given in hexadecimal.

SYMBOLS AND TERMINOLOGY

Throughout this manual, the following symbols and terminology are used:

W[–]	Denotes a jumper block and the pins to connect.
Autoexecution	Automatic execution of a program on power–up or reset.
BIOS drive	The solid–state disk which contains the system BIOS and ROM–DOS.
Console Port	Video card or COM1 where BIOS and DOS messages appear and keyboard input is available.
Control Card	Contains the CPU, memory, and operating system and controls the operation of all the extension cards.
DRAM	Dynamic Random Access Memory devices. DRAMs provide volatile memory with unlimited read and write cycles.
Expansion Card	The expansion cards add I/O functions to the Micro PC system, such as analog input/ output, digital input/output, motion control, display, and so on.
Flash EPROM	Electrically erasable PROM which allows approximately 100,000 writes.
Memory device	The type of static RAM, DRAM, flash EPROM or EPROM specified for either volatile or nonvolatile memory.
PC SmartLINK	A serial communications software package designed by Octagon for use with the 6012 Control Card. Refers to all versions of PC SmartLINK.

ROM	Read Only Memory devices. ROMs provide nonvolatile memory, have a limited number of write cycles, and include EPROMs, EEPROMs, and flash EPROMs.
ROM–DOS	DOS operating system included in Micro PC ROM.
Solid–State Disk (SSD)	A simulated disk using a high speed solid–state memory device, for example flash, EEPROM, or static RAM.
Static RAM	Static Random Access Memory device. Static RAMs provide volatile memory with unlimited read and write cycles. They may be used with a battery back–up module.
TTL Compatible	Transistor transistor logic compatible; 0–5V logic levels.
Virtual Drive	A disk created in DOS or extended memory which emulates an actual disk. Provides temporary storage for files. When power to the computer is turned off the virtual drive disappears.
XMODEM	A communications protocol which allows transfer of files between two computers.
XON/XOFF	A communications protocol for asynchronous connections. The receiver can pace the sender by sending the XOFF and XON characters to stop and continue the data flow.
H	The suffix “H” denotes a hexadecimal number. A decimal number has no prefix or suffix. For example, 1000H and 4096 are equivalent.

TECHNICAL SUPPORT

If you have a question about the 6012 Control Card and cannot find the answer in this manual, call Technical Support. They will be ready to give you the assistance you need.

When you call, please have the following at hand:

Your *6012 Control Card User's Manual*

A description of your problem.

The direct line to Technical Support is 303–426–4521.

CHAPTER 1 OVERVIEW

DESCRIPTION

The 6012 PC Control Card is a low cost solution combining a PC and data acquisition and control on the same card. The 6012 can be operated stand–alone or plugged into a Micro PC card cage for I/O expansion. It integrates PC architecture with two serial ports; printer, keyboard and speaker ports; a 24–line digital port for logic I/O or for interfacing directly to an opto module rack; 8–channel A/D converter with programmable single–ended and differential inputs; calendar/clock option; 1 MB DRAM; and DOS in ROM.

MAJOR FEATURES

ROM–DOS Operating System

ROM–DOS is a MS–DOS version 6.22 compatible operating system. Since it is stored in ROM, it is always present on power–up. During run time it requires only about 20K of RAM space.

Solid–State Disk Options

The 6012 has sockets for two solid–state disks. The boot disk (SSD1) accepts one or two 256K flash EPROMs. The data disk (SSD2) accepts a 128K or 512K static RAM.

The SSD1 socket normally contains the program to be executed on power–up. The program is automatically loaded into DOS memory and executed. A program residing in memory can be transferred into the flash using the on–card programmer and supplied software. Only flash EPROMs may be programmed. These devices are erased automatically during the programming process. Multiple programs may be stored as long as the total size does not exceed 512K.

The SSD2 socket supports only a 128K or 512K static RAM which is used for data storage. To retain data during power outages, the DS–1216DM calendar/clock that plugs into this socket will also battery–back the RAM.

The solid–state disks reside in memory that is separate from the 640K of DOS memory. Software drivers are provided. Also, if your application requires additional program and data storage capabilities, you can add Micro PC 5805 Solid–State Disk Cards to your system.

Programmable Analog Inputs

There are eight channels that have software programmable modes and input voltage ranges. The mode of a channel may be single–ended or differential. A maximum of four differential channels may be configured. The input ranges are software programmable for 0–5V or +/–5V. The resolution is 12 bits on both ranges. The span is adjustable so that an overrange can be detected.

Digital I/O Port and Opto Rack Interface

The 24 digital I/O lines will interface with logic devices, switch inputs, LEDs and industry standard opto module racks. The I/O lines are 0–5V logic compatible. They can be programmed as inputs or outputs in groups of four and eight lines.

High Current Interface

Eight of the 24 digital I/O lines can also drive external devices that require up to 100 mA per device, and up to a 50V power supply. Relays, small motors, displays and other devices can be driven directly by the 6012. The outputs act as switches to ground. The eight lines can be converted to 0–5V logic levels with a supplied jumper block.

Speaker and Keyboard

The speaker and keyboard lines are brought out to a 10–pin connector via a CMA–10 cable. The Octagon PSKI–1 interface provides a PC compatible connector for the keyboard and provides screw terminals for the speaker. Any XT compatible keyboard may be used. A keyboard and monitor are not required for operation. The keyboard and monitor can be substituted for a terminal or PC.

LPT1 Parallel Port

The parallel printer port can be used to support a number of devices:

1. PC compatible printer
2. 17 digital I/O lines
3. Matrix keypad
4. Multiline displays

This port has a 20–pin connector. When used only for digital I/O, a CMA–20 cable connects the port to the STB–20 terminal board for connection to field wiring.

To use a PC compatible printer, connect this port to the PSKI–1 interface board with a CMA–20 cable. The PSKI–1 has a DB–25 connector for the printer.

This port will also interface with Octagon displays and keypads. For LCD displays, use the LCD–IFB interface board and the DP–IFB interface board for the DP series (vacuum fluorescent) displays. Both interface boards have keypad connectors. A CMA–20 cable is required.

COM1 and COM2 Serial Ports

The COM1 and COM2 serial ports are 8250 compatible and support IBM compatible interrupts. The baud rates are programmable to 56K baud. The serial interface is RS–232C and is compatible with the Octagon VTC–9F serial cable. COM2 has an additional RS–485 interface for networking.

Watchdog Timer

The watchdog timer is used to reset the system if the program stops unexpectedly. The watchdog is enabled under software control. The timeout is 1.2 seconds.

Calendar/Clock Option

The DS–1216DM offers a battery–backed calendar/clock option that contains a 99–year calendar. Time can be set and read in a 24–hr. format with a resolution of 0.01 seconds. The clock plugs into a solid–state disk socket. The clock contains its own dual lithium battery system with a minimum life of five years. A driver is built into the BIOS to handle all the clock functions required by DOS.

SETUP Stored in Serial EEPROM

The 6012 stores setup information in nonvolatile EEPROM; as a result it is immune to battery or power failure. The BIOS uses 60 bytes of the EEPROM. Additional user-definable information can also be stored in the EEPROM: Up to 452 bytes are optionally available; 68 bytes are standard.

Hardware Reset

You can reset the system without turning off the power using the hardware reset button. It also provides a more complete reset than the <CTL> <ALT> <DEL> method.

Where To Go From Here

Before you can begin developing your application program for the 6012, we recommend you read Chapters 2–4. These chapters give instructions for hardware installation, downloading and saving your program, and autoexecuting your application.

Chapter 2 Quick Start	Covers the basics of setting up a 6012 system. This chapter describes how to install the 6012 into the card cage, how to establish a serial communications link with your PC and how to download files to the 6012.
Chapter 3 RAMs & EPROMs	Configuring and installing static RAMs, DRAMs and flash EPROMs. Installing the battery backup and calendar/clock module.
Chapter 4 SETUP	Running the SETUP configuration program.
Chapter 5 Save & Run Programs	How to save your program files and autoexecute them from the 6012.
Chapter 6 Serial Ports	Using COM1 and COM2. Setting COM1 as the main console I/O for serial communications with your PC.

Chapter 7 Digital I/O	Using the digital I/O lines.
Chapter 8 Analog Inputs	Configuring the analog input channels.
Chapter 9 LPT1 Parallel Port	Using the LPT1 parallel port for a printer, digital I/O, display or keypad.
Chapter 10 Serial EEPROM	How to read and write to the serial EEPROM.
Chapter 11 Watchdog Timer	Enabling the watchdog timer and configuring the timeouts.
Chapter 12 Video and Keyboard	Configuring the 6012 with a video, keyboard and floppy drive.
Chapter 13 External Drives	Configuring the 6012 with a floppy drive or hard drive.
Chapter 14 Using Your Own DOS	Configuring the 6012 with a version of DOS other than ROM–DOS.
Chapter 15 Troubleshooting	Problems encountered when using the 6012.
Chapter 16 Technical Data	Technical specifications, jumper configurations and connector pinouts.
Appendix A Software Utilities	Description and operation of software utility programs and device drivers.
Appendix B	Using non–Octagon cables, programming EPROMs, uploading files from the 6012 and assigning drive designators.
Appendix C Analog Input	Description of analog input circuitry.

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CHAPTER 2 QUICK START

This chapter covers the basics of setting up a 6012 system and tells you:

1. How to panel mount or install the 6012 into the card cage;
2. How to set up a serial communications link between the 6012 and your PC; and
3. How to download files to the 6012 and run a program from the virtual drive.

WARNING: The 6012 may not be installed in a PC. These cards are designed to be independent CPU cards only, not accelerators or coprocessors.

HARDWARE INSTALLATION

Your 6012 Control Card can be installed in one of three ways:

1. Plug it directly into a Micro PC card cage;
2. Use the optional PC mounting bracket and plug it into any passive backplane;
3. Panel mount it using the four mounting holes

Panel Mounting the 6012

To panel mount the 6012, you will need the following equipment (or equivalent):

6012 PC Control Card
5V Power Supply
VTC–9F Cable
Null modem adapter
6012 ROM–DOS & Utility Software Disk
PC SmartLINK w/manual
Your PC

A screw terminal connector is provided to supply the 5V power. Refer to Figure 2–1 for the location of various connectors.

1. Use #4–40 standoffs and screws to bolt down the 6012. The following diagram shows the center to center mounting hole dimensions.

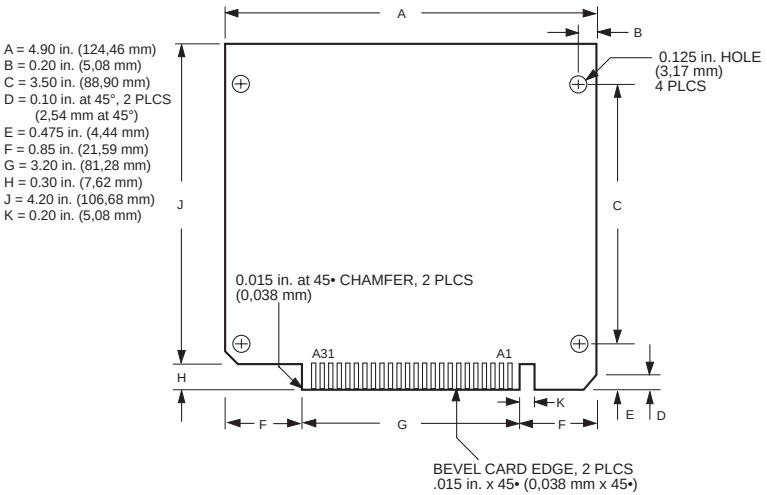

Figure 2–1 6012 Center to Center Hole Dimensions

2. Connect the proper ground and 5V wires to the terminal block at P2.

3. Connect one end of the VTC–9F cable to the null modem adapter. Connect the other end to COM1 (J4) on the 6012.

   NOTE: You must use COM1 on the 6012 in order to establish a serial communications link with your PC.

4. If your PC has a 9–pin serial connector, connect the null modem adapter to serial port COM1 or COM2 on your PC. If your PC has a 25–pin serial connector, attach a 9– to 25–pin adapter to your null modem adapter, then insert the matching end of the 9– to 25–pin adapter into COM1 or COM2.

   NOTE: Please refer to the PC SmartLINK manual for more information on using COM2 on your PC.

You are now ready to transfer files between your PC and the 6012. Please continue with the section, “Establishing Communications with the 6012” in this chapter.

Using a Micro PC Card Cage

To install the 6012 in a Micro PC card cage, you will need the following equipment (or equivalent):

6012 PC Control Card
Micro PC Card Cage
Power Module
VTC–9F Cable
Null modem adapter
6012 ROM–DOS & Utility Software Disk
PC SmartLINK w/manual
Your PC

Please refer to Appendix B if you are making your own serial cable or using other non–Octagon components.

To install the 6012:

1. Please refer to Figure 2–2 for the location of various connectors before installing the 6012 PC Control Card.

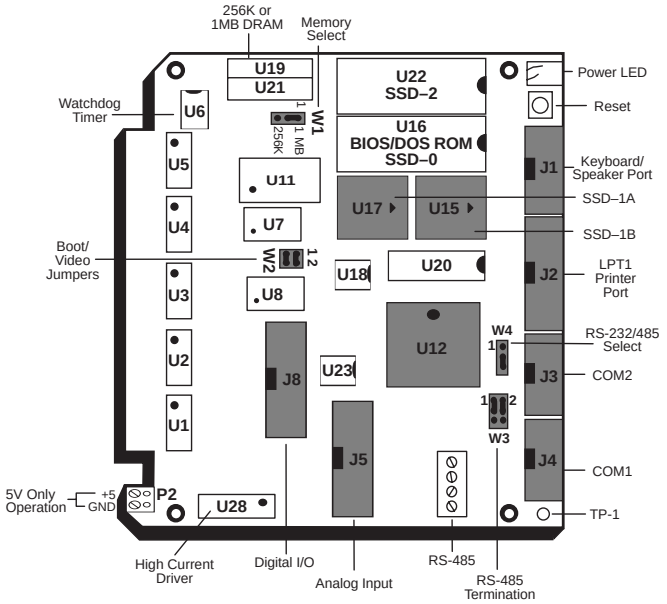

Figure 2–2 – 6012 Component Diagram

WARNING: The 6012 Control Card contains static–sensitive CMOS components. The greatest danger occurs when the card is plugged into a card cage. The 6012 card becomes charged by the user, and the static discharges to the backplane from the pin closest to the card connector. If that pin happens to be an input pin, even TTL inputs may be damaged. To avoid damaging your card and its components:

- Ground yourself before handling the 6012.
- Disconnect power before removing or inserting the card.
- When programming a memory device, place the device in the socket before applying power.

WARNING: Take care to correctly position the 6012 card in the card cage. The VCC and ground signals must match those on the backplane. Figure 2–3 shows the relative positions of the 6012 card as it is installed in the card cage.

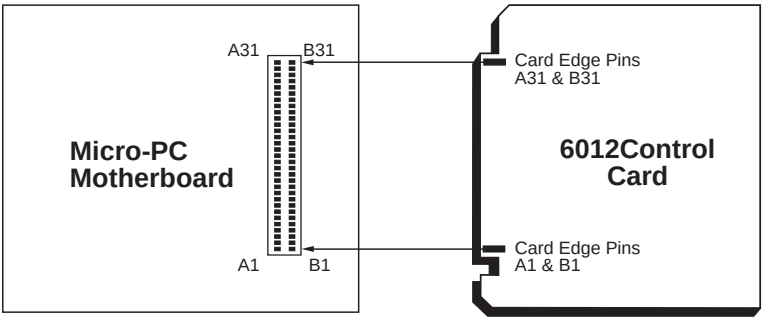

Figure 2–3 – Edge Connector Orientation

2. Attach the power module to the card cage following the instructions supplied with the power module.
3. Make sure power to the card cage is OFF.
4. Slide the 6012 into the card cage. The ROM–BIOS label on the card should face to the left or up depending on the type of card cage.

WARNING: Plugging the card in backwards will destroy the card!

5. Connect one end of a VTC–9F cable to the null modem adapter. Connect the other end to COM1 (J4) on the 6012.

   NOTE: You must use COM1 on the 6012 in order to establish a serial communications link with your PC.
6. If your PC has a 9–pin serial connector, connect the null modem adapter to serial port COM1 or COM2 on your PC. If your PC has a 25–pin serial connector, attach a 9– to 25–pin adapter to your null modem adapter, then insert the matching end of the 9– to 25–pin adapter into COM1 or COM2.

   NOTE: Please refer to the PC SmartLINK manual for more information on using COM2 on your PC.

ESTABLISHING COMMUNICATIONS WITH THE 6012

1. Install PC SmartLINK (or other communications software) on your PC if you have not already done so. Refer to the PC SmartLINK manual for installation instructions.

2. Copy the 6012 files from the 6012 utility disk to a subdirectory on your PC hard drive.

3. Start PC SmartLINK. You are now ready to establish communications between your PC and the 6012 Control Card.

4. Plug the card cage power cable into an AC outlet. Turn on the power module.

5. A logon message similar to the one below will appear on your PC monitor:

```
Octagon 5012A/6012 BIOS Vers. x.xx
Copyright (c) 1991-1996 Octagon Systems, Corp. (TM)
All Rights Reserved

5012A/6012 MEMDRIVE.SYS V2.06, expanded memory
present.
5012A/6012 MEMDRIVE.SYS V2.06, formatting expanded
memory (384KB) as drive D:
5012A/6012 MEMDRIVE.SYS V2.06, assigning SSD1A
(256KB) as drive E:
5012A/6012 MEMDRIVE.SYS V2.06, memory device not
found in SSD1B.
```

```
5012A/6012 MEMDRIVE.SYS V2.06, memory device not
found in SSD2.

C:\>path = D:\;C:\;
C:\>prompt $p$g

C:\>showtime
Current date/time is TUE 1/1/1980  1:00:00
C:>
```

If you do not get the proper logon message:

- Check the serial parameters of your PC to make sure they are set correctly. Parameters should be 9600 baud, 8 data bits, no parity, and 1 stop bit.
- Make sure a video card is not installed in the card cage.
- Remove jumper W2[3–4] from the 6012 card. Be sure to turn off the power before removing the 6012 card from the card cage.
- If the system still does not respond, refer to Chapter 15, "Troubleshooting".

6. Use the directory command to make sure your equipment and software are working properly. Type:

```
DIR <return>
```

A directory listing of ROM–DOS files stored in the BIOS socket should appear:

```
Volume in drive C is BIOS DRIVE

Directory of C:\

COMMAND   COM    27095  05-20-94     6:00a
CONFIG    SYS      146  05-17-94     10:42a
TRANSFER  EXE     9969  01-05-93     2:36p
DISKSAVE  EXE    12602  11-02-94     4:39p
SETUP     COM     2852  11-02-94     4:39p
AUTOEXEC  BAT       41  04-15-94     9:42a
RESET     COM      381  11-02-94     4:39p
FAST      COM      390  11-02-94     4:39a
SLOW      COM      390  11-02-94     4:39a
SHOWTIME  COM      619  11-02-94     4:39a
MEMDRIVE  SYS     3377  11-02-94     4:38p
   11 Files(s)         57862 bytes
                          0 bytes free
```

7. You are now ready to transfer files between your PC and the 6012.

TRANSFERRING FILES BETWEEN 6012 & YOUR PC

Once you have established communications between your PC and the 6012, you can download files to the virtual drive on the 6012. The virtual drive provides temporary storage for your files and allows you to test and debug your application files before permanently saving them.

You can also upload files from your 6012 to your PC for editing and debugging. When you boot the 6012, a 1 MB system has a 384K virtual drive generally configured as drive D.

Files are downloaded using the transfer program, TRANSFER.EXE, which resides on the 6012. The following information on downloading files between the 6012 and your PC uses an example program, DEMO.EXE. This file is on your 6012 utility disk in the DEMO subdirectory.

Downloading Files to the 6012

The following procedure assumes you are using PC SmartLINK and SmartLINK is included in your directory path. For other communication programs, refer to information on sending a file from your PC to the target system.

1. Log into the directory on your PC which contains the file(s) you will download to the 6012. Example:

   ```
   C:\SL\6012\DEMO
   ```

2. Start PC SmartLINK and power on the 6012.

3. Execute the TRANSFER.EXE program from the 6012 by typing:

   ```
   TRANSFER D:DEMO.EXE <RETURN>
   ```

The following message displays:

```
Receiving D:DEMO.EXE
```

4. Execute the following using PC SmartLINK:

   a. Press <ALT>+<D> to download a file.
   b. Type in the name of the file to transfer.
   c. Select START. The progress of the transfer displays in the dialog box.

   NOTE: Transfer will timeout if the program has not been started after approximately 40 seconds. It displays the following message:

```
Failed to receive d:DEMO.EXE
Deleting d:DEMO.EXE
```

5. When the transfer is complete, type the following DOS command to view the virtual drive directory and confirm that your file has transferred to the 6012:

```
DIR D:
```

   The system will display the contents of drive D:

```
Volume in drive D has no label
Directory of D:\

DEMO      EXE    1725   11-05-91     2:37p
          1 file(s) 387072 bytes free
```

6. To execute the program you have just downloaded type:

```
D:DEMO
```

7. The system displays a message on your PC.

Before you can save and run your application from the 6012, you must first configure the system for your particular application requirements. This chapter tells you:

1. How to configure the jumpers for DRAM options and;

2. How to install RAMs or EPROMs.

SETTING JUMPERS

The 6012 is shipped with various DRAM options. Verify that the jumper settings for W1 reflect the correct memory configuration for your system.

W1: DRAM Size	
DRAM	**Pins Jumpered**
1 MB	[1-2]
256K	[2-3]

INSTALLING RAMS AND EPROMS

To Install Flash EPROMs

The 6012 card includes three sockets for solid–state disks: SSD1A, SSD1B and SSD2. SSD1A/B generally contains the program to be executed on power–up. The program is automatically loaded into DOS memory and executed. SSD1A/B accepts only 256K flash (N28F020). Your application program can be saved to the flash using the on–card programmer. These devices are erased automatically during the programming process. You can write to the flash a limited number of times (100,000), if your application program requires changes.

1. Install the first 256K flash directly into SSD1A and the second flash (if applicable) into SSD1B making sure to align the notched corner of the flash with the notched corner of the socket (see Figure 3-1).

WARNING: If you need to remove the flash memory from the sockets, be sure to use a PLCC chip puller. Failure to use the correct tool could result in damage to the flash and socket.

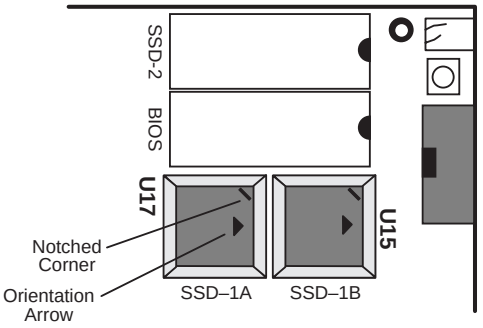

Figure 3-1 6012 PLCC Orientation

After installing a flash in SSD1, you should run the SETUP program to specify the size of device. If you change the size of the device in SSD1, you **must** run SETUP again.

To Install Static RAMs

1. For static RAMs without battery backup, install the static RAM directly into SSD2. Pin 1 should point away from the gold contact fingers of the 6012 card.

To Install Battery Backup & Calendar/Clock Module

1. Install the DS–1216DM into socket SSD2. Pin 1 of the DS–1216DM should point away from the gold contact fingers of the 6012 card.

2. Insert the static RAM on top of the DS–1216DM. Pin 1 of the RAM chip should point away from the gold contact fingers of the 6012 card.

3. After installing the calendar/clock module, confirm that the SETUP option, "DS clock?", is enabled. Otherwise, the time and date will be incorrect.

To Install Additional DRAM

The 6012 is shipped with various options of DRAM installed on the card. Additional DRAM may be added. Be sure the chips meet the industrial temperature range of –40° C to +85°C. The following table lists the memory upgrade options and Octagon order number for DRAM:

DRAM Upgrades for 6012			
On-card Memory	**Memory Upgrade**	**Order #**	**Description**
0K	256K	3471	(2) 256K x 4 ZIPs
	1 MB	3214	(2) 1 MB x 4 ZIPs
256K	1 MB	3214	(2) 1 MB x 4 ZIPs

1. Install the DRAMs in sockets as shown in Figure 3–2. Line the pins of the chip up with the holes of the socket. The index mark on the end of the chip (it looks like a small nick) should be farthest from the gold contact fingers. Carefully push the DRAM into the socket. Populate sockets U19 and U21 for 256K or 1 MB systems.

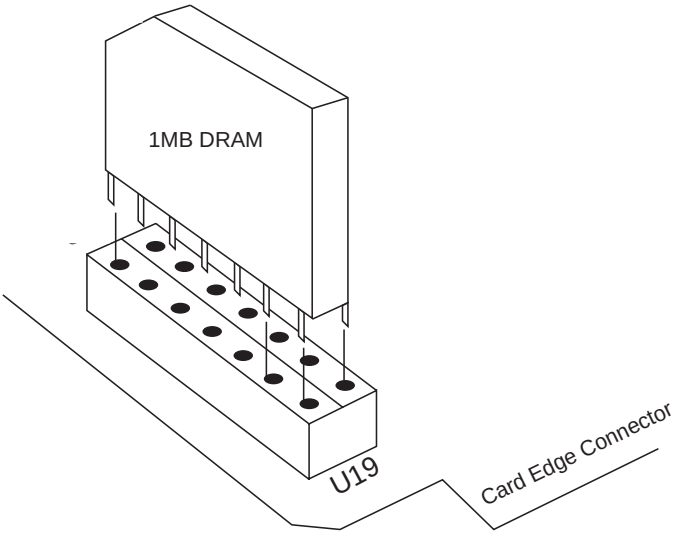

Figure 3–2 DRAM Installation

DESCRIPTION

The SETUP program defines the 6012 system parameters for CPU clock speed, COM1, memory test, boot options, number and size of floppy drive(s), SSD1 flash size, clock option and number of line printers. The 6012 is shipped with default configuration parameters stored in the EEPROM, U23. You make changes to these parameters by running the SETUP program which is stored on the BIOS drive. Each time you make a change to your system's configuration, you must rerun SETUP.

6012 SETUP Parameters	Description	Default
COM1 Console Baud Rate	Specifies communications rate between your PC and the 6012 when no video card is in use.	9600
Power-on Memory Test	Extensive memory testing performed on bootup.	Enabled
SSD1 Device	Specifies the type of memory device installed in SSD1.	512K Flash (two 256Ks as 1 disk)
Boot from	Specifies the default boot drive.	BIOS drive using ROM-DOS
Number of Floppy Drives	Specifies the number of floppy drives attached.	0
Floppy Drive Size	Specifies size of first floppy drive.	1.44 MB
DS Clock Installed	Specifies whether you have a DS-1216DM installed in SSD2.	No
Number of line printers	System will automatically check to verify if line printer port(s) exist	Auto check

RUNNING SETUP

If you are running SETUP for the first time and have not previously saved and autoexecuted your program, we recommend you keep the default setting, "Boot from: BIOS drive using ROM–DOS". The 6012 will continue to boot from the default BIOS drive until you have verified that your program files are successfully saved to SSD1. You can also test your program before making changes for autoexecution. Once your program is tested and verified, you can run SETUP and make changes so that your program will autoexecute and "Boot from SSD1 using ROM–DOS".

1. Make sure you have established a serial communications link between the 6012 and your PC.

2. Type:

   ```
   C:SETUP
   ```

   NOTE: If you are not booting from the BIOS drive, the drive designator may differ.

3. The system will display the 6012 setup parameters and available options. Select the option by pressing the space bar until the correct information appears, then press <enter>. Press <ESC> if you want to exit setup without saving your responses.

   - COM1 Console Baud Rate:
     1200
     2400
     4800
     9600
     19200
     38400
     57600
     115200

The following messages may appear:

```
NOTE:  To use COM1 as the console at a speed
other than 9600 baud, you must install the
BIOS boot jumper. (W2[3–4])

NOTE:  TRANSFER may have problems when rates
are above 19200 baud.  Higher baud rates are
more reliable when CPU speed is fast.
```

- Power on memory test:
  Enabled
  Disabled

You may want to disable the memory test to speed up the boot process.

- SSD1 device:
  none
  256K Flash (N28F020) in SSD1A
  512K Flash (2–256Ks) as one disk
  512K Flash (2–256Ks) as two disks

When configuring the 6012, you have the option to setup the 256K flash EPROMs as one 512K disk (SSD1A) or two 256K disks (SSD1A and SSD1B).

NOTE: After setting the SSD1 device, use DISKSAVE/ DISKSEND to program the flash. The message “Device not found from MEMDRIVE.SYS” displays until the device is programmed.

- Boot from:
  BIOS drive using ROM–DOS
  SSD1A using ROM–DOS
  SSD1B using ROM–DOS
  Floppy or Hard drive
  SSD1A using User supplied DOS
  SSD1B using User supplied DOS

NOTE: IF NONE was selected for SSD1 device type the SSD1 boot options are not available.

If jumper W2[3–4] is not installed and you selected an option other than BOOT FROM BIOS DRIVE USING ROM–DOS, the following message will also appear:

```
NOTE  To boot from the specified device you must
install the BIOS boot jumper. (W2[3–4])
```

We recommend that you do not change this option until you have saved and verified your program files in SSD1. If booting from the BIOS drive, the No Video jumper, W2[1–2], is ignored.

- Number of floppy drives:
  0, 1, 2

A maximum of 1 floppy drive is possible if booting from SSD1 and using your own DOS. See Chapter 14, "Using Your Own DOS" for details. The following message will appear if you select one floppy disk and you boot from SSD1 with your own DOS:

```
NOTE:  Connect the floppy to the second floppy
connector.  The drive will be known as B:
```

- Floppy drive 1 size:
  360K
  1.2 MB
  720K
  1.44 MB

- Floppy drive 2 size:
  360K
  1.2 MB
  720K
  1.44 MB

These two options only display if you have specified that a floppy drive (s) is attached to the 6012.

- DS clock installed:
  Yes
  No

- Number of line printers:
  Auto Check
  0
  1
  2
  3

If you select Auto Check, the system automatically checks the LPT1 printer port to verify that a printer is available by writing a pattern to the printer data lines during boot–up or reset. If you have a non–printing device attached to the LPT1 port, e.g., MPB–16PC and do not want data written to that port during boot–up, deselect the Auto Check option.

```
Press ENTER to SAVE the changes or
Press ESC to EXIT without saving the changes.

Saving options.
Options saved.
```

Depending on the options you have selected, the system may display the following message:

```
You must reset for these options to take effect.
```

SETUP EXAMPLE

The following example configures a system with 256K flash in SSD1A, a DS–1216DM calendar/clock in SSD2, and booting from SSD1A with ROM–DOS:

```
OCTAGON SYSTEMS CORPORATION
5012A/6012 SETUP UTILITY V4.30
(Press SPACE to CHANGE, ENTER to ACCEPT, ESC to
EXIT)

COM1 Console Baud Rate:  9600
Power on memory test:  Disabled
SSD1 device: 256K FLASH (N28F020) in SSD-1A
Boot from:  SSD1 using ROM–DOS
Number of floppy drives: 0
DS clock installed:  Yes
Number of line printers:  Auto check

Press ENTER to SAVE the changes or
Press ESC to EXIT without saving the changes.

Options Saved.
You must reset for these options to take effect.

C:\
```

CHAPTER 5 SAVE & RUN PROGRAMS

SAVE AND RUN YOUR PROGRAMS ON THE 6012

Once you have written, tested and debugged your application, you can then save it to the flash in SSD1A/B. When you reboot the 6012, your program will automatically load into DOS memory and execute.

This chapter tells you:

1. How to save an application program to SSD1;

2. How to autoexecute the program from the 6012; and

3. How to override autoexecution of your program.

The information in this chapter assumes you will be using ROM–DOS in your application. Some Microsoft programs make undocumented DOS calls. With ROM–DOS, an error will be returned when an undocumented DOS call is made, causing your program to operate unpredictably. We recommend booting from SSD1, using your own DOS, when using programs with undocumented DOS calls. Refer to Chapter 14, "Using Your Own DOS", for more information on saving and autoexecuting programs.

This chapter also assumes you will be using the 6012 without a video card/monitor. If you are using these devices, refer to Chapter 12, "Video and Keyboard", for more information on transferring and saving programs.

SAVING YOUR PROGRAM

Saving your program to SSD1 is accomplished in two steps:

1. Run SETUP to define the size of the flash in SSD1 and default boot option. Refer to Chapter 4, "SETUP" for more information.

2. Save your program and supporting files from your PC to the 6012.

Saving Program and Support Files

In addition to your application program, you must also transfer and save support files to the 6012 to ensure proper operation. These files include the ROM–DOS COMMAND.COM, CONFIG.SYS, AUTOEXEC.BAT and other files specific to your application. ROM–DOS COMMAND.COM is required to boot the 6012 with ROM–DOS from SSD1. AUTOEXEC.BAT defines the routine for autoexecution of your program.

CONFIG.SYS defines the various device drivers of your 6012 system. The following is an example listing of CONFIG.SYS entries for the device drivers included with the 6012. Each of these device drivers is discussed in greater detail in Appendix A, "Software Utilities". Refer to Appendix B for more information on how the 6012 assigns drive designators.

`DEVICE=MEMDRIVE.SYS SSD1A`	Accesses the SSD1 drive
`DEVICE=MEMDRIVE.SYS SSD2`	Accesses the SSD2 drive
`DEVICE=MEMDRIVE.SYS BIOS`	Accesses the BIOS drive
`DEVICE=MEMDRIVE.SYS BASE 136/NOTIFEMS`	Accesses a virtual drive in DOS base memory
`DEVICE=MEMDRIVE.SYS EMS`	Accesses the virtual drive in extended memory

NOTE: SSD1 and SSD1A are equivalent. SSD1B will display "SSD1B not installed" if SSD1 was previously programmed as a 512K disk.

We recommend you include in your CONFIG.SYS file the entry DEVICE=MEMDRIVE.SYS BIOS. This allows you to easily access utility programs that are located on the BIOS drive. For example, if you make changes to your program, you will need to rerun the SETUP program.

NOTE: MEMDRIVE.SYS will report "Device Not Present" with a new, unprogrammed flash EPROM installed. Program the flash EPROM using DISKSAVE and DISKSEND, then reboot. Refer to the following section for more information.

To Save Files to the 6012 SSD1

The following information steps you through transferring, saving and autoexecuting a program using the DEMO application. All the files for this application are located on the 6012 utility disk in the DEMO directory.

1. Create the directory MPC:

   ```
   MD C:\MPC
   ```

2. Insert the utility diskette into drive A: and enter the following:

   ```
   XCOPY A:\*.* C:\MPC /S
   ```

3. Format a floppy disk on your PC and copy the following files from the C:\MPC\DEMO directory, onto the floppy disk:

   ```
   COMMAND.COM
   CONFIG.SYS
   AUTOEXEC.BAT
   MEMDRIVE.SYS
   DEMO.EXE
   ```

4. So that you can access the DISKSEND.EXE program, change directories as follows (you may also want to copy PC SmartLINK into this directory):

   ```
   CD \MPC\6012
   ```

5. Establish a serial communications link between your PC and the 6012. Configure your PC as the main console for the 6012, i.e., no video card or keyboard is available.

6. On the 6012, execute the DISKSAVE program by typing:

   ```
   C>DISKSAVE
   ```

7. Once a connection is made, exit from PC SmartLINK using the F9 key.

8. From your PC, execute the DISKSEND program by typing:

   C:>DISKSEND

   When prompted for the “Input drive to send”, enter the drive designator for the newly created floppy disk. The system will then erase and program the flash. This will take several minutes. Using a RAM disk or virtual drive on your PC in place of the floppy disk will considerably shorten the time it takes to program the flash.

   NOTE: If you are using PC SmartLINK from COM2 on your PC, you must use the /C2 switch with DISKSEND. Refer to the DISKSEND section in Appendix A for more information.

   The two programs DISKSAVE and DISKSEND transfer and save the files on the floppy disk to SSD1. The DISKSAVE program resides on the BIOS drive of the 6012 and the DISKSEND program resides on the 6012 Utility Disk.

9. Restart PC SmartLINK by typing "exit".

10. If you are saving your program to SSD1 for the first time or you are running the DEMO program, the system should boot from the BIOS drive since you did not change the default “Boot from” option in SETUP. Type:

    ```
    C:RESET
    ```

11. Display and verify the contents of SSD1:

    ```
    DIR E:
    ```

12. Test run the DEMO program:

    ```
    E:DEMO
    ```

13. If there are no problems, you are now ready to autoexecute your program from SSD1.

AUTOEXECUTING YOUR PROGRAM

Once you've saved your program and other files to SSD1 you may boot from SSD1 and autoexecute your program. You cannot boot from SSD2.

1. Make sure jumper W2[3–4] is installed. (This is the default setting.)

2. Establish a serial communications link between your PC and the 6012.

3. Make sure the name of your application program is listed in the AUTOEXEC.BAT file e.g. DEMO.

4. Run SETUP and specify "Boot from: SSD1 using ROM–DOS".

   ```
   E:SETUP
   ```

   NOTE: The drive designators will change depending on your system configuration.

5. Type:

   ```
   E:RESET
   ```

   The 6012 will reset and boot from SSD1. SSD1 now becomes drive A.

OVERRIDING PROGRAM AUTOEXECUTION FROM SSD1

If you want to make changes to your program and need to override autoexecution of your program, you must reboot the 6012 from the BIOS drive. There are two options available:

1. You can rerun SETUP to change the "Boot from" option to "BIOS drive with ROM–DOS". If you included the line DEVICE=MEMDRIVE.SYS BIOS in your CONFIG.SYS file, you can access the SETUP program on the 6012 BIOS drive.

2. You can remove jumper W2[3–4]. However, this may be inconvenient and/or impossible if you are making program changes from an off site location.

The following information discusses each of these options in detail.

To Rerun SETUP:

1. Make sure you have established a serial link between your PC and the 6012.

2. To execute SETUP which is on the BIOS drive, type:

   ```
   E:SETUP
   ```

   NOTE: The drive designator will vary depending on the hardware configuration of the 6012.

3. Select the “Boot from BIOS drive using ROM–DOS” option.

4. Type:

   ```
   E:RESET
   ```

5. Make the necessary changes to your application and copy the new files to a floppy disk or RAM disk.

6. Rerun DISKSEND and DISKSAVE to save your new files to SSD1. Verify and test your program.

7. Rerun SETUP to change the default boot drive to “SSD1 using ROM–DOS”.

8. Reset the 6012.

Removing Jumper W2[3–4]

If the SETUP program is not accessible from SSD1, you must remove jumper W2[3–4]. This configuration uses video, and boots from the BIOS drive using ROM–DOS. COM1 is configured for 9600, N, 8, 1. The following message appears when you reboot the 6012:

```
BIOS boot jumper (W2[3–4]) not installed, boot-
ing from the BIOS drive and ignoring the video
jumper setting.
.
.
6012 C:\>
```

W2: COM1/Video and BIOS Boot Options	
Pin#	**Description**
[1-2]* Jumpered	Use video card (if available) or COM1 as the console.
[1-2] Not jumpered	No console port. This leaves COM1 available for use with your application program when no video card is present.
[3-4]* Jumpered	Boot using all the information saved by SETUP.
[3-4] Not jumpered	Boot using all the information saved in SETUP, except: Boot from the BIOS drive. If no video card exists, use 9600, N, 8, 1 settings for COM1 console and use COM1 as the console port (ignores W2[1-2]).

* = default

After booting from the BIOS drive, use the DISKSAVE and DISKSEND programs to download new files to SSD1. Before rebooting the 6012, be sure to reinstall jumper W2[3–4] if you want the 6012 to boot from SSD1, (or the drive specified in SETUP).

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DESCRIPTION

The 6012 has two serial ports, COM1 and COM2, that are Intel 8250 compatible. They can be used for interfacing to a printer, terminal or other serial device. When COM1 (J4) is designated as the main console I/O, it can be used for program development. During run time, it can be used in the same manner as COM2 (J3). It can be used with printers, displays, or other devices that do not require handshaking during run time.

J4: COM1 and J3: COM2 Serial Ports		
Pin #	**Function**	
1	In	DCD
2	In	DSR
3	In	RxD*
4	Out	RTS
5	Out	TxD*
6	In	CTS
7	Out	DTR
8	In	RI
9	Out	Gnd
10	Out	+5

* = active low

These ports support 5–, 6–, 7–, or 8–bit word lengths, 1, 1.5, or 2 stop bits, and baud rates up to 115.2K. Default parameters for both ports are 9600 baud, 8 data bits, no parity, and 1 stop bit.

Use a VTC–9F cable to connect the ports to the external serial equipment. The pinout of the connector allows you to plug the cable directly into a 9–pin PC serial connector. When interfacing the 6012 to your PC, you will need to use a null modem adapter.

COM1 AS CONSOLE I/O

When the 6012 system boots up, it looks for the video card to determine whether or not to send and receive information via a keyboard and monitor, or across the serial link on COM1 to the PC. Jumper block W2[1–2] determines the configuration for COM1 as well as the default boot options.

W2: COM1/Video and BIOS Boot Options	
Pin#	**Description**
[1-2]* Jumpered	Use video card (if available) or COM1 as the console.
[1-2] Not jumpered	No console port. This leaves COM1 available for use with your application program when no video card is present.
[3-4]* Jumpered	Boot using all the information saved by SETUP.
[3-4] Not jumpered	Boot using all the information saved in SETUP, except: Boot from the BIOS drive. If no video card exists, use 9600, N, 8, 1 settings for COM1 console and use COM1 as the console port (ignores W2[1-2]).

* = default

If there is no video card and W2[1–2] is installed, and you are not booting from the BIOS drive, the system will communicate via COM1, accepting keyboard input and displaying responses over the serial link. In this case, the serial parameters of COM1 are:

Baud rate – specified by SETUP
Data bits – 8
Stop bits – 1
Parity – none
Interface – RS–232

NOTE: When W2[3–4] is removed, the baud rate defaults to 9600. The TRANSFER program defaults to COM1 as the main console port.

If you are using a video card, you can use the /COM# switch as described in Chapter 12, "Video and Keyboard". Also, refer to the *ROM–DOS User's Guide* for more information about the TRANSFER program.

Some programs which access the video memory directly will not work properly on the 6012 without a video card resident. Refer to the DEMO.BAS program on the utility disk for an example of QuickBASIC modifications. Refer to Chapter 12, "Video and Keyboard," for more information on using a video as the console.

COM2 RS–422/485 COMPATIBILITY

The RS–422/485 compatible port is accessed through COM2 via P3. Make sure W4[1–2] is jumpered for RS–485 prior to using the port.

W4: RS-232 or RS-485 Select	
Pins Jumpered	**Description**
[1-2]	RS-485 Receiver selected
[2-3]*	RS-232 Receiver selected

* = default

You can connect up to 32 units on a multidrop RS–485 network. However, only one transmitter can be active at a time. Although no wire type or maximum wire length is specified in the EIA 485 specification, the EIA 422 specification (which is very similar) lists a maximum length of 4000 ft.

Operating Precautions

The transmitter and receiver are not optically isolated so you must avoid ground loops. Send only signals through the RS–485 lines, not power or power grounds. Power grounds cannot be used as a

reference ground for RS–485 signals. Establish a common ground reference before implementing your 485 network. The maximum common mode voltage output is +/–7V. Refer to the EIA 485 specification for further details on grounding and safety procedures.

Transmitter Control

To turn the transmitter ON and OFF through software control refer to the following table:

6012 Transmitter Control	
Program Statement	**Description**
Write a "1" to I/O location 0C3H	Enables transmitter output I/O location 0C3H, 1
Write a "0" to I/O location 0C3H	Disables transmitter output I/O location 0C3H, 0

Termination Network

Jumper block W3 installs or removes the termination network. A termination network must be installed at the last receiver of the network. Failure to do so may cause spurious oscillation on the receive line and corrupt incoming data.

W3: RS-485 Receiver Termination	
Pins Jumpered	**Description**
[1-3][2-4]*	Termination active
[3-5][4-6]	No termination

* = default

DISABLING INTERRUPTS

The PC Bus does not allow shared interrupts on the bus. You can, however, disable the COM1 and COM2 interrupts (IRQ3 and IRQ4) to allow for other devices which use these interrupts. If COM1 is the console, its interrupt (IRQ4) is in use. COM2 (IRQ3) is not used by the BIOS. To disable interrupts for COM1, write a 0 to 3FC bit 3. To disable COM2 write a 0 to 2FC bit 3.

However, the 6012 now supports three additional interrupts: IRQ9, IRQ10 and IRQ11. Please refer to Appendix B for more information.

COM1CON.COM

The COM1CON.COM program redirects video to the COM1 port when you have a video card and monitor installed. Execute COM1CON from the command line. When you are finished using the console port, reset your system. After boot–up, the system reverts to using the video card and monitor.

Also, some programming languages may not restore the serial parameters after using the COM1 port. COM1CON will restore COM1 as the console. To restore the serial parameters, create a batch file with your application. Specify COM1CON as the last line of the file. For example, TEST.BAT includes the following to execute a QuickBASIC V4.5 (or other language) application named USECOM1:

```
USECOM1
COM1CON
```

Then execute TEST.BAT.

QUICKBASIC NOTES

When QuickBASIC V4.5 opens COM1 as a device, and when the program is completed, it fails to restore COM1's parameters. This causes the keyboard to no longer function. Use COM1CON to restore the parameters. (See the previous section, *COM1CON.COM*.)

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DESCRIPTION

Digital I/O lines can be used to interface with opto–module racks, operate switches, turn on low–current LEDs, and interface with other devices that have TTL input or output (for example, printers and scales). Figure 7–1 shows a typical opto–rack configuration.

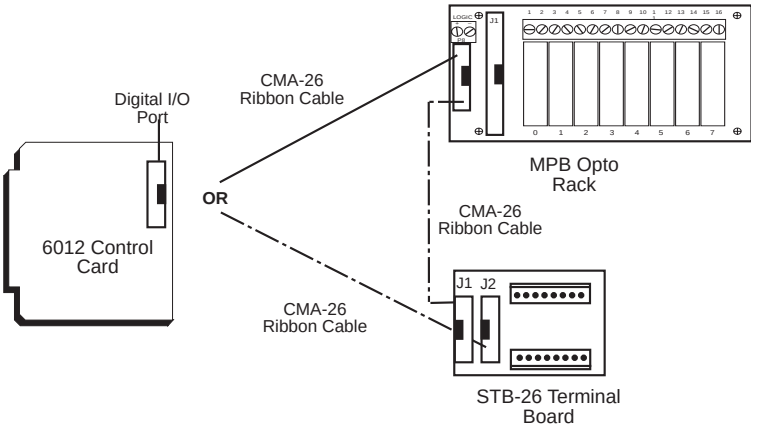

Figure 7-1—Typical Opto Rack Configuration

WARNING: Apply power to the 6012 Control Card before applying an input voltage to the digital I/O lines. This prevents excessive currents from flowing and damaging input devices.

ORGANIZATION OF THE PORTS

The digital I/O lines on the 6012 are supplied by a 82C55 chip. The 82C55 is located in U26, which is connected to J8. On power–up and software or hardware reset, all the 82C55 digital I/O lines in J8 are configured as inputs. All lines are TTL logic level compatible (0–5V) and have 10K pull–up resistors to the 5V supply.

6012 Digital I/O Port: J8		
Port	**I/O Address**	**Description**
A	208H	8 lines which can be programmed as all inputs or all outputs
B	209H	8 lines which can be programmed as all inputs or all outputs. 8 lines interface to a high current driver.
C	20AH	8 lines which can be programmed as one group of 8 lines or two groups of 4 lines as all inputs or all outputs.
Control Register	20BH	

The 82C55 has three ports with eight parallel I/O lines (bits) per port. Each port has a unique I/O address. Port A and Port B can be programmed as all inputs or all outputs. Port C can be programmed in one group of eight lines (all inputs or all outputs) or as two groups of four lines (upper and lower C). The four lines in upper or lower C can each be programmed as all inputs or all outputs. When a line is configured as an output, it can sink a maximum of 2.5 mA at 0.4V and can source over 2.5 mA at 2.4V. When driving opto–modules, the output can sink 15 mA at 1.0V.

NOTE: Port B uses a ULN2804 high current Darlington array in IC socket U28. The array outputs are open collector and can drive loads as high as 100 mA @ 50V. With the ULN2804 installed, port B can only be used as an output port. Port B can be converted to standard 0–5V I/O with the supplied jumper block installed in socket U28. Install the jumper block leaving pins 9 and 10 open. If the jumper is incorrectly installed, VCC – pin 10, will be shorted to GND – pin 9.

CONFIGURING THE 82C55 DIGITAL I/O LINES

On power–up or reset, all ports are inputs. You can alter which ports are inputs or outputs by writing a control command to the control register in the 82C55.

6012 Digital I/O Control Commands					
HEX	**DEC**	**Port A***	**Port B***	**Upper Port C***	**Lower Port C***
80H	128	OUT	OUT	OUT	OUT
81H	129	OUT	OUT	OUT	IN
82H	130	OUT	IN	OUT	OUT
83H	131	OUT	IN	OUT	IN
88H	136	OUT	OUT	IN	OUT
89H	137	OUT	OUT	IN	IN
8AH	138	OUT	IN	IN	OUT
8BH	139	OUT	IN	IN	IN
90H	144	IN	OUT	OUT	OUT
91H	145	IN	OUT	OUT	IN
92H	146	IN	IN	OUT	OUT
93H	147	IN	IN	OUT	IN
98H	152	IN	OUT	IN	OUT
99H	153	IN	OUT	IN	IN
9AH	154	IN	IN	IN	OUT
9BH	155	IN	IN	IN	IN

*Ports A and B must be either all inputs or all outputs. Each half of Port C is controllable. Upper C includes bits 4 through 7 and lower C includes bits 0 to 3.

If you want all three ports to be outputs use:

```
OUT &H20B, &H80
```

Port A will now output all “1”s after:

```
OUT &H208, &Hff
```

or all “0”s after:

```
OUT &H208,0
```

OPTO–MODULE RACK INTERFACE

You can interface digital I/O lines from J8 to an MPB–8, MPB–16, or MPB–24 series opto–module rack via a CMA–26 cable. One end of the CMA–26 cable plugs into J8 and the other plugs into an MPB–8, MPB–16, or MPB–24 mounting rack. Use isolator modules when driving or receiving signals from high voltage and/or high current devices. Opto–isolation also eliminates ground loops and significantly reduces the chance that noise will invade the system.

You can also use a CMA–26 cable to connect J8 on the 6012 to a STB–26 terminal board and then to the opto rack. The STB–26 has two 26–pin connectors, one of which plugs into J8; the other plugs into the opto rack.

For either configuration, run a separate line to 5V and ground on the opto–module rack. Use the following table to determine the corresponding opto channel for a particular port.

6012 Opto Rack Interface		
Opto Channels	**82C55 Port**	**I/O Address**
0-3	Lower C	20AH
4-7	Upper C	20AH
8-15	A	208H
16-23	B	209H

INTERFACING TO SWITCHES AND OTHER DEVICES

The STB–26 terminal board provides a convenient way of interfacing switches or other digital I/O devices to the 82C55 digital port on the 6012 Control Card. All 82C55 lines have 10K pull–up resistors. I/O lines at connector J8 can be connected to the STB–26 with a CMA–26 cable. Parallel I/O devices are then connected to the screw terminals on the STB–26.

DESCRIPTION

The 6012 has eight analog input channels that are programmable as single-ended or differential with 0–5V or +/–5V ranges. The resolution is 12 bits on both ranges. A precision reference is included. These channels can be used to measure voltages from transducers, 4-20 mA current loops, thermistors, etc.

Conversion time is 130 uS. The input impedance is 1 Mohm. Voltages as high as +/–16V will not damage the converter. The inputs are terminated with a 20–pin IDC connector.

This chapter shows you how to initialize and use the analog input feature of this card. Additional technical information is found in Appendix C.

CONNECTING TO THE 6012

Analog devices interface to the 6012 via a 20–pin IDC connector at J5 and supports either eight channels single-ended or four channels differential. A STB–20 terminal board provides a connection for field wiring. You can use 12 to 22 gauge solid or stranded wires to connect equipment to the screw terminal. The STB–20 connects to the 6012 using a CMA–20 cable.

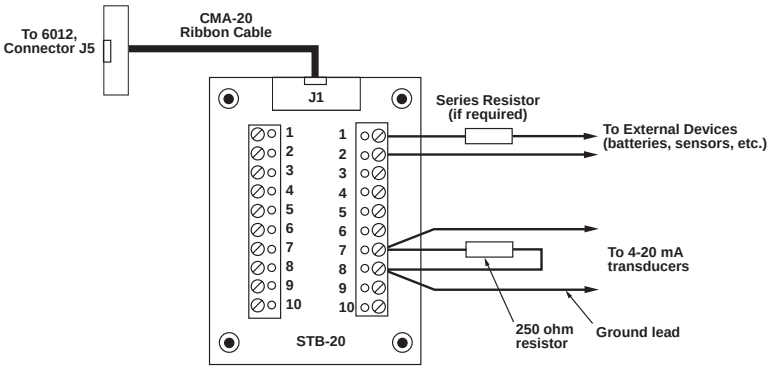

Figure 8-1 — Connecting External Devices to the 6012 via STB–20

INITIALIZING ANALOG CHANNELS

Each analog channel must be initialized with software commands. The 6012 card comes with a utility disk containing software drivers. Refer to the source code listings and README.DOC for information on configuring and reading the analog channels. You can have up to eight single–ended inputs, four differential inputs or a combination.

Refer to the following table for corresponding J5 connector pins to the 6012 channels.

J5: Analog Port			
Pin #	**Function**	**Pin #**	**Function**
1	CH0	11	CH5
2	Gnd	12	Gnd
3	CH1	13	CH6
4	Gnd	14	Gnd
5	CH2	15	CH7
6	Gnd	16	Gnd
7	CH3	17	NC
8	Gnd	18	NC
9	CH4	19	NC
10	Gnd	20	NC

NOTE: Only the following channels may be used for the differential mode: 0, 2, 4 and 6.

MEASURING HIGH VOLTAGES

Voltage ranges higher than +5V can be measured by placing a resistor in series with the input:

Analog Input Voltages	
Input Voltage	**Resistor**
5	0
6	200K
10	1M
12.5	1.5M
24	3.8M

If you have a voltage range other than that listed above, use the following formula to determine the series resistance:

```
Rs=Vi x 200,000 - 1,000,000
```

Rs is the resistor value in ohms in series with the input. Vi is the maximum input voltage.

NOTE: If the result of your calculation is negative or zero, a series resistor is not necessary.

WARNING: If any input voltage exceeds +5V or is less than –5V, all channel readings may be erroneous.

CONVERTING ANALOG MEASUREMENTS

Input readings can be converted to engineering units of measurement by performing scaling calculations in your program. In the unipolar mode, the input value returned will always be in the 0–4095 range because the A/D converter is 12 bits. Thus, 0 corresponds to 0.000V and 4095 corresponds to +4.9988V. When using a channel in the bipolar range, the value returned is interpreted differently. Zero counts is 0V, 2047 is +4.9975, 4095 is –.0024V and 2048 is –5.000V.

To convert the returned values to voltage, use the following formulas:

Unipolar 0 to 5V

```
voltage = .00122 * converted value
```

Bipolar +/–5V

1. Mask of bit 11 of the returned A/D value to determine if the returned value is negative.
2 If the returned A/D value is negative then convert the results.
3. Scale the results.

QuickBASIC example:

```
mask=&H800                  'This will mask bit 11 of A/D value
negtest=count AND mask      'Test for bit 11
IF negtest=&H800 THEN count=-(4096-count)
                            'Convert if bit 11 set
voltage=count*(5/2048)      'Scale the results
```

A/D Conversion Examples

Example 1:
If you want to measure the results of an A/D conversion in volts and the voltage range is 0 to +5V, divide 5 by 4095 to obtain the value of K.

```
K = 5/4095
K = .001221
```

To obtain the final value for the equation in volts:

```
variable = .001221 * A/D value
```

Example 2:
If you want to measure a 0 to 200 PSI pressure transducer with a 0 to +5V output, divide 200 by 4095 to obtain the value of K.

```
K = 200/4095
K = .0488
```

To obtain the final value for the equation in PSI:

```
variable = .0488 * A/D value
```

Measuring 4-20 mA Current Loops

The 6012 can measure devices with 4–20 mA current outputs with slightly reduced resolution. A 4–20 mA current loop is converted to voltage by placing a shunt resistor across the input of the channel to ground.

An analog converter with a 0 to +5V range would require a 250 ohm shunt resistor. This resistor value provides the minimum and maximum voltages that could be read using this voltage range (+1V to +5V).

Readings from a 4–20 mA loop can be converted to engineering units of measurement by performing scaling calculations in your program.

K is the scaling constant. The formula for determining the value of K is similar to that described earlier except the count range changes. Since the measurement range is 1 to 5V, the count range is reduced by 20% to 3277:

```
K = 5/3277
K = .0015258
```

There is an additional factor that needs to be introduced. Since the lowest value that can be read in our example is 1V, this offset must be subtracted from all readings. This offset is computed by subtracting the range count of the A/D converter by its reduced amount, which is the effective range:

```
offset = count range - new count range
offset = 4096 - 3277
offset = 819
```

The program line then becomes:

```
variable = .0061 * A/D value
```

NOTE: If the current loop line breaks, the system returns a negative value.

CALIBRATION

The A/D converter can be calibrated using the 6012 internal voltage reference or an external voltage reference. For 12–bit accuracy, you must use a voltmeter with an accuracy of 0.02% or better.

To calibrate:

1. Connect the digital voltmeter ground lead to J5, pin 2 (Gnd).

2. Connect the digital voltmeter "+" lead to the test point TP1 at the upper right–hand corner. Refer to Figure 2–2 (page 14).

3. Adjust trim pot R3 for 5.000 VDC.

CHAPTER 9 LPT1 PRINTER PORT

DESCRIPTION

The LPT1 parallel port has a 20–pin connector. It can be used to support a number of devices:

1. PC compatible printer
2. 17 digital I/O lines
3. Matrix keypad
4. Multiline displays

PRINTER

To install a printer:

1. Connect a CMA–20 cable from the LPT1 port to the PSKI–1 interface card.

2 Connect your printer to the DB–25 connector on the PSKI–1.

DIGITAL I/O LINES

When used only for digital I/O, a CMA–20 cable connects the port to a STB–20 terminal board for connection of field wiring.

J2: LPT1 Printer/Parallel Port		
Pin #	**Function**	
1	Out	STB*
2	Out	AFD*
3	I/O	Data 0
4	In	ERR*
5	I/O	Data 1
6	Out	INIT*
7	I/O	Data 2
8	Out	SLIN*
9	I/O	Data 3
10	I/O	Data 4
11	I/O	Data 5
12	I/O	Data 6
13	I/O	Data 7
14	In	ACK*
15	In	BUSY
16	In	PE
17	In	SLCT
18	Out	+5V
19	Out	Gnd
20	Out	Gnd

* = active low

DISPLAYS

The LPT1 port supports either vacuum fluorescent (DP series) or liquid crystal (LCD) displays. To interface the displays to the 6012, use the LCD–IFB interface board for LCD displays and the DP–IFB interface board for the DP series displays. A CMA–20 cable is required to connect the interface board to the 6012. The

program DISPLAY.EXE (found on the 6012 utility disk) provides an easy method to use the display. Please refer to the file DISPLAY.DOC on the utility disk for information on how to initialize and use the display.

To install a display:

1. Connect a CMA–20 cable from the LPT1 port to the DP–IFB or LCD–IFB.

2. Connect the display cable to the interface board.

3. Refer to the file DISPLAY.DOC for more information on initializing and using the display.

LPT1CON allows the display to be used as the console device. To do this, add the DISPLAY and LPT1CON commands to your AUTOEXEC.BAT file. Keyboard input can be from a local keyboard or from COM1 (if no video card is installed and if W2[1-2], no video jumper, is installed).

KEYPAD

LPT1 also supports 4x4 matrix keypads. To interface the keypad to the 6012, use either the LCD–IFB or DP–IFB interface board. A CMA–20 cable is required to connect the interface board to the 6012. The program DISPLAY.EXE (found on the 6012 utility disk) provides an easy method to use the keypad. Please refer to the file DISPLAY.DOC on the utility disk for information on how to initialize and use the keypad.

To install a keypad:

1. Connect a CMA–20 cable from the LPT1 port to the DP–IFB or LCD–IFB.

2. Connect the keypad cable to the interface board.

3. Refer to the file DISPLAY.DOC for more information on reading the keypad.

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DESCRIPTION

Up to 68 bytes (that is, 34 words) of user-definable data can be saved in the serial EEPROM. The serial EEPROM does not require battery backup to maintain the data when the system power is off. The serial EEPROM is easily accessable via software interrupts by most programming languages. The software interrupt used is INT 17 subfunction 0FEH (read) and INT 17 subfunction 0FFH (write).

READING THE SERIAL EEPROM

The following Borland C example reads word 2:

```
_AH = 0xfe;      /* read */
_BX = 2;         /* index for word in serial EEPROM (0-33)*/
_DX = 0xffff;    /* always set to FFFFH */
geninterrupt(0x17);  /* do interrupt */
EEdata = _AX; /* serial EEPROM data returned in AX */
```

WRITING TO THE SERIAL EEPROM

The following Borland C example writes 1234H to word 2:

```
_AH = 0xff;      /* write */
_BX = 2;         /* index for word in serial EEPROM (0-33)*/
_CX = 0x1234;  /* Data to write */
_DX = 0xffff;    /* always set to FFFFH */
geninterrupt(0x17);  /* do interrupt */
```

NOTE: During programming of the EEPROM, the power LED may momentarily flash.

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DESCRIPTION

The watchdog timer is a failsafe against program crashes or processor lockups. It times out every 1.2 seconds.

The address for the watchdog timer enable port is 380H. The timer is software disabled when you write a 0 to 380H. This is the default setting on power–up or reset.

When you want to start using the watchdog timer, write a "1" to 380H. You must write any data to 201H within the timeout period to prevent the board from resetting. When you write to 201H, the timer resets and begins counting down again. The following table lists the software enable and strobe information.

Watchdog Timer Software & Strobe Addresses	
Enable Base Address 380H	**Strobe Base Address 201H**
Timer disables 0*	Write any data to this address to reset timer
Timer enabled 1	

* = default

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CHAPTER 12 VIDEO AND KEYBOARD

DESCRIPTION

You can use a video card with monitor and a keyboard with the 6012 instead of using your PC keyboard and monitor over a serial communications link. The speaker and keyboard lines are brought out to a 10–pin connector via a CMA–10 cable. The Octagon PSKI–1 interface provides a PC compatible connector for the keyboard and provides screw terminals for the speaker. Any XT compatible keyboard may be used.

This chapter tells you:

1. How to use a video monitor and keyboard with a 6012;

2. How to save a program from your PC to the 6012; and

3. How to transfer files between your PC and a 6012 with a video and keyboard only.

USING A VIDEO MONITOR AND KEYBOARD

You will need the following equipment (or equivalent) to use your 6012 with a video and keyboard:

6012 PC Control Card
Micro PC Card Cage
Power Module
5420 Video Card
XT Compatible Keyboard
PSKI–1 Interface Board
VTC–9F Cable
Monitor
CMA–10 Cable
Null modem adapter

1. Configure the 6012 for a video card by installing jumper W2[1–2]. Boot the 6012 from the BIOS drive.

W2: COM1/Video and BIOS Boot Options	
Pin#	**Description**
[1-2]* Jumpered	Use video card (if available) or COM1 as the console.
[1-2] Not jumpered	No console port. This leaves COM1 available for use with your application program when no video card is present.
[3-4]* Jumpered	Boot using all the information saved by SETUP.
[3-4] Not jumpered	Boot using all the information saved in SETUP, except: Boot from the BIOS drive. If no video card exists, use 9600, N, 8, 1 settings for COM1 console and use COM1 as the console port (ignores W2[1-2]).

* = default

2. Connect the video card to the video monitor.

3. Connect the PSKI–1 to J1 (keyboard/speaker port) on the 6012 using a CMA–10 cable and then connect the keyboard to the PSKI–1.

4. Install the 6012 and video card into the card cage.

5. Boot the 6012 from the BIOS drive with COM1 set as the main console I/O. The BIOS messages should appear on your video monitor:

```
Octagon 5012A/6012 BIOS Vers. x.xx
Copyright (c) 1991-1996, Octagon Systems, Corp.
All Rights Reserved
```

Saving a Program to the 6012

1. Create a bootable floppy disk with COMMAND.COM, CONFIG.SYS, AUTOEXEC.BAT, your applications and other supporting files. (Refer to Chapter 5, "Save and Run Programs," if you are using ROM–DOS. Refer to Chapter 14, "Using Your Own DOS," if using other versions of DOS.)

2. Copy the program DISKSEND from the 6012 utility disk to your PC.

3. Connect a VTC–9F cable with a null modem adapter between COM1 of your PC to COM1 of the 6012.

4. On the 6012, execute the DISKSAVE program.

5. From your PC, execute the DISKSEND program by typing:

   C>DISKSEND

   When prompted for the “Input drive to send”, enter the drive designator for the newly created floppy disk. The system will then erase and program the flash. This will take several minutes.

   The two programs, DISKSAVE and DISKSEND, transfer and save the files on the floppy disk to SSD1. The DISKSAVE program resides on the BIOS drive of the 6012 and the DISKSEND program resides on the 6012 utility disk.

Transferring Files to the 6012

1. Connect a VTC–9F cable with a null modem adapter between COM1 of your PC to COM1 of the 6012.

2. Execute the TRANSFER program from the 6012 to receive a file from your PC.

   C:\> TRANSFER /COM1 /R /V <drive>*filename.ext*

   <drive> is a virtual drive on the 6012 where you are transferring the file.

filename.ext is the name of the file which you are receiving from your PC.

3. Execute the TRANSFER program on your PC to send a file from your PC.

   C:\> TRANSFER /COM1 /S /V <drive><path>*filename.ext*

   filename.ext is the name of the file on the PC which you are sending to the 6012.

Transferring Files from the 6012

1. Connect a VTC–9F cable with a null modem adapter between COM1 of your PC to COM1 of the 6012.

2. Execute the TRANSFER program from the 6012 to send a file to your PC.

   C:\> TRANSFER /COM1 /S /V <drive><path>*filename.ext*

   filename.ext is the name of the file on the 6012 which you are sending to your PC.

3. Execute the TRANSFER program on your PC to receive a file from the 6012.

   C:\> TRANSFER /COM1 /R /V <drive><path>*filename.ext*

   filename.ext is the name of the file on the PC which you are receiving from the 6012.

CHAPTER 13 EXTERNAL DRIVES

DESCRIPTION

You can use your 6012 Control Card with one or two floppy disk drives and/or a hard disk drive. This chapter includes installation and operation instructions for each device. Also, refer to the instruction manuals included with each device.

For each of the devices below, the first step is to install the 6012 Control Card into the Micro PC backplane. Refer to the instructions in Chapters 4–5 if you will be booting from the BIOS drive or from SSD1 using ROM–DOS. If you are booting up using your own DOS, refer to the instructions in Chapter 14.

You can also boot your 6012 from a floppy or hard disk. However, MEMDRIVE.SYS must be placed in your CONFIG.SYS file in order for the system to access the memory device in SSD1A, SSD1B, SSD2, or the BIOS drive.

FLOPPY DISK DRIVES

You can add two floppy disk drives by using the 5800A Floppy/ Hard Disk Card with your 6012 card.

1. Install the 6012 Control Card.

2. Install the 5800A Floppy/Hard Disk Card and the 5814 Floppy Disk Drive, following the instructions included with these products.

3. Plug the card cage power cable into an AC outlet. Turn on the power supply. This supplies power to the floppy disk drive (via the ribbon cable) as well as to the cards in the card cage.

4. Run SETUP to set the number of floppy drives and their size.

   NOTE: Two drive designators will be assigned regardless of how many drives you specify in SETUP.

5. When you boot from either the BIOS or SSD1 drives using ROM–DOS, the floppy drive designations will be A: and B:.

NOTE: When you boot from SSD1 using your own DOS, only one floppy drive will be available, since DOS thinks that SSD1 is drive A:. Connect your floppy disk drive to connector J3 (FDC drive B) and access it with B:. If you boot from the floppy disk, the first floppy drive is drive A: and the second is drive B:.

6. If, in SETUP, you entered 0 drives, access to either A: or B: will generate an error message:

   ```
   ABORT RETRY FAIL?
   ```

   Press <A> or <F> to cancel your request.

   If, in SETUP, you entered 1 drive, then you can access drive A: and requests to access drive B: result in the following prompt:

   ```
   INSERT FLOPPY INTO DRIVE B: AND PRESS ANY KEY
   ```

   Insert another floppy disk and press a key. The program then accesses your one drive as drive B:. When the request is complete, a prompt gives you the opportunity to replace the original A: floppy. In this way, systems with only one drive can copy files from one floppy to another.

   If, in SETUP, you entered 2 drives, access to either drive A: or drive B: works just as it would in a PC.

If you want to boot from the floppy disk using your own DOS refer to Chapter 14, "Using Your Own DOS."

HARD DISK DRIVE

The 5800A Series of Micro PC Floppy/Hard Disk Drive Cards support 16–bit, IDE type hard drives. The disk drive designation for a hard drive will be D: if you boot from ROM–DOS and C: if you boot using your own DOS.

CHAPTER 14 USING YOUR OWN DOS

DESCRIPTION

Use these instructions instead of those in Chapter 2 if you are using your own DOS and not the ROM–DOS installed on the BIOS drive. You can boot from SSD1 or a floppy/hard disk when you use your own DOS. Initially, you will need to boot from the BIOS drive so that you can run SETUP and specify your system parameters, including where you want to boot from.

GETTING STARTED

1. Make sure jumper W2[1–2] and W2[3–4] are installed.

2. Configure jumper W1 for the DRAM memory size that you have in your system:

W1: DRAM Size	
DRAM	**Pins Jumpered**
1 MB	[1-2]
256K	[2-3]

3. Install memory devices in SSD1 and SSD2 if they aren't already in place. To install memory devices refer to Chapter 3, "RAMs and EPROMs."

4. Verify that power to the card is OFF and install your 6012 Control Card and peripheral equipment, except for the video card, into the card cage

   WARNING: Plugging the card in backwards will destroy the card!

5. A logon message similar to the one below will appear on your PC monitor:

```
Octagon 5012A/6012 BIOS Vers. x.xx
Copyright (c) 1991-1996 Octagon Systems, Corp.
All Rights Reserved
```

If you do not get the proper logon message:

- Remove W2[3–4]. Also check the serial parameters of your PC to make sure they are set correctly. Parameters should be 9600 baud, 8 data bits, no parity, and 1 stop bit.
- Make sure a video card is not installed.
- If the parameters are set correctly and the system still does not respond, refer to Chapter 15, "Troubleshooting."

6. Use the directory command to make sure your equipment and software are working properly. Type:

   ```
   DIR <return>
   ```

   A directory listing of ROM–DOS files stored in the BIOS socket should appear (this is the default drive).

7. You are now ready to run SETUP to select boot, memory and drive options.

SELECTING BOOT, MEMORY, AND DRIVE OPTIONS

You must specify your system's parameters before you can save and run programs with the 6012 card. You define parameters by running the SETUP program. For a complete list of the options included in SETUP, please refer to Chapter 4, "SETUP." As shipped, the BIOS drive is selected as the default boot device.

Autoexecuting the 6012 from a Floppy/Hard Disk Drive

1. Type:

   ```
   SETUP
   ```

2. Select the answer to each question by pressing the space bar until the correct information appears, then press <ENTER>. Press <ESC> if you want to exit SETUP without saving your answers (or changes to the answers).

   When you reach the "Boot from" option, press the spacebar until "Floppy or Hard Disk" appears then press <RETURN> until SETUP is complete.

3. After completing the information for SETUP, insert your bootable disk (which contains your DOS) into the floppy disk drive.

4. Reboot the system by typing:

   ```
   RESET
   ```

   Your system will boot from the floppy disk.

Autoexecuting from SSD1 with/without a Floppy Drive Installed

1. Create a bootable floppy disk on your PC and copy your DOS version of COMMAND.COM, all device drivers and necessary application files onto the floppy.

2. Copy the file DISKSEND.EXE from the 6012 utility disk to your PC.

3. Establish a serial communications link between your PC and the 6012. Configure your PC as the main console for the 6012, i.e., no video card or keyboard is available.

4. On the 6012, execute the DISKSAVE program by typing:

   ```
   C>DISKSAVE
   ```

5. Once a connection is made, exit from PC SmartLINK.

6. From your PC, execute the DISKSEND program by typing:

   ```
   C>DISKSEND
   ```

   When prompted for the “Input drive to send”, enter the drive designator for the newly created floppy disk. The system will then erase and program the flash. This will take several minutes.

   NOTE: If you are using PC SmartLINK from COM2 on your PC, you must use the /C2 switch with DISKSEND. Refer to the DISKSEND section in Appendix A for more information.

   The two programs, DISKSAVE and DISKSEND, transfer and save the files on the floppy disk to SSD1. The DISKSAVE program resides on the BIOS drive of the 6012 and the DISKSEND program resides on the 6012 Utility Disk.

7. Restart PC SmartLINK.

8. Type:

   ```
   C:RESET
   ```

9. Display and verify the contents of SSD1:

   ```
   DIR E:
   ```

10. Run SETUP and change your selection of the Boot options to:

    ```
    SSD1 using user supplied DOS
    ```

11. Install jumper W2[3–4], if needed, and reboot your system by typing:

    ```
    RESET
    ```

    Your system will boot from SSD1.

CHAPTER 15 TROUBLESHOOTING

If your system is not working properly, check the following items:

No Screen Activity – Checking Serial Communications for Console

If you do not get the sign–on message after bootup:

1. Make sure all cards except the 6012 card are removed from the card cage. This ensures that other cards are not interacting with the 6012 and that no video card is installed.

2. Install W2[1–2] or remove W2[3–4].

3. The VTC–9F serial cable turns the 6012 Control Card serial port into a 9–pin AT serial port. Make sure a null modem adaptor is installed on the other end, and that the assembly is inserted into the proper serial port on the PC. Make sure the VTC–9F serial cable is connected to J4 on the Control Card.

4. Make sure your power module provides +5V +/–0.25V.

5. After verifying the above conditions, you can monitor voltage levels by connecting an oscilloscope between the TxD* line on J4 (pin 5) and ground. After power–up, you should see a burst of activity on the oscilloscope screen. The voltage level should switch between +/–8V.

Garbled Screen Activity

If you do get activity on your screen but the message is garbled, check the following:

1. Remove W2[3–4] to force 9600, N, 8, 1 for COM1.

2. If you are using PC SmartLINK, make sure you have configured the software for 9600 baud and have selected the correct serial port for communicating with your PC. Refer to the PC SmartLINK manual for information on selecting the baud rate.

3. If you are using communications software other than PC SmartLINK, Octagon cannot guarantee the operation. Make sure that the software parameters are set to match those of the 6012 Control Card: 9600 baud, 8 bits, 1 stop bit, no parity.

System generates a BIOS message but locks up when booting from SSD1:

1. Remove W2[3–4] to force booting from the BIOS drive.

2. Press the reset button and reboot. Then note the drive designator for SSD1.

3. Display the directory of SSD1 and verify that all the necessary boot files exist. If some files are missing, you will need to copy any missing files to your floppy disk and re–execute the DISKSEND and DISKSAVE programs.

4. If no files are missing, reprogram SSD1 to overwrite any files which may have become corrupted.

System boots from BIOS drive even though I specified boot from SSD1 using ROM–DOS:

1. Make sure ROM–DOS COMMAND.COM resides on SSD1.

Booting from SSD1 with DOS doesn't work:

1. If you made SSD1 using a floppy drive, test the boot files on the floppy drive of your PC. Also, make sure all the necessary boot files are present.

Cannot save programs to flash EPROM

1. Make sure the EPROM(s) are installed in SSD1 correctly and that there are no bent pins. If using only one 256K flash EPROM, make sure it is installed in socket SSD1A.

2. Confirm that the Dallas clock, DS1216DM, is installed. A DS1216D from Dallas SemiConductor will not work properly. It requires minor modifications. Call Technical Support for more information.

Clock doesn't work

1. Verify SETUP indicates a clock is installed.

2. Make sure the DS–1216DM is installed in SSD2 correctly.

MEMDRIVE.SYS reports device not present with new flash installed.

1. You must program the EPROM using DISKSEND and DISKSAVE. Refer to Chapter 5, "Save and Run Programs".

MEMDRIVE.SYS reports smaller size disk than device will hold in SSD1.

1. Device was programmed from smaller disk than destination device using DISKSEND and DISKSAVE.

TECHNICAL ASSISTANCE

Carefully recheck your system before calling Technical Support. Run as many tests as possible; the more information you can provide, the easier it will be for the Technical Support staff to help you solve the problem.

For technical assistance, please call 303–426–4521.

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TECHNICAL SPECIFICATIONS

CPU
V20 (CMOS 8088)

Clock
4.77 or 12 MHz, 12 MHz is default; software selectable

BIOS
PC compatible with industrial extensions.

DRAM
0K, 256K and 1 MB; 80 nS; 0 wait state; supports the LIM 4.0 standard above 640K.

Solid–State Disks
SSD0 contains the BIOS and DOS 6.22

SSD1 supports one or two 256K flash EPROMs for application programs. Programmer built–in. EPROMs not included.

SSD2 supports 128K/512K static RAMs that may be battery–backed. RAM and Dallas module not included.

Serial EEPROM
68 bytes available to user in standard model. Options to 452 bytes are available.

ROM–DOS
Combined with BIOS ROM; DOS 6.22 compatible.

Serial Ports
8250 compatible UARTs; interface is standard RS–232D. Serial voltages generated on card.

Printer Port
Standard Centronics/IBM parallel port. Data lines are bi–directional. 24 mA drive capability.

Digital Port
24 lines programmable as inputs or outputs in groups of 4 or 8. 0–5V voltage levels. Source and sink current 2.5 mA for logic

interface. Sink current is 12 mA when driving opto module racks. All lines have 10K pull–up resistor.

8 of the 24 lines above will also drive loads as high as 100 mA and 50V. This is the default. These 8 lines can be converted to standard 0–5V I/O with a supplied jumper block.

This port is terminated with a 26–pin IDC connector.

Analog Input
8 channels, 1 Mohm input impedance, programmable for 0–5V or +/–5V for each channel, sample–and–hold on + inputs, damage protected to +/–16V, full scale adjustable for overrange detection.

Input voltage must not exceed the full scale rating by more than 50 mV for normal operation.

Adjacent channels may be software configured for differential inputs.

Resolution is 12 bits on both ranges. Linearity is 0.025%. An adjustable precision reference provides the full scale value. Tempco is 20 PPM. Zero offset is not adjustable and has a typical value of 1.5 counts.

This port is terminated with a 20–pin IDC connector.

Software Supplied
BIOS is PC–compatible. ROM–DOS, combined with BIOS ROM, is compatible with DOS version 6.22 and later. Programs should not make undocumented DOS calls or jump directly into the middle of DOS.

Power Requirements
+5V +/-5% at 235 mA typical (1 MB DRAM)
+5V +/-5% at 350 mA during flash programming

Environmental Specifications
–40° to 85° C operating
–55° to 90° C nonoperating
RH 5% to 95%, noncondensing

Size
4.5 in. x 4.9 in.

Watchdog Timer
Timeout is fixed at 1.2 seconds. Address of the enable timer is 380H; address of strobe is 201H.

Battery Backed Calendar/Clock
Supports optional Dallas SmartWatch DS–1216DM modules to battery back 128K or 512K static RAMs.

6012 Memory Map	
Device	**Memory Range**
DRAM, 1 MB	0-9FFFF (base) A0000-FFFFF (expanded memory at available EMS windows)
SSD1	D0000-DFFFF
SSD2	D0000-DFFFF
BIOS drive	E0000-EFFFF
ROM-DOS kernel	F0000-FAFFF
BIOS	FB000-FFFFF

6012 I/O Map	
Hex Range	**Function**
000-00F	8237 DMA #1
020-021	8259 PIC #1
040-043	8253 Timer
060-063	8255 PPI (XT)
080-08F	DMA Page Registers
0A0-0AF	NMI Mask Register (XT)
0C0-0C7	Bit Port (write)
0C0	Serial EEPROM CS & opto-isolated input bit
0C1	Serial EEPROM data in
0C2	Serial EEPROM clock
0C3	RS-485 driver enable
0C4	A/D converter chip enable
0C5	LPT1 I/O direction enable
0C6	Not used
0C7	Not used
0C0-0C7	Bit Port (read)
0C0	W2 jumpers, EEPROM, AOT
0C8-0CF	A/D decoded data strobe
100-1FF	Off card
200-207	Watchdog strobe port
208-20F	Industrial I/O (8255-J8)
208	Port A
209	Port B
20A	Port C
20B	Control register
210-2F7	Off card
2F8-2FF	COM2 serial port
300-377	Off card
378-37F	LPT1 printer port
380-387	Bit port
380	Watchdog enable
381	Flash program voltage on
382	SSD bank switch A16
383	SSD bank switch A17
384	SSD bank switch A18
385	SSD sockect select
386	Power LED
387	SSD socket enable
388-3E7	Off card
3E8-3EF	COM3 serial port
3F0-3F7	Off card
3F8-3FF	COM1 serial port

INTERRUPTS

6012 Interrupts	
Interrupt	**Description**
0	Timer
1	Keyboard
2	Free
3	COM2/COM4
4	COM1/COM3
5	Hard Drive (XT)
6	Floppy Drive
7	LPT1 (Not used by ROM-DOS)

JUMPER CONFIGURATIONS

W1: DRAM Size	
DRAM	**Pins Jumpered**
1 MB	[1-2]
256K	[2-3]

W2: COM1/Video and BIOS Boot Options	
Pin#	**Description**
[1-2]* Jumpered	Use video card (if available) or COM1 as the console.
[1-2] Not jumpered	No console port. This leaves COM1 available for use with your application program when no video card is present.
[3-4]* Jumpered	Boot using all the information saved by SETUP.
[3-4] Not jumpered	Boot using all the information saved in SETUP, except: Boot from the BIOS drive. If no video card exists, use 9600, N, 8, 1 settings for COM1 console and use COM1 as the console port (ignores W2[1-2]).

* = default

W3: RS-485 Receiver Termination	
Pins Jumpered	**Description**
[1-3][2-4]*	Termination active
[3-5][4-6]	No termination

* = default

W4: RS-232 or RS-485 Select	
Pins Jumpered	**Description**
[1-2]	RS-485 Receiver selected
[2-3]*	RS-232 Receiver selected

* = default

CONNECTOR PINOUTS

J1: Keyboard/Speaker Port	
Pin #	**Function**
1	Keyboard clock
2	Keyboard data
3	PBR*
4	Gnd
5	+5V
6	SYSRES*
7	N.C.
8	+5V
9	Speaker
10	Gnd

* active low

J2: LPT1 Printer/Parallel Port		
Pin #	**Function**	
1	Out	STB*
2	Out	AFD*
3	I/O	Data 0
4	In	ERR*
5	I/O	Data 1
6	Out	INIT*
7	I/O	Data 2
8	Out	SLIN*
9	I/O	Data 3
10	I/O	Data 4
11	I/O	Data 5
12	I/O	Data 6
13	I/O	Data 7
14	In	ACK*
15	In	BUSY
16	In	PE
17	In	SLCT
18	Out	+5V
19	Out	Gnd
20	Out	Gnd

* = active low

J4: COM1 and J3: COM2 Serial Ports		
Pin #	**Function**	**Function**
1	In	DCD
2	In	DSR
3	In	RxD*
4	Out	RTS
5	Out	TxD*
6	In	CTS
7	Out	DTR
8	In	RI
9	Out	Gnd
10	Out	+5V

* = active low

J5: Analog Port			
Pin #	**Function**	**Pin #**	**Function**
1	CH0	11	CH5
2	Gnd	12	Gnd
3	CH1	13	CH6
4	Gnd	14	Gnd
5	CH2	15	CH7
6	Gnd	16	Gnd
7	CH3	17	NC
8	Gnd	18	NC
9	CH4	19	NC
10	Gnd	20	NC

J8: Digital I/O Port			
I/O Line	**Port A**	**Port B**	**Port C**
Line 0	19	10*	13
Line 1	21	8*	16
Line 2	23	4*	15
Line 3	25	6*	17
Line 4	24	1*	14
Line 5	22	3*	11
Line 6	20	5*	12
Line 7	18	7*	9
+5V - Pin 2			
Gnd - Pin 26			

* These lines are also high current.

PC BUS PINOUTS

Micro PC "A"					
Pin #	**Description**	**Signal**	**Pin #**	**Description**	**Signal**
A1	I/O CH CK*	I	A17	A14	O
A2	D7	I/O	A18	A13	O
A3	D6	I/O	A19	A12	O
A4	D5	I/O	A20	A11	O
A5	D4	I/O	A21	A10	O
A6	D3	I/O	A22	A9	O
A7	D2	I/O	A23	A8	O
A8	D1	I/O	A24	A7	O
A9	D0	I/O	A25	A6	O
A10	I/O CH RDY	I	A26	A5	O
A11	AEN	O	A27	A4	O
A12	A19	O	A28	A3	O
A13	A18	O	A29	A2	O
A14	A17	O	A30	A1	O
A15	A16	O	A31	A0	O
A16	A15	O			

* = active low

Micro PC "B"					
Pin #	**Description**	**Signal**	**Pin #**	**Description**	**Signal**
B1	GND	I	B17	DACK1*	O
B2	RESET	O	B18	DRQ1	I
B3	+5V	I	B19	DACK0*	O
B4	IRQ2	I	B20	CLOCK	O
B5	-5V	Not used	B21	IRQ7	I
B6	DRQ2	I	B22	IRQ6	I
B7	NC	I	B23	IRQ5	I
B8	Reserved	Not used	B24	IRQ4	I
B9	NC	I	B25	IRQ3	I
B10	NC	I	B26	DACK2*	I
B11	MEMW*	O	B27	T/C	I
B12	MEMR*	O	B28	ALE	O
B13	IOW*	O	B29	NC	I
B14	IOR*	O	B30	OSC	O
B15	DACK3*	O	B31	Gnd	I
B16	DRQ3	I			

* = active low

APPENDIX A SOFTWARE UTILITIES

INTRODUCTION

The 6012 ROM–DOS and Software Utility Disk comes with the utilities listed below. Some of these utilities are also available on the 6012 BIOS drive. This appendix describes the utilities and their use.

Support commands:

COM1CON.COM
DISKSAVE.EXE
DISKSEND.EXE
FAST.COM
LPT1CON.COM
MAKESSD1.COM
REMDISK.EXE
REMQUIT.EXE
REMSERV.EXE
RESET.COM
SETUP.COM
SHOWTIME.COM
SLEEP.COM
SLOW.COM

Support device drivers:

MEMDRIVE.SYS

NOTE: Other utilities are included from ROM–DOS and are not mentioned in this section. Please refer to your ROM–DOS manual.

COM1CON.COM

COM1CON.COM Support command

PURPOSE: Redirects video to the COM1 port when you have a video card and monitor installed in your system and restores COM1 serial parameters.

SYNTAX: **COM1CON**

REMARKS: Execute COM1CON from the command line. When you are finished using the console port, reset your system. After boot-up, the system reverts to using the video card and monitor.

Also, some programming languages may not restore the serial parameters after using the COM1 port. COM1CON.COM will restore the COM1 port as the console. You must include your program and COM1CON in a batch file and then execute the batch file to restore the console.

SEE ALSO: LPT1CON.COM

DISKSAVE.EXE

DISKSAVE.EXE Support command

PURPOSE: To transfer a disk into SSD1.

SYNTAX: **DISKSAVE**

REMARKS: This program saves data to SSD1. This program is used in conjunction with DISKSEND. Start DISKSAVE on the 6012 and then start DISKSEND on your PC. The following message displays:

```
5012A/6012 DISKSAVE v2.03 Octagon
Systems, Corp.
Attempting connection with DISKSEND
on remote host.
```

The parameters SSD1A/SSD1B are available when SSD1 has been configured for two disks. The default configuration programs SSD1.

PARAMETERS: Various communication parameters can be modified on the command line. If any of the default parameters are changed (other than the COM port), the same parameters MUST also be used when invoking DISKSEND.

Switch	**Options**	**Default**
/B[baud rate]	1200,2400,9600...	57600
/C[com port]	1,2,3,4	1
/D[data bits]	7,8	8
/S[stop bits]	1,2	1
/P[parity]	NONE,EVEN,ODD	NONE
/H[handshake]	ECHO,CTS,XON	CTS

For example to use 2400 baud via COM2 use the following:

```
DISKSAVE /B2400 /C2
```

Normally only the communication port for DISKSAVE and/or the baud rate for both DISKSAVE and DISKSEND will need to be adjusted.

NOTE: The baud rate can be different than the console baud rate set up with SETUP.

SEE ALSO: DISKSEND.EXE

DISKSEND.EXE

DISKSEND.EXE Support command

PURPOSE: To transfer a disk into SSD1.

SYNTAX: **DISKSEND**

REMARKS: This program reads a diskette from your PC and transfers it to the 6012. It is used in conjunction with DISKSAVE, which programs the flash in SSD1 with the diskette image. Start DISKSAVE on the 6012 and then start DISKSEND on your PC. The following message displays:

```
6012 DISKSEND v1.00 Octagon Sys-
tems, Corp.
Attempting connection with DISKSAVE
on remote host.
```

When the system detects DISKSAVE has been started on the other end of the serial link, it responds:

```
Connection established.
```

If DISKSAVE was not started, or has timed out, the system will respond:

```
Connection failed!
```

Next, DISKSEND verifies the SETUP parameters on the 6012. If the SSD1 device is NONE, the response is:

```
The device type for SSD1 indicates
something other than Flash EPROM.
Please correct the device type by
executing SETUP on the MicroPC(TM)
card.
```

Otherwise the following message appears:

```
Input drive to send:
```

Input the diskette drive letter which contains the floppy you wish to send.

If you entered drive A and the 6012 has 256K flash, the next message is:

```
Verifying drive A will fit into the
256K Flash EPROM.
```

DISKSEND reads the disk and verifies all the files on the disk actually reside in the first 256K of the diskette. If they do not, one of the following is true:

1) The total size of all the files should fit into 256K, but there are blank spaces between the files causing a part of a file to be beyond the 256K boundary. The following message displays:

```
The files on your floppy would fit
into the Flash EPROM if the files
were squeezed on the diskette.
Delete all the files on the floppy
and copy them to the floppy again
to squeeze the diskette.
```

Either delete all the files and copy them again. If that does not work, try copying to a newly formatted floppy. Deleting files from the floppy is the main cause of the blank spaces on the floppy.

2) The total size of all the files is over the 256K. The following message displays:

```
You must reduce the number and/or
size of files to fit into the Flash
EPROM!
```

Either:

- Reduce the number of files.
- Reduce the size of the files.
- Add another 256K flash to make it 512K.
- Use SSD2 to hold some of the files.

If the contents will fit into the flash, the following displays:

```
Erasing the Flash EPROM
. . . . . .
Flash EPROM erase completed.

Programming the Flash EPROM.
. . . . . .
Programming complete.
```

If you receive errors during Erasing or Programming, check the following.

- Correct size for SSD1 type in SETUP.
- If using 256K, make sure it is installed in SSD1A.
- Flash EPROM is installed correctly with the notched corners aligned.
- Try another diskette.

NOTE: DISKSAVE must be started first.

PARAMETERS: Various communication parameters can be modified on the command line. If any of the default parameters are changed (other than the COM port), the same parameters MUST also be used when invoking DISKSAVE.

Switch	**Options**	**Default**
/B[baud rate]	1200,2400,9600...	57600
/C[com port]	1,2,3,4	1
/D[data bits]	7,8	8
/S[stop bits]	1,2	1
/P[parity]	NONE,EVEN,ODD	NONE
/H[handshake]	ECHO,CTS,XON	CTS

For example, to use 2400 baud via COM2 use the following:

```
DISKSAVE /B2400 /C2
```

Normally only the communication port for DISKSEND and/or the baud rate for both DISKSEND and DISKSAVE will need to be adjusted.

NOTE: The baud rate can be different than the console baud rate set up with SETUP.

SEE ALSO: DISKSAVE

FAST.COM

FAST.COM Support command

PURPOSE: To change CPU clock speed to 12 MHz.

SYNTAX: **FAST**

REMARKS: The 6012 always boots at the faster clock speed of 12 MHz. If you have changed to the slower speed of 4.77 MHz and need to return to 12 MHz, enter the following from the DOS prompt or in a batch file:

```
FAST
```

You can also enter <CTL><ALT><+> to switch to 12 MHz if you are using a keyboard and monitor with the 6012.

SEE ALSO: SLOW.COM

LPT1CON.COM

LPT1CON.COM Support command

PURPOSE: Redirects the video to the LPT1 port.

SYNTAX: **LPT1CON**

REMARKS: If you have an LCD-IFB or DP-IFB interface board and a display connected to LPT1, executing the DISPLAY.EXE and LPT1CON.COM programs allow you to use the display as the system console. You must reset your system to change the video to the original parameters.

SEE ALSO: COM1CON.COM, DISPLAY.DOC on the utility disk

MAKESSD1.COM

MAKESSD1.COM Support command

PURPOSE: Saves virtual drive or floppy drive to SSD1A/ SSD1B.

SYNTAX: **MAKESSD1**

REMARKS: From the directory where this utility file is located, type:

```
MAKESSD1 [SSD1A/SSD1B]
```

NOTE: The default setting as defined in SETUP is `MAKESSD1 SSD1A`. If you have one disk in your system, use the syntax: MAKESSD1. If you have two disks in your system, use the syntax: `MAKESSD1 SSD1A` or `MAKESSD1 SSD1B`. The default setting is `MAKESSD1 SSD1A`.

After the copyright message displays, the following message displays:

```
Which disk do you want to copy to
the XXXK memory device in SSD1x
(default D:)
```

(XXX will vary depending on what device SETUP.COM has defined for SSD1.)

```
Erasing the Flash EPROM.
Copying drive D: into the FLASH
EPROM. . .
Drive successfully copied.
```

```
Warning:  Reset the system before
accessing SSD1X as a drive.  Before
resetting change the 'Boot from'
option in SETUP.
```

'Boot From' option	Desired results/Notes
BIOS drive with ROM–DOS	–To view SSD1X before trying to boot from SSD1X or to use SSD1X as a data drive.
SSD1X using ROM–DOS	–To boot with ROM–DOS on SSD1X. SSD1X must contain ROM–DOS COMMAND.COM to be bootable.
Floppy or hard drive	–If you wish to boot from a floppy or hard drive and access SSD1X as a data drive. Copy MEMDRIVE.SYS to your drive and add the following line to the CONFIG.SYS 'DEVICE=MEMDRIVE.SYS SSD1X'.
SSD1X using user supplied DOS	–To boot with your DOS on SSD1X. SSD1X must contain all required DOS boot files. See your DOS manual for more information.

MEMDRIVE.SYS

MEMDRIVE.SYS Device driver

PURPOSE: This device driver is used when the user wishes to access the on–card SSDs or virtual drives.

SYNTAX: **MEMDRIVE**

REMARKS: The following CONFIG.SYS entries allow the user to access on–card SSDs:

```
DEVICE=MEMDRIVE.SYS BIOS   Accesses BIOS
                           Drive
DEVICE=MEMDRIVE.SYS SSD1   Accesses SSD1/
                           SSD1A
DEVICE=MEMDRIVE.SYS SSD1A  Accesses SSD1/
                           SSD1A
DEVICE=MEMDRIVE.SYS SSD1B  Accesses SSD1B
DEVICE=MEMDRIVE.SYS SSD2   Accesses SSD2
```

This driver first looks at the SSD to see if it looks like a valid disk. If it does, the system assigns a drive letter, after which time you can access the device as a normal disk. The drive letter for the virtual drive is dependent on the order of the devices listed in the CONFIG.SYS file. If the driver does not see a valid device, it will do one of the following:

Flash EPROM: If the system does not find a valid disk (i.e., a flash EPROM which has been programmed with DISKSAVE/ DISKSEND), it displays the following message:

```
6012 MEMDRIVE.SYS V2.06, memory
device not found in SSD2.
```

Static RAM: The system attempts to format SSD2 as either a 128K or 512K SSD and displays the following message:

```
6012 MEMDRIVE.SYS V2.06, formatting
SSD2 (128KB) as drive F:
```

If it is unable to format the memory area as a disk, it displays the message:

```
6012 MEMDRIVE.SYS V2.06, memory
device not found in SSD2
```

When there is a valid disk in SSD2 the system displays the following message:

```
6012 MEMDRIVE.SYS V2.06, assigning SSD2
(128KB) as drive F:
```

NOTE: When booting from SSD1, you do not need a MEMDRIVE SSD1 entry in your CONFIG.SYS file.

The following CONFIG.SYS entries allow the user to access part of the memory normally used by the computer for executing programs as a RAM disk. This RAM disk is initialized whenever the system is reset. For some DOS systems, this is often called a virtual drive. The default size for this drive is 128K. The size can be modified.

`DEVICE=MEMDRIVE.SYS BASE nnn`
Base memory (allocates nnnK)

`DEVICE=MEMDRIVE.SYS BASE nnn /NOTIFEMS`
Base memory (allocates nnnK) but only on systems with less than 1 MB

The /NOTIFEMS switch is optional. If it is included on 1 to 2 MB systems, the virtual drive will **not** be available. For 512K systems, the virtual drive is always available.

These drives are always formatted on reset. Once the virtual drive is defined, it can be accessed as any other disk.

At boot–up, if the virtual drive is specified, the following message displays:

```
6012 MEMDRIVE.SYS V2.06 formatting
(136KB) drive in DOS memory as drive D:
```

The following CONFIG.SYS entries allow the user to access EMS memory. This is the memory above the 640K DOS memory limit.

```
DEVICE=MEMDRIVE.SYS  EMS
```
All extended memory as a drive

```
DEVICE=MEMDRIVE.SYS EMS mmm sss
```
Extended memory as a drive of size mmmK. Starting address at 16K page # sss.

sss: 0 = start addr. 1MB
sss: 1 = start addr. 1MB+16K
sss: 2 = start addr. 1MB+32K

The size of the virtual drive depends on the amount of DRAM in your system:

6012 EMS Virtual Drives	
DRAM Installed	**Virtual Drive Size**
1 MB	384K
2 MB	1024K

REMDISK.EXE

REMDISK.EXE Support command

PURPOSE: Allows access to a disk drive on a remote system via a serial cable and standard PC style (8250 UART) serial port.

SYNTAX: **REMDISK** [**/U**] [**/?**] [**/B*nnnn***] [**+**] [**/COM*n***]

REMARKS: In a Remote Disk setup, one system, the one that will share its drives, is termed the Server. The other system, the one that will access and use the remote drives, is called the Client. The serial ports on both systems must be connected via null modem cable. A cabling diagram for a standard cable is shown below:

DB9 TO DB9	DB25 TO DB25	DB9 TO DB25
2---------3	2---------3	2---------3
3---------2	3---------2	3---------2
7---------8	4---------5	7---------4
8---------7	5---------4	8---------5
5---------5	7---------7	5---------7
6---------4	6--------20	6---------6
4---------6	20--------6	4---------20

Run REMDISK.EXE on the Client system. This program creates a new drive letter for the Client. REMDISK will use the next available system drive letter. For example, if the last assigned drive was D:, REMDISK will create a drive E:. This drive acts in all ways just like any other drive, except for the fact that it requires the serial port to do its job.

REMDISK.EXE can be installed using a **DEVICE=** command in CONFIG.SYS or from the DOS prompt.

/U tells REMDISK to unload itself from memory, thereby disabling the new drive letter and freeing the memory occupied by REMDISK. The option can only be used when

REMDISK is installed from the DOS command line. A Remote Disk installed via CONFIG.SYS cannot be unloaded.

/? displays a short help screen for the REMDISK program. No other arguments are to be included on the command line when the **/?** is used.

/B*nnnn* selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115k. The default baud rate is 115k.

+ is an optional argument which specifies packet style transmission. This is recommended for any baud rates over 19200. The default for this option is to include the **+** for packet transmission.

COM*n* is an optional argument which selects the communication port. Available ports are 1 and 2. COM1 is the default port.

NOTE: To use the Remote Disk, both the REMDISK and the REMSERV programs must be running on their respective systems. Both programs must use the same baud rate and packet or non-packet style transmission. It does not matter which program is installed first.

EXAMPLE 1: To install the REMDISK program from CONFIG.SYS at 19200, on COM1, using packet style transmission, enter the following in CONFIG.SYS and then reboot the system (remember to include the full path to find REMDISK.EXE if not located in the root directory):

```
DEVICE=REMDISK.EXE /B19200 +
```

EXAMPLE 2: To display a help screen for REMDISK, enter the following at the DOS prompt:

```
REMDISK /?
```

EXAMPLE 3: To install REMDISK from the DOS prompt or from a Batch file (like AUTOEXEC.BAT) at 9600 baud, without packet style transmission, on COM2, enter the following;

```
REMDISK /B9600 /COM2
```

EXAMPLE 4: To unload the REMDISK installed from the batch file or the DOS prompt, type:

```
REMDISK /U
```

SEE ALSO: REMSERV.EXE, REMQUIT.EXE

REMQUIT.EXE

REMQUIT.EXE Support command

PURPOSE: To cancel a REMSERV session on a remote system.

SYNTAX: **REMQUIT**

REMARKS: Once a REMDISK/REMSERV connection is no longer needed, the REMQUIT command is used (on the same CPU running REMDISK) to cancel the REMSERV command. You may also press the ESC key if you have access to a local keyboard to the CPU running REMSERV.

SEE ALSO: REMSERV.EXE, REMDISK.EXE

REMSERV.EXE

REMSERV.EXE Support command

PURPOSE: To make a single drive at a time on the server system available to the Client. The available drive can be changed at any time by quitting the REMSERV program and then running the program again with a new drive letter.

SYNTAX: **REMSERV.EXE** *d:* [**/B***nnnn*] [**+**] [**/COM***n*] [**/S**]

REMARKS: *d:* represents the letter of the drive that the Server will make available to the Client.

/B*nnnn* selects the baud rate for transmission. Available baud rates are 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115k. The default baud rate is 115k.

+ is an optional argument which specifies packet style transmission. This is recommended for any baud rates over 19200. The default for this option is to include the **+** for packet transmission.

COM*n* is an optional argument which selects the communication port. Available ports are 1 and 2. COM1 is the default port.

/S instructs REMSERV to run silently, that is without any screen output.

/? is an unlisted option which is used to print a short help screen for the REMSERV program. If the **/?** is used, the drive letter argument is omitted, for example:

```
REMSERV /?
```

EXAMPLE 1: To select drive B: as the available Server drive at 115K baud, pack style transmission, using COM1, you would enter the following:

```
REMSERV B:
```

EXAMPLE 2: To set drive C: as the Server disk at 9600 baud, without packet style transmission, on COM2, you would enter the following:

```
REMSERV C: /B9600 /COM2
```

NOTE: The Server program can be terminated at any time by pressing the <ESC> key. The Client can then no longer access the Server's drive until the REMSERV program is run again.

SEE ALSO: REMDISK.EXE, REMQUIT.EXE

RESET.COM

RESET.COM Support command

PURPOSE: To enable the watchdog timer and allow timeout to expire, thus restarting the system.

SYNTAX: **RESET**

REMARKS: The RESET command also restarts all the expansion I/O cards on the bus. This differs from a <CTL><ALT><DEL> reboot of the system which only restarts the system but not the expansion cards. The RESET button on the 6012 also accomplishes the same thing as the RESET command.

SETUP.COM

SETUP.COM Support command

PURPOSE: Modifies date and/or time for battery–backed clock, and modifies serial port parameters.

SYNTAX: **SETUP**

REMARKS: From the directory where this utility file is located, type:

```
SETUP <RET>
```

After the copyright message displays, the main menu appears:

```
OCTAGON SYSTEMS CORPORATION
5012A/6012 SETUP UTILITY V4.30
------------------------------
(Press SPACE to CHANGE, ENTER to
ACCEPT, ESC to EXIT)

COM1 Console baud rate:      1200
                             2400
                             4800
                             9600
                             19200
                             38400
                             57600
                             115200

Power on memory test:Enabled
                     Disabled

SSD1 Device  none
             256K Flash (N28F020)
             in SSD1A
             512K Flash (2–256Ks)
             as one disk
             512K Flash (2–256Ks)
             as two disks
```

```
Boot from:  BIOS drive using ROM-
            DOS
            SSD1A using ROM-DOS
            SSD1B using ROM-DOS
            Floppy or Hard drive
            SSD1A using user sup-
            plied DOS
            SSD1B using user sup-
            plied DOS

Number of floppy drives:     0
                             1
                             2

Floppy drive 1 size:    360K
                        1.2 MB
                        720K
                        1.44 MB

DS Clock Installed      Yes
                        No

Number of line printers: Auto Check
                           0
                           1
                           2
                           3

Press ENTER to SAVE the changes or
Press ESC to EXIT without saving
the changes:

Options saved.
You must reset for these options to
take effect.
```

SHOWTIME.COM

SHOWTIME.COM Support command

PURPOSE: To display the current time and date.

SYNTAX: **SHOWTIME**

REMARKS: This command displays the following, for example:

```
Current date/time is: THU 12/1/1994
10:06:47
```

SLEEP.COM

SLEEP.COM Support command

PURPOSE: To conserve CPU power consumption.

SYNTAX: **SLEEP**

REMARKS: The command puts the processor in “sleep” mode, thus using less power. An interrupt awakens the processor and lets it resume its activities. The DOS clock is stopped while in sleep mode. The 18.2 per second timer tick is disabled during this time. All other interrupts (i.e., serial and keyboard) are left enabled. When the processor is awakened via an interrupt (usually via COM1 or keyboard) and if a DS–1216DM clock module has been installed in SSD2 of the 6012 and has been enabled in SETUP, the time will be accurate when the processor is awakened from sleep mode. Otherwise, the time will not be accurate.

SLOW.COM

SLOW.COM Support command

PURPOSE: To change the CPU clock speed to 4.77 MHz.

SYNTAX: **SLOW**

REMARKS: The 6012 always boots with the faster clock speed of 12 MHz. Enter the following command in your AUTOEXEC.BAT file to automatically change to the 4.77 MHz clock speed during system bootup:

```
SLOW
```

You can also press <CTL><ALT><–> to change to 4.77 MHz if you are using a keyboard and monitor with the 6012.

SEE ALSO: FAST.COM

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APPENDIX B

CUSTOM COMMUNICATION CABLE

The 6012 card requires an RS–232 serial communications cable to interface to the PC. If you are not using a VTC series cable, you can make your own communications cable.

NOTE: This is a null modem cable. RxD and TxD are crossed.

1. Determine if your PC requires a male or female connector.

2. Refer to the following table for cable connections for the 6012:

Custom RS-232 Cable				
COM1/COM2	**Micro PC Signal Direction**	**DB-25**	**DB-9**	**PC Signal**
1	DCD Input	8	1	DCD
2	DSR Input	6	6	DSR
3	RxD Input	2	3	TxD
4	RTS Output	4	7	RTS
5	TxD Output	3	2	RxD
6	CTS Input	5	8	CTS
7	DTR Output	20	4	DTR
8	RI Input	22	9	RI
9	Gnd	7	5	Gnd
10	5V	NC	NC	NC

UPLOADING FILES FROM THE 6012

The TRANSFER program is also used to upload files from the 6012 card to your PC for editing or debugging. To upload a file:

1. Make sure a serial link is established between your PC and the 6012.

2. Start PC SmartLINK on your PC.

3. Execute the TRANSFER program from the 6012 to send a file to your PC.

   ```
   6012:\> TRANSFER /COM1 /S <drive><path> filename.ext
   ```

   filename.ext is the name of the file on the 6012 which you are sending to your PC.

4. Execute the TRANSFER program on your PC to receive a file from the 6012.

   ```
   C:\> TRANSFER /COM1 /R <drive><path> filename.ext
   ```

   filename.ext is the name of the file on the PC which you are receiving from the 6012.

ASSIGNING DRIVE DESIGNATORS

ROM–DOS is a MS–DOS version 6.22 compatible operating system. Since it is stored in ROM, it is always present on power–up. During run time it requires only about 20K of RAM space. When you boot from ROM–DOS in the BIOS socket, the system automatically assigns drive designators to the extended memory virtual drive, SSD1 and SSD2. However, if you boot from SSD1 or floppy/hard drive you must add the appropriate device drivers to your CONFIG.SYS file and copy the files to your boot drive in order to access SSD2, the BIOS drive and the extended memory virtual drive.

NOTE: Even though you provide information about memory devices during setup, you must still define drivers for these devices in your CONFIG.SYS file. You may also need to format the device. The following is an example listing of CONFIG.SYS entries for the device drivers included with the 6012. Each of these device drivers is discussed in greater detail in Appendix A, "Software Utilities."

```
device=MEMDRIVE.SYS  SSD2   defines the SSD2 drive;
device=MEMDRIVE.SYS  SSD1   defines the SSD1 drive;
device=MEMDRIVE.SYS  BIOS   defines the BIOS drive;
device=MEMDRIVE.SYS  EMS    defines the virtual drive (384K
                            or, with extra 1 MB DRAM,
                            1408K)
```

When your system boots up, the 6012 device drivers will be listed with their drive designations. When you boot from ROM–DOS in the BIOS drive, and when SSD1 is programmed as one drive, drives D–F are defined in the CONFIG.SYS file. The drives are designated as:

A: floppy disk
B: floppy disk
C: BIOS drive
D: virtual disk
E: SSD1
F: SSD2

If your system has a hard drive, drive C: (in the example above) becomes the hard drive and drives C–F are now designated as D–G.

When you boot from SSD1 with ROM–DOS, the drives are designated as:

A: floppy disk
B: floppy disk
C: SSD1
D: first driver in CONFIG.SYS
E: second driver in CONFIG.SYS

Example:

In the following example of bootup messages, the system boots from the BIOS drive with 1MB DRAM, 256K flash EPROM in SSD1A and nothing installed in SSD2. The system assigns the following drive designations:

```
5012A/6012 MEMDRIVE.SYS v2.06, formatting (384KB) in
expanded memory as drive D:
5012A/6012 MEMDRIVE.SYS v2.06, assigning SSD1A
(256KB) as drive E:
5012A/6012 MEMDRIVE.SYS v2.06, SSD1B memory device
not found.
```

NOTE: If a 512K battery–backed static RAM was installed in SSD2, the message would read MEMDRIVE.SYS v2.0, assigning SSD2 (512K) as drive F.

EXTENDED MEMORY

Once you have installed 1 MB or more of DRAM in your system you can bypass the memory driver and extend the available memory past 640K by using the following instructions. This assumes you are not using the extended memory for a virtual drive.

NOTE: These instructions are written in 8086 assembly code.

Perform the following before your program accesses extended memory:

```
MOV DX,387H
```

(To prevent contention, disable access to the SSD, by writing a "1" to 387H.)

```
MOV AL,1
OUT DX,AL
```

Enable the EMS for the page from which you want to modify or read:

For systems with 1 MB, there will be 384K available over the 640K limit. Dividing this amount into 16K amounts gives page numbers from 0–17H.

Bit 7 is the enable/disable flag. The window 0 I/O address is 258H at D000H.

```
MOV AL,81H
```

(Enables the second 16K page to be accessed through window 0, located at 0D000H.)

```
MOV DX,258H
OUT DX,AL
```

Enable the other three 16K windows:

Window 1 I/O address is 4258H at D800H.
Window 2 I/O address is 8258H at D400H.
Window 3 I/O address is C258H at DC00H.

```
MOV AL,97H
```

(Enables the last 16K page to be accessed through window 1, located at 0D800H.)

```
MOV DX,4258H
OUT DX,AL
```

Access the page by writing/reading through the EMS window:

```
MOV AX,0D000H
MOV ES,AX
```

(Sets ES to the window segment.)

```
XOR DI,DI
MOV ES:[DI],AH
```

(To store something in the window.)

```
MOV AH,ES:[DI]
```

(To retrieve something from the window.)

When your program has finished with the EMS memory:

```
MOV AL,0
```

(Bit 7 = 0 disables the EMS.)

```
MOV DX,258H
```

(The EMS window 0 I/O port = 258H.)

```
OUT DX,AL
```

Disable the other enabled windows:

```
MOV DX,4258H

(Disables page 1.)

OUT DX,AL
```

Reenable the SSD::

```
MOV AL,0

(Enables the SSD.)

MOV DX,387H
OUT DX,AL
```

ANALOG INPUT

The analog input circuitry includes the LTC1290 I.C. from the Linear Technology corporation (Ph# 408 432-1900). The LTC1290 contains a serial I/O successive approximation A/D converter. The chip's 8–channel input multiplexer can be configured for either single–ended or differential inputs (or combinations thereof).

For input protection, we have added current limiting resistors and a diode clamp array to the circuit. In addition, you can install capacitors in the circuit for implementing a low pass filter to reduce 'noise'.

Differential Mode Option

The use of the 'differential input mode' is useful when the signal source transmits both a 'plus' and a 'minus' signal. If you are reading signals generated from strain gauges, pressure transducers or any device that generates a differential output, you can use the differential mode.

Input Filter Capacitors

It is very important that the signals, especially the minus signal, remain as stable as possible when using the differential mode. If a signal is noisy or varies in level, the resulting conversion data will be in error. It is possible to add filtering capacitors that help reduce the effect of any extraneous noise on the signal. A properly sized filter capacitor will 'cut off' high frequencies that can cause inaccurate readings. The filter capacitor should be a monolithic ceramic type and one should be placed on each input of the differential channels. The dielectric characteristics should be of NPO or CGO grade. The lead spacing of the capacitors should be 0.1 in. The 'ideal size' for the capacitors will depend upon your specific application. Just for purposes of discussion, let's talk about a 1000 pf capacitor. If your source output resistance is 50 ohms or less, the cut off frequency of the filter would be approximately 300 kHz. If your source output resistance is in the 500 ohm range, the cut off frequency of the filter would be approximately 140 kHz.

In summary, the optional input capacitors are intended to be used only on channels using the differential mode. The filter capacitors should be installed on both the plus and minus inputs. Channels

that are programmed for the single–ended mode do not require the filter capacitors.

Signal Conditioning

Devices such as RTDs and thermocouples generate signal levels that can not be read directly by the LTC1290. A thermocouple, for example, will typically generate an output signal in the millivolt range. The LTC1290 expects an input voltage range of either 0–5 volts or +/–5 volts. There are several companies that provide analog signal conditioning modules that will convert low level signals into a range compatible with the LTC1290. Two of the companies are listed below. Octagon offers the AIN-5B board that can house the special modules and provide an easy interface to any Octagon card containing an analog input section.

- Analog Devices, Inc.
  Industrial Products Division
  One Technology Way
  Norwood, MA 02062-9106
  (800) 426-2564

- Burr-Brown Corporation
  6730 S. Tucson Blvd.
  Tucson, AZ 85706
  (800) 548-6132

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1. Octagon's goal is to ship your product within 10 working days of receipt.
2. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.
3. Customers that return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

RETURNING A PRODUCT FOR REPAIR

Upon determining that repair services are required, the customer must:

1. Obtain an RMA (Return Material Authorization) number from the Customer Service Department, 303-430–1500.
2. If the request is for an out of warranty repair, a purchase order number or other acceptable information must be supplied by the customer.
3. Include a list of problems encountered along with your name, address, telephone, and RMA number.
4. Carefully package the product in an antistatic bag. (Failure to package in antistatic material will VOID all warranties.) Then package in a safe container for shipping.
5. Write RMA number on the outside of the box.
6. For products under warranty, the customer pays for shipping to Octagon. Octagon pays for shipping back to customer.
7. Other conditions and limitations may apply to international shipments.

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