

**INTELLIGENT 4-PORT SERIAL  
I/O PROCESSOR FIRMWARE Ver.2**

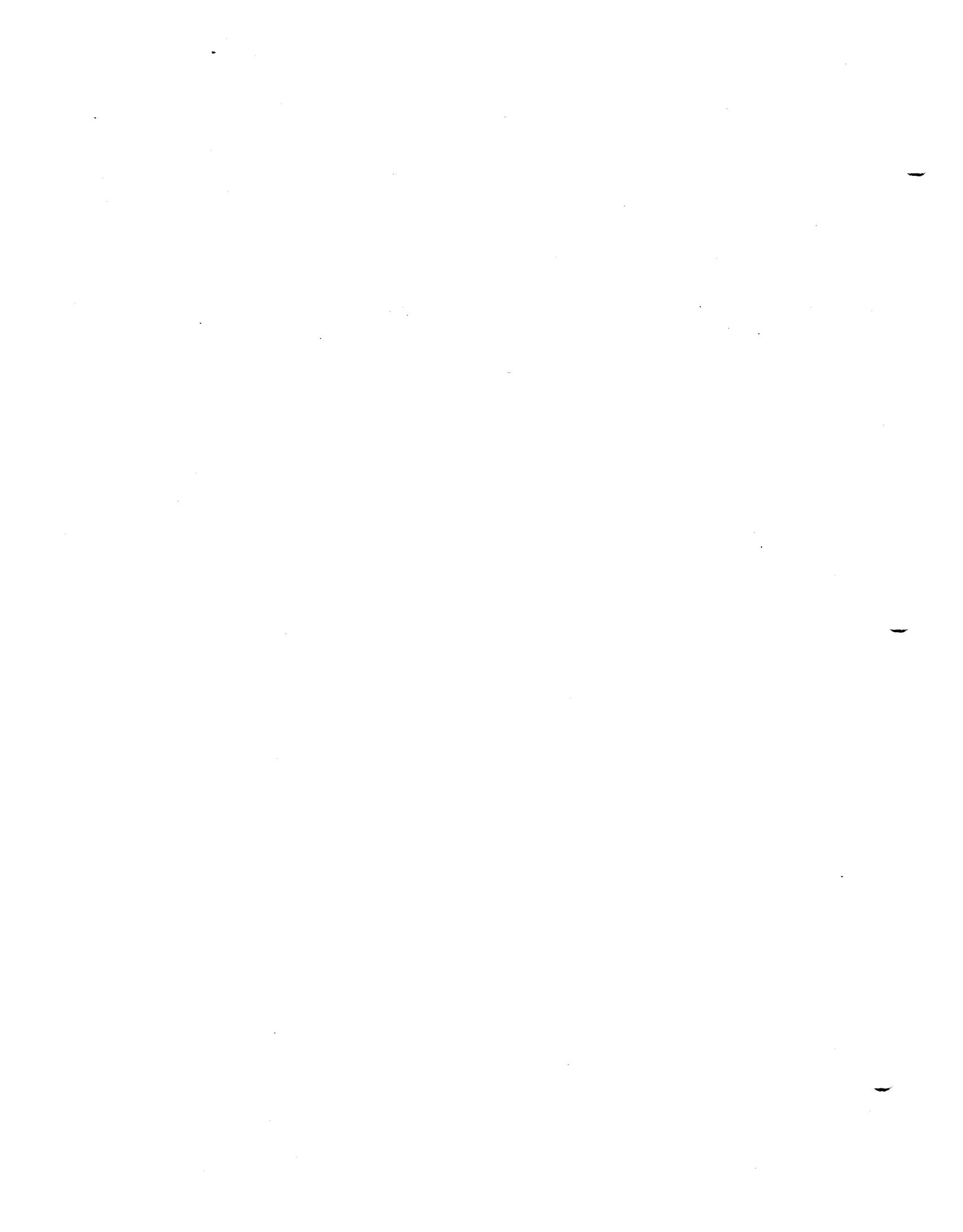
**User's Manual**

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GMX™ Intelligent 4-Port Serial I/O Interface  
OS-9™ Software \* Version 2.x

This document describes the GMX™ Intelligent 4-Port Serial I/O Interface firmware and system software for use with the OS-9 operating system.

CONTENTS

DESCRIPTION .....	2
HARDWARE CONFIGURATION .....	2
SENSE SWITCHES .....	2
BAUD RATE SELECTION .....	3
SIGN-ON MESSAGES .....	4
COMMUNICATION CHARACTERISTICS (parity, stop bits, etc.).	5
HANDSHAKING (DCD/DSR and X-ON/X-OFF) .....	5
DEVICE DESCRIPTORS .....	6
SOFTWARE CONSIDERATIONS .....	7
6551 ACIA COMMAND and CONTROL REGISTERS .....	Appendix A

\*\*\*\*\* IMPORTANT \*\*\*\*\*

This version of the firmware (V2.xx) can only be used with edition 5 or later of IOPMAN and edition 6 or later of IOP. Earlier versions of this firmware (V1.xx) are NOT compatible with the new firmware or drivers. All I/O processors in the system must have the the same version firmware (either 1.xx or 2.xx) and MUST use the matching driver and file-manager. The hardware configuration is the same for either version of the firmware and no hardware configuration changes are necessary when converting between versions.

## DESCRIPTION

The OS-9 software for the GMX™ Intelligent Serial I/O Interface consists of four (4) parts. The first part, the on-board firmware, is contained in an EPROM on the I/O processor board. The remaining three parts; the File Manager (IOPMAN), the Device Driver (IOP), and the Device Descriptor(s) (ITx, IPx, etc.), are part of the OS-9 operating system. The software is essentially transparent to the user in that it provides the same functions and options as the standard SCF type drivers for terminals and printers. However, because much of the overhead normally handled by the host system (input line editing, output buffering, etc.) is performed by the I/O interface, a considerable increase in system throughput can be realized.

## HARDWARE CONFIGURATION

Most of the hardware options on the I/O board are configured at the factory when the firmware is installed and should not need to be reconfigured by the user.

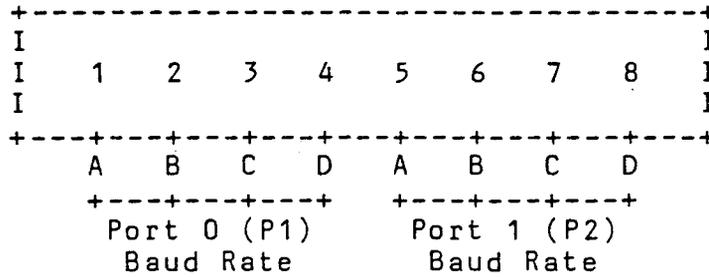
The base address of the board will normally need to be configured to suit the particular installation. While the software is not fixed to a particular address or group of addresses in the case of multiple boards, the following addresses are recommended. The first board should be addressed at \$FE080. Additional boards should be addressed on successive 4 byte boundaries (\$FE084, \$FE088, ...). The address range from \$FE080 to \$FE09F is currently reserved by GIMIX for this use. Regardless of the address chosen for the board(s), the user will also need to create Device Descriptors containing the appropriate address. (See the section on Device Descriptors.)

The user may need to reconfigure the I/O connector configuration jumpers (JA-1, 2, 3, and 4) and the Sense Switches (SW1, 2, and 3). See the I/O interface hardware manual for information on the configuration of JA-1, 2, 3, and 4).

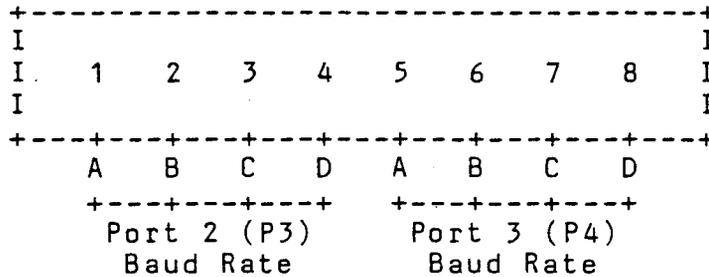
## SENSE SWITCHES (SW-1, 2, and 3)

The sense switches are used to select between the available firmware options. The following options are supported: Selection of Baud Rate for each of the four ports on the board and enabling or disabling of the sign-on messages for each port. The following diagrams show the function of the switches.

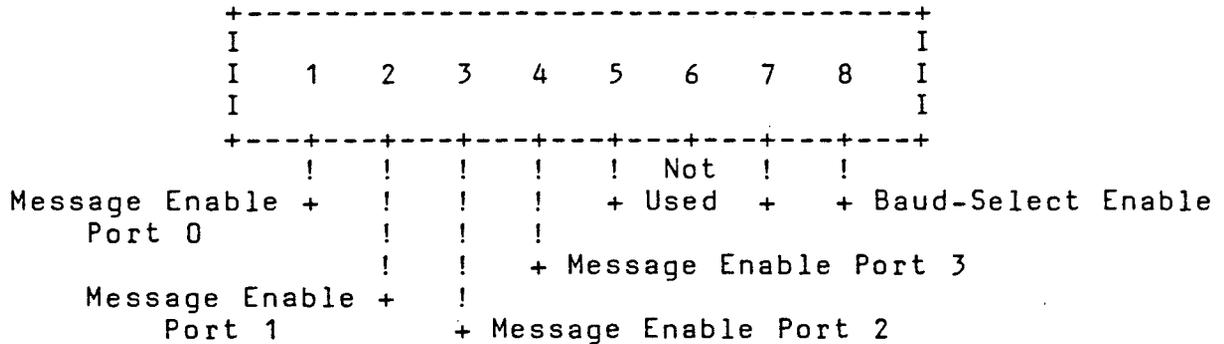
Switch 1



Switch 2



Switch 3



BAUD RATE SELECTION

The Baud-Select Enable switch (S1-8) must be ON (CLOSED) when using switch selected baud rates. If the Baud-Select Enable Switch is OFF (OPEN) the baud rate switches are ignored and the baud rate from the Device Descriptor is used, once OS-9 has initialized the port. (The standard Device Descriptors are configured for 9600 Baud.) The sign-on messages however, are always transmitted at the baud rate selected by the switches.

The Baud Rate switches allow the selection of any one of the fifteen available rates for each port. The following table shows the available baud rates and the appropriate switch patterns for each. (Note: Use the table in appendix A for determining the bit pattern for baud rates in the Device Descriptors.) Set the appropriate switch section OFF (OPEN) for a zero (0) and ON (CLOSED) for a one (1).

Baud Rate	Switch ABCD	Baud Rate	Switch ABCD
* ----->	0000	1200 ----->	0001
50 ----->	1000	1800 ----->	1001
75 ----->	0100	2400 ----->	0101
109.92 ----->	1100	3600 ----->	1101
134.58 ----->	0010	4800 ----->	0011
150 ----->	1010	7200 ----->	1011
300 ----->	0110	9600 ----->	0111
600 ----->	1110	19.2K ----->	1111

- \* If all four switches for a particular port are set to zero (OFF), the Baud Rate from the Device Descriptor is used. When this option is selected, the Message Enable switch for the corresponding port(s) MUST be OFF.

#### SIGN-ON MESSAGES

The firmware includes an option for sending two messages to each of the I/O devices connected to the board. The first message is transmitted whenever power is applied to the board or the system is reset. This message indicates that the on-board processor is running and waiting for the host system. It is sent simultaneously to all ports that have messages enabled. If this message is not sent, it indicates that either the messages are disabled (see below), or that the board is not functioning. Note: Failure to receive the sign-on message may also be caused by incorrect Baud Rate, improper connections to the peripheral, a defective peripheral, etc. The second message is transmitted to each port, on an individual basis, when the host first opens a path to that port (unless messages to that port are disabled).

Since it is not desirable to transmit the sign-on messages to certain devices, such as printers, the user has the option of inhibiting messages to any or all of the ports. DIP-switch S3 sections 1, 2, 3, and 4 enable or inhibit messages to the individual ports. A switch set ON (CLOSED) enables messages for the corresponding port, a switch set OFF (OPEN) inhibits messages for that port.

The sign-on messages may be modified by the user if the appropriate EPROM programming equipment is available. The on-board firmware is

normally supplied on an 8Kx8, 28 pin EPROM. The two messages are near the end of the executable code and can be located by examining the EPROM contents. The messages follow the standard OS-9 format with the last byte of each message having bit 8 set high as a terminator. Each message is followed by 32 bytes of \$80 which have been inserted as filler to allow room for expanding the messages. Caution: The instruction following the last byte of the second message should not be changed or moved. The location of the first byte of each message is also fixed and cannot be moved. Note: The software in the EPROM is NOT an OS-9 module and therefore does not have a CRC. Only the appropriate message bytes need to be changed to modify the messages.

#### COMMUNICATION CHARACTERISTICS (parity, stop bits, etc.)

The on-board firmware assumes default values for the number of data bits (8), number of stop bits (1), and parity (NONE); used when the ports are first initialized and the sign-on messages are transmitted. These values are contained in the EPROM and can not normally be modified. A second set of values, in the Device Descriptors, are used to initialize the ports when the host system opens a path to them. The values in the standard Device Descriptors supplied are the same as the values in the EPROM (8-1-NONE). If it is necessary to change the characteristics of one or more of the ports, the device descriptor(s) must be modified. Source code for the standard Device Descriptors is included. Appendix A shows the configuration of the ACIA Command and Control registers. The required values can be determined from the tables and inserted in the device descriptor(s). Note: Since the default values in the EPROM are always used when the sign-on messages are transmitted, the messages should normally be disabled for any port that uses values other than the default values.

#### HANDSHAKING

Handshaking is required whenever the external I/O device (terminal, printer, etc.) must halt the flow of data from the host while it "catches up". The on-board firmware has provisions for two types of start/stop handshaking between the board and the external I/O devices.

Hardware handshake is provided by using either the DCD or DSR inputs, which have identical functions. When both of these inputs are in the inactive (high) state, data will be transmitted from the board. If one or both inputs are made active (low), the board will stop sending data until the input(s) return to the inactive (high) state.

Software handshake, using X-ON/X-OFF, is also supported by the firmware. Note: X-ON/X-OFF must be enabled by inserting the appropriate values in the Device Descriptor(s) for the port(s) on which it is to be used. The standard Device Descriptors supplied have X-ON/X-OFF disabled. See the section on Device Descriptors. When the X-OFF character (normally Control-S, \$13, ASCII DC3), is received by the board, data transmission is halted until receipt of the X-ON character (normally control-Q, \$11, ASCII DC1).

The need for handshake and the choice of methods will depend on the peripheral(s) used and the Baud Rate(s) chosen. Consult the peripheral

manufacturer's documentation for information on handshaking requirements.

CAUTION: Because of the possibility of noise pickup, which could cause erratic operation, unused handshake inputs (DCD, DSR, CTS) should be left unconnected (by removing the jumpers on the board) or connected to an output that is at the appropriate RS-232 active (high) level. The output labeled "PU" on the I/O connector jumper areas (JA-1, 2, 3, and 4) can be used for this function if desired, by connecting it to the unused inputs at the connector on the I/O cable. The "PU" output is factory jumpered to pin 11 of the DB-25 connector.

The "PU" output also has two other potential uses. On ports that are not being used and are not connected to any external device, the "PU" can be connected to all of the handshake inputs and to the RX input of the unused port, to prevent noise from entering the system if the unused port is accidentally initialized (by a TSMON for example).

On ports that have a terminal (or other device) connected, and a possibility exists that the port will be initialized with the terminal turned off, or if the terminal will be turned on and off after the port is initialized, "PU" can be connected to the RX input (only) of the port to reduce the possibility of false characters being received when the terminal is turned on or off. Note: Do NOT connect "PU" to RX and the handshake lines on a port that is being used.

Note: Due to a peculiarity of the 6551 ACIAs used on the board, the CTS input, normally used for handshaking, cannot be used for handshaking with certain devices, such as printers. For more information see the hardware documentation for the board and/or a 6551 data sheets.

## DEVICE DESCRIPTORS

The Device Descriptors required by the 4-Port Intelligent Interface are, identical to those use by the 3-Port Intelligent boards (with the exception that the "port" number can be 0, 1, 2, or 3 for the 4-Port board) and, in most respects, identical to standard SCF type descriptors. The "Path Options" section is copied to the board when a path to a port is opened. The Descriptors for the intelligent boards include two bytes that are passed directly to the ACIAs when they are initialized. These bytes determine the baud rate and operating parameters of the port. An additional byte determines which of the four ports on the board is affected by the descriptor. Source files for both "printer" and "terminal" type descriptors are included with the standard system disk. Use the tables in appendix A to determine new values for the ACIA Command and Control registers if required. See the source files for more information.

## SOFTWARE CONSIDERATIONS

To realize maximum performance from systems using the Intelligent I/O Interface, certain factors must be taken into consideration. Because the I/O software is optimized for handling transfers between the interface and the host on a line-by-line rather than a character-by-character basis, software that is I/O intensive (especially programs such as text editors) should use line oriented I/O calls. Programs that use character oriented I/O calls may run slower when used with the Intelligent Interface. Whenever possible the data should be buffered by the program itself and output on a line-by-line basis.

We would appreciate information from users on any other problems encountered while using this software. To be most useful, the information should be submitted in writing, and should include a complete description of the problem and the conditions under which it occurs, including the Edition number(s) of any programs involved (use the IDENT command). A brief description of the hardware configuration should also be included so that we can attempt to duplicate the problem if necessary. Information regarding problems with the software should be addressed to:

GIMIX Inc.  
1337 W 37th Place  
Chicago Il 60609

Attn: Mike Magnus

# 6551 ACIA COMMAND AND CONTROL REGISTERS

