Protocol Converter
A/S-2G
FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer’s instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n’émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.
INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquear la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deberá ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas o otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:
   A: El cable de poder o el contacto ha sido dañado; u
   B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
   C: El aparato ha sido expuesto a la lluvia; o
   D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
   E: El aparato ha sido tirado o su cubierta ha sido dañada.
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1.0 Specifications

**Protocol** — Asynchronous: TTY (ASCII)
Bisynchronous: 2770, 2780, 3741, and 3780 (EBCDIC)

**Ports** — A: Asynchronous
B: Synchronous/bisynchronous

**Speed** — Up to 19.2 Kbps (each port independent)

**Interface** — RS-232 (both ports)

**Connectors** — (2) DB25 (female)

**Flow Control** — Asynchronous: X-ON/X-OFF or DTR/CTS interface lead (in DTE only)
Synchronous/bisynchronous: standard BSC handshaking

**Indicators** — Unit Power: PWR Power (LED mounted on Port B side)
Each Port: TXD Transmit Data
          RXD Receive Data
          RTS Ready to Send
          CTS Clear to Send
          DTR Data Terminal Ready
          DSR Data Send Ready
Port A only: CDA Carrier Detect
Port B only: CDB Carrier Detect (LED mounted on Port A side)
          TXC Transmit Clock
          RXC Receive Clock

**Approvals** — CE

**Power** — 115 VAC, 50/60 Hz, 63 watts
(230 VAC model available upon request)

**Size** — 2.1"H x 11.5"W x 8.8"D (5.3 x 29.2 x 22.4 cm)

**Weight** — 3.5 lb. (1.6 kg)
2.0 Introduction

The Model A/S-2G provides compatibility between an asynchronous, ASCII coded device and a synchronous, EBCDIC coded device. It is desirable, prior to installation, to review the following checklist to ensure the appropriateness of all the devices in the system for the planned application.

Synchronous (Bisynchronous) Side -

- Which Protocol is being used? (2770, 2780, 3741, or 3780)
- If IBM® – is the line to be used a Bisynchronous line? Do you have the BSC Communications package?
- Is machine code EBCDIC?

Asynchronous Side -

- Is transmission code ASCII?
- Will it operate in TTY format (start/stop, RS-232, 7 bit, and even-odd mark or space parity)?

The A/S-2G is equipped with two bidirectional RS-232C ports. These ports, labeled Port A and Port B, transfer data at up to 19.2 Kbps. Either or both ports may be connected directly to a terminal, CPU, or an appropriate modem. You configure each port’s operational parameters independently by setting DIP shunts, DIP switches, and jumpers (explained in Chapter 3.0).

Diagnostic LEDs are mounted on the front of the unit. These LEDs are labeled Port A and Port B. They are directly associated with the two ports and indicate the status of the A/S-2G at the port indicated.

The reset button on the back panel will cause the A/S-2G’s Z80A microprocessor to reinitialize (reset).
3.0 Installation

3.1 UNPACKING AND INSPECTION

After unpacking the A/S-2G, inspect it for shipping damage. Should there be any noticeable damage, save the cartons and contact the carrier who delivered the box to place a freight damage claim.

To open the A/S-2G, take out the four screws from the bottom. Lift off the cover. With the cover removed, visually inspect for components that may have been loosened in shipment. Shipping damage is rare, but a quick inspection is always good practice.

Leave the cover off for installation.

3.2 DATA FLOW CONTROL

For the locations of the switches and jumpers, see Figure 5-2 on page 28.

3.2.1 SW3

Locate the set of 8 asynchronous switches labeled SW3 on the printed circuit board. (See Figure 5-2 on page 28.) These should be set as follows:

Switch #1

ON = echo asynchronous characters — echoplex mode.

OFF = don’t echo asynchronous characters — normal mode.

Set this switch ON when the asynchronous device expects to receive an echo of its transmitted data.

**NOTE**

The A/S-2G always operates in half-duplex mode on the synchronous side, so this option applies only to the asynchronous device.

Switch #2

ON = echo “EOT” character.

OFF = don’t echo “EOT” character.

*The last record received from the asynchronous device must be terminated with a “Control D” character.* For this character to echo to the asynchronous device, switch #2 must be ON. This character is echoed only after the EOT sequence is sent to the synchronous device. Its echo appears as a CR LF, EOT.

**NOTE**

An EOT from the bisynchronous device will be displayed in the same way to the asynchronous device with this switch ON.

Switch #3

ON = do not include CR (carriage return) character in EBCDIC data.

OFF = include CR character in EBCDIC data.

*Each block sent by the asynchronous device (except the last one) must be terminated with a CR (carriage return) code.* If this CR code will be included in the synchronous EBCDIC data as a new line, this switch must be OFF.

**NOTE**

The 3741 protocol is limited to a block size of 128 characters (the block size is also the record size), thus a CR must be entered not later than each 128 characters.
Block size for the 2770/2780 is normally limited to 160, but block size is 400 if the 2770/2780 has the Multiple Record Transmission. Block size for the 3780 is 512.

**Switch #4**  
ON = sends CR LF (Carriage Return, Line Feed) to asynchronous device immediately after each logical end of block character (ETB, or ETX) is received from the synchronous side.  
OFF = Normal operation

**Switch #5**  
ON = Variable-length blocks. This switch causes the records sent by the asynchronous device to be blocked and treated as variable length, i.e. no spaces are used to pad out the block.  
OFF = All blocks are treated as fixed length, which would require blank spaces, if necessary, to complete the block size. (In 2780 multi-record blocks, an IUS character is inserted after each 80 characters counted. The final record is the only one that may be less than the block size specified).

**NOTE**  
It is possible that a block will have only one record if you enter a CR after each record (2780 mode).

**Switch #6**  
ON = 3780 MODE  
OFF = 2770/2780/3741 MODE

**Switch #7**  
ON = When RAM reaches a nearly-full state, DTR (Pin 20) will be lowered. When RAM space is available, DTR will be raised to permit transmission to resume. Port A must be configured as DTE (see Section 3.2.5). When CTS from the external asynchronous device is ON, the A/S-2G can send data. When the external device lowers CTS, the A/S-2G will not send data.  
OFF = When RAM reaches a nearly-full state, an X-OFF (ASCII DC3, 13 Hex) will be issued to the asynchronous device to prevent buffer overrun. When RAM space is available, X-ON (ASCII DCl, 11 Hex) will be sent to resume transmission. Put the CTS A jumper to the on position (see Section 3.2.3).

**Switch #8**  
ON = 2 Stop Bits (asynchronous side only).  
OFF = 1 Stop Bit (asynchronous side only).

### 3.2.2 SW2

Locate the switch labeled SW2 on the printed circuit board. (See Figure 5-2 on page 28.)

**Switch #1**  
ON = Space compression on transmit (3780 Mode only).  
OFF = Normal operation.

**Switch #2**  
ON = Pass escape sequences through.  
OFF = Convert escape sequences to CR LF or FF per Section 4.2.3 on page 20.

**Switch #3**  
ON = No Asynchronous RTS except during bisynchronous receive (half-duplex on asynchronous side).  
OFF = Normal Operation (full-duplex).
Switch #4  ON = Self-Diagnostics Mode.
          OFF = Normal Operation.

Switch #5, #6—Block Size Specification.

<table>
<thead>
<tr>
<th>OFF</th>
<th>OFF</th>
<th>80 Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>128 Characters</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>256 Characters</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>512 Characters</td>
</tr>
</tbody>
</table>

**NOTE**
For 3741, set SW3, Switch #5: OFF (Fixed length) SW2, Switch #5: OFF, and Switch #6: OFF (128 character block)

Switch #7, #8—Asynchronous Parity Specification.

<table>
<thead>
<tr>
<th>OFF</th>
<th>OFF</th>
<th>Space Parity (always 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Mark Parity (always 1)</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Odd Parity</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>Even Parity</td>
</tr>
</tbody>
</table>

**NOTE**
The A/S-2G only recognizes a 7-bit, 1 bit parity sequence. 8-bit data, no parity is the same as 7-bit, space parity. If you have 8-bit data, no parity, set SW2, Switches #7 and #8 to the OFF position.

### 3.2.3 SELF-DIAGNOSTICS

There are two ways to enter the self-diagnostic mode. The first method requires that you locate SW2, switch #4 and set it to the ON position. When you press the reset switch, the A/S-2G will display diagnostic information (see below) on a terminal or printer connected to Port A.

The second method requires a terminal connected to Port A. When you type an ampersand ("&") and then a pound sign ("#"), the A/S-2G will enter the Self-Diagnostics/Reconfigure Switch Menu. Press the “l” key to enter the self-diagnostics mode and the A/S-2G will display diagnostic information on your terminal.

This is what the A/S-2G does in self-diagnostic mode:

- Displays its software version
- Checks the ROM
- Checks the RAM
- Displays the state of SW3
- Displays the state of SW2
- Displays the state of SW1 Port A
- Displays the state of SW1 Port B

The information for SW3, SW2, and SW1 is listed in binary: 1=ON and 0=OFF.
NOTE

Self-diagnostics will normally display the switches as they are set on the printed circuit board. If the switches were reconfigured (see Section 3.2.4), the switches will be displayed as they are set in the software.

3.2.4 RECONFIGURE SWITCH MODE

To enter the Reconfigure Switch Mode, a terminal must be connected to Port A. When you type an ampersand (“&”) and then a pound sign (“#”), the A/S-2G will enter the Self-Diagnostics/Reconfigure Switch menu. Press the “2” key to enter the Reconfigure Switch Mode. The position of SW2, Switch #4 (for self-diagnostic testing) does not affect this operation.

The setting for SW3-1 (SW3, switch #1) will be displayed. To select the other option for SW3-1, press “T” (must be upper case). As long as “T” is pressed, the A/S-2G will “toggle” between or among your options. The option will be chosen when you press “enter.” The next switch will then be displayed.

After you have entered the last option, the A/S-2G will return to the main program.

NOTE: If power is interrupted, the A/S-2G will use the manual configurations of SW1, SW2, and SW3 when power is restored. The switch options chosen in the Reconfigure Switch Mode must be reentered.

3.2.5 RS-232 PASS-THROUGH OPTIONS

On the A/S-2G’s printed circuit board are three sets of double pass-through jumpers: DSR, DTR, and CD. You can have any, or all, of these signals pass-thru from one port to the other without being regulated by the A/S-2G.

The DSR double jumper is located just below C7 on the circuit board. For normal operation (A/S-2G signal control), place the jumper over the center and left posts. For pass-through, position the jumper over the center and right posts.

The DTR double jumper is located just below and slightly to the right of U28 on the circuit board. For normal operation (A/S-2G signal control), place the jumper over the center and left posts. For pass-through, position the jumper over the center and right posts.

The CD double jumper is located between U20 and U24 on the circuit board. For normal operation (A/S-2G signal control), place the jumper over the center and upper posts. For pass-through, position the jumper over the center and lower posts.

3.2.6 RESET OPTIONS

You can configure the A/S-2G to reset automatically on the occurrence of Ring Indicate (RI) on either port or the loss of Data Set Ready (DSR) on Port A and/or Port B. These jumpers are located on the upper left of the circuit board, just below U7. Any, or all, of these jumpers may be selected. All of the reset options are disabled as shipped from the factory—the jumper is over the center and right posts. To enable one of these reset options, move the appropriate jumper over the left and center posts.

3.3 PREPARING THE A/S-2G FOR CONNECTION TO AN ASYNCHRONOUS DEVICE

The asynchronous port (Port A) is designed to connect to an asynchronous modem, terminal, or CPU. Set the switches, shunts, and jumpers as described below, then plug a male RS-232 connector into the A/S-2G’s female receptacle. Sex-change adapters, connectors, and cable are available if you need them.

3.3.1 DATA TERMINAL READY (DTR) SIGNAL OPTIONS

The asynchronous port DTR option control is a jumper labeled DTR A. It is located between U23 and U24 on the circuit board. (See Figure 5-2 on page 28.) Placing the jumper over ON maintains a constant high signal on DTR. Placing this jumper to CNT allows the A/S-2G to control data flow based on the position of SW3, Switch #7.
If SW3, Switch #7 is ON, the A/S-2G will drop DTR when only 32 character spaces remain in the buffer. The A/S-2G will reassert DTR as soon as there are at least 33 character spaces available. For most applications, it is best to configure SW3, Switch #7 ON.

If SW3, Switch #7 is OFF, the A/S-2G does not use DTR to control the buffer. Instead, the A/S-2G will issue either an X-ON or X-OFF to control data flow.

### 3.3.2 CLEAR TO SEND (CTS) SIGNAL OPTIONS

The asynchronous port CTS option control is a jumper labeled CTS A. It is located between U18 and U22 on the circuit board. (See Figure 5-2 on page 28.) Placing the jumper over ON maintains a constant high signal on CTS. Placing this jumper to CNT allows the A/S-2G to control data flow.

When CTS is dropped by the device connected to the A/S-2G’s asynchronous port, the A/S-2G will hold whatever it has in its buffer and stop transmission until CTS is raised again. When the asynchronous port is configured as DCE (see Section 3.3.4), it is best to have the CTS A jumper positioned over ON.

### 3.3.3 BAUD RATE OPTIONS

SW1, switches #1 through #4 (See Figure 5-2 on page 28) control the Port A Baud Rate. Set these four switches so that the baud rate of the A/S-2G matches the baud rate of the modem, terminal, or CPU that you will be connecting to the asynchronous port. Refer to Table 3-1, Port A (Asynchronous) Baud Rate, to determine the position of each switch.

**NOTE**

The baud rate of the asynchronous port (Port A) cannot be set externally. Do not use the EXT setting for Port A.

### 3.3.4 MODEM OR DIRECT-TO-TERMINAL CONNECTION

When connecting the A/S-2G’s asynchronous port to a modem or external Asynchronous Modem Eliminator, the A/S-2G should be made to appear as DTE (Data Terminal Equipment).

When connecting the A/S-2G’s asynchronous port directly to a terminal or CPU, the A/S-2G should be made to appear as DCE (Data Communications Equipment).

To configure this interface correctly, place the DIP Shunt (which resembles a PROM) into the correct socket. There are two DIP Shunts—one for the asynchronous port and one for the synchronous port. *Only one of these configurations—DTE or DCE—may be selected for each port at any given time.* The DIP Shunt for the asynchronous port (Port A) should go on U27 or U28. (Refer to the printed circuit board layout, Figure 5-2, on page 28.) To remove or replace a DIP Shunt, follow the instructions for installing and replacing PROMs, Section 5.2, on page 24.

<table>
<thead>
<tr>
<th>Rate</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Rate</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT (Invalid)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>1800</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>75</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>2000</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>110</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>2400</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>134.5</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>4800</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>150</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>7200</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>300</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>9600</td>
<td>ON</td>
<td>ON</td>
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<td>OFF</td>
</tr>
<tr>
<td>600</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>19200</td>
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</tr>
<tr>
<td>1200</td>
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<td>ON</td>
<td>ON</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-1. Port A (Asynchronous) Baud Rates.
3.3.5 CARRIER OPTIONS

If the carrier detect signal is to be driven by the A/S-2G configuration (DCE), the jumper labeled CAR A ENB must be installed. CAR A ENB is located below U20. Refer to the printed circuit board, Figure 5-2, on page 28.

The carrier control jumper, CARR A, in between U18 and U19 on the circuit board (See Figure 5-2 on page 28) should be set as follows:

(a) continuous carrier—place the jumper over the ON position.

(b) switched carrier equal to the RTS signal from the A/S-2G—place the jumper over the CNT position.

If the A/S-2G asynchronous port is configured as DCE, place a jumper over CAR A ENB and place the CARR A jumper over ON.

3.3.6 CABLE REQUIREMENT

Use an RS-232 cable which is pinned straight through, i.e. 1 to 1, 2 to 2, 3 to 3, etc., to connect the A/S-2G’s asynchronous port to the modem, terminal, or CPU. Leads 1 through 8 and 20 are required (see Section 5.3 on page 25).

3.4 PREPARING THE A/S-2G FOR CONNECTION TO A SYNCHRONOUS DEVICE

The synchronous port (Port B) is designed to connect to a synchronous modem, modem eliminator, or terminal. Set the switches, shunts, and jumpers as described below, then plug a male RS-232 connector into the A/S-2G’s female receptacle. Sex-change adapters, connectors, and cable are available if you need them.

<table>
<thead>
<tr>
<th>Rate</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Rate</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>1800</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>75</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>2000</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>110</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>2400</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>134.5</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>4800</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>150</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>7200</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>300</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>9600</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>600</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>19200</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>1200</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-2. Port B (Synchronous) Baud Rates.

3.4.1 DATA TERMINAL READY (DTR) SIGNAL OPTIONS

The synchronous port DTR option control is a jumper labeled DTR B. It is just under U26 on the circuit board. (See Figure 5-2 on page 28.) Placing the jumper over ON maintains a constant high signal on DTR. When this jumper is placed over CNT, the A/S-2G will drop DTR during a reset or after receipt of a DLE EOT sequence from either the synchronous or the asynchronous port. For most installations, position the jumper over ON.

3.4.2 CLEAR TO SEND (CTS) SIGNAL OPTIONS

The synchronous port CTS option control is a jumper labeled CTS B. It is located between U21 and U25 on the circuit board. (See Figure 5-2 on page 28.) Placing the jumper over ON maintains a constant high signal on CTS. When this jumper is placed over CNT, the A/S-2G will raise RTS when
CHAPTER 3: Installation

there is data to be transmitted. Once the A/S-2G receives CTS from the attached device, it will transmit the data. When the synchronous port (Port B) is configured as DTE, the CTS B jumper must be placed over the CNT position. Place the CTS B jumper over the CNT position when Port B is configured as DCE.

3.4.3 BAUD RATE OPTIONS

For externally provided synchronous clocking, the baud rate for the synchronous communication line is determined by the modem or modem eliminator. To select External Clock on Port B, all switches for Port B Baud Rate (SW1, Switches #5 through #8) must be in the OFF position.

When Transmit and Receive Clock are optioned for INTERNAL, set the four switches so that the baud rate of the A/S-2G matches the baud rate of the external synchronous device. Refer to Table 3-2, Port B (Synchronous) Baud Rates, to determine the position of each switch.

3.4.4 MODEM OR DIRECT-TO-TERMINAL CONNECTION

When connecting the A/S-2G's synchronous port to a modem or external Synchronous Modem Eliminator, the A/S-2G should be made to appear as DTE (Data Terminal Equipment).

When connecting the A/S-2G's synchronous port directly to a terminal or CPU, the A/S-2G should be made to appear as DCE (Data Communications Equipment).

To configure this interface correctly, place the DIP Shunt (which resembles a PROM) into the correct socket. There are two DIP Shunts—one for the asynchronous port and one for the synchronous port. Only one of these configurations—DTE or DCE—may be selected for each port at any given time. The DIP Shunt for the synchronous port (Port B) should go on U29 or U30. Refer to the circuit board layout (Figure 5-2 on page 28). To remove or replace a DIP Shunt, follow the instructions for installing and replacing PROMs, Section 5.2, on page 24.

3.4.5 EXTERNAL OR INTERNAL CLOCKING OPTION

The Receive and Transmit Clock options are controlled by two EXT B jumpers and two SME B jumpers. The EXT B jumpers are located near U25. The SME B jumpers are located just below U28. (Refer to the printed circuit board, Figure 5-2, on page 28.) The Receive and Transmit Clock jumpers must be selected to agree with the synchronous port DIP Shunt configuration as DTE or DCE.

When the synchronous port has been configured as DTE, Transmit and Receive Clock must be optioned for EXTERNAL. Install both EXT B jumpers. Remove both SME B jumpers. Port B Baud Rate Switches (SW1, Switches #5 to #8) must all be in the OFF position.

When the synchronous port has been configured as DCE, Transmit and Receive Clock must be optioned for INTERNAL. Remove both EXT B jumpers. Install both SME B jumpers. Port B Baud Rate switches (SW1, Switches #5 to #8) must then be set to match the synchronous baud rate of your external device.

3.4.6 CARRIER OPTIONS

If the Carrier Detect signal is to be driven by the A/S-2G configuration (DCE), the jumper labeled CAR B ENB must be installed. CAR B ENB is located next to U19. Refer to the printed circuit board, Figure 5-2, on page 28.

The carrier control jumper, CARR B, is located in between U18 and U19 on the circuit board (See Figure 5-2 on page 28). For most applications, the jumper should be placed over the CNT position.

3.4.7 CABLE REQUIREMENT

Use an RS-232 cable which is pinned straight through, i.e. 1 to 1, 2 to 2, 3 to 3, etc., to connect the A/S-2G's synchronous port to a modem, modem eliminator, or terminal. Leads 1 through 8, 15, 17, 20, and 22 are required (see Section 5.3 on page 25).
3.4.8 COMMAND PASS-THRU

To use the command pass-thru feature, the command must be preceded by &\% and terminated by &\%.

Example: &\%-Command-&\%  

Commands consist of character pairs. Each pair must represent a valid Hexidecimal value (i.e. zero through 9 or A through F). Example: To send an escape sequence to an attached ASCII device, such as “ESC A,” the following EBCDIC string must be sent to the A/S-2G: &\%1B41&\%. 
4.0 Operation

By its nature, a protocol converter must operate differently in each direction, since it is communicating with separate devices. Therefore, its operation will be discussed separately for asynchronous to synchronous operation and for synchronous to asynchronous.

4.1 ASYNCHRONOUS DEVICE TO SYNCHRONOUS DEVICE

4.1.1 LINE CONTROL

When the A/S-2G is initially connected to an AC power source or reset, the asynchronous device can transmit data.

When the synchronous side has control of the line, a turnaround cannot occur until an “End of Transmission” character has been entered from the controlling device. This character will be an EOT (EBCDIC 37 Hex) on the synchronous side.

4.1.2 ASYNCHRONOUS INPUT DATA FORMAT

The asynchronous side of the A/S-2G is programmed to accept asynchronous data within the following parameters:

- 1 start bit
- 7 data bits
- 1 parity bit (any parity is accepted, but ignored. Parity is user-selectable by SW2, Switches #7 and #8.)
- 1 or 2 stop bits (user-selectable with SW3, Switch #8)
- Half or full duplex (user-selectable with SW2, Switch #3)
- 75 to 9600 bps (user-selectable by SW1, Switches #1 through #4)

ASCII code

<table>
<thead>
<tr>
<th>ASCII Characters Translated to EBCDIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
</tr>
<tr>
<td>Control D</td>
</tr>
<tr>
<td>1B (ASCII Hex)</td>
</tr>
<tr>
<td>CR (when SW3, Switch #3 is OFF)</td>
</tr>
</tbody>
</table>

Table 4-1. ASCII characters translated to EBCDIC.

4.1.3 DATA CONVERSION

The A/S-2G converts Asynchronous ASCII data byte-for-byte to EBCDIC equivalents, blocks it appropriately and wraps it in the applicable protocol envelope. The only characters not converted byte-for-byte are listed in Tables 4-1 and 4-2.

4.1.4 RECORD AND BLOCK SIZE

In preparing asynchronous data for communication to a synchronous device, the A/S-2G groups characters according to the block size selected (SW2, Switches #5 and #6).

In accordance with 2770 and 2780 protocols, the A/S-2G adds an IUS (Hex 1F) followed by 2 block check characters (which are subsequently stripped by the EBCDIC device) after each 80 characters until a CR is received. The CR signifies the end of a block. If SW3, Switch #5 is OFF, the A/S-2G will fill the block with spaces until it reaches the block size specified by SW3, Switches 5 and 6. If SW3, Switch #5 is ON, the block will end immediately after the CR.
In 3741 protocol, each block contains only one record. If SW3, Switch #5 is OFF, the A/S-2G will fill the block with spaces until it reaches 128 characters. If SW3, Switch #5 is ON, the block will end immediately after CR.

**NOTE:**
- If SW3, Switch #3 is OFF, then one character of the total count must be allotted to the CR. The CR will be translated into EBCDIC as a NL (New Line). Thus, if block size is specified as 80 characters, 79 characters plus the CR would make a full 80 character record. Entering 80 characters and a CR would cause 2 records to be sent: one with the 80 characters; the second with the NL character and, if SW3, Switch #5 is OFF, 79 spaces.
- When SW3, Switch #3 is ON, the A/S-2G will delete CR from the character count and send no representation of the CR with the EBCDIC data.

### 4.1.5 USE OF CARRIAGE RETURN

#### (A) 2770/2780 MODE

Data from the asynchronous device is buffered (stored in RAM) until a CR (ASCII 0D Hex) is entered. If the A/S-2G receives asynchronous characters up to the selected block size without receiving a CR character, the A/S-2G will add an IUS character and a 2-byte CRC sequence to the block.

When the A/S-2G receives a CR, the A/S-2G sends any buffered data to the synchronous device with an ETB (EBCDIC Hex 26).

The last block of asynchronous data must end with a “Control D” (ASCII Hex 04). The A/S-2G will send the block, adding with an ETX (EBCDIC Hex 03). After receiving a positive acknowledgement, the A/S-2G sends an EOT.

#### (B) 3741/3780 MODE

Data from the asynchronous device is buffered until a CR (ASCII 0D Hex) is entered. When the A/S-2G receives a CR, the A/S-2G inserts an IRS (EBCDIC 1E Hex). Data will continue to accumulate until the selected block size is exceeded. At this point, the A/S-2G sends the full block of data.

The last block of asynchronous data must end with a “Control D” (ASCII Hex 04). The A/S-2G will send the block, adding with an ETX (EBCDIC Hex 03). After receiving a positive acknowledgement, the A/S-2G sends an EOT.

### 4.1.6 FLOW CONTROL

The input buffer (RAM) is capable of storing up to 1720 characters. The asynchronous device can continuously send data to the A/S-2G if RAM is available and the character string contains a CR code before the buffer fills. (However, the maximum block size that is acceptable to the synchronous device must be considered.)
If SW3, Switch #7 is OFF, the A/S-2G will send an X-OFF (ASCII DC3, 13 Hex) to the asynchronous device when RAM reaches a nearly-full state. This prevents data from being lost due to a buffer overrun. When RAM space is available, the A/S-2G will send an X-ON (ASCII DC1, 11 Hex) to resume transmission.

Alternatively, if SW3, Switch #7 is ON, the A/S-2G will lower the DTR (Pin 20) when RAM reaches a nearly-full state. When RAM space is available, the A/S-2G will again raise DTR to resume transmission.

### 4.1.7 PRESENTATION OF DATA FROM A/S-2G TO SYNCHRONOUS DEVICE

When an asynchronous device begins transmission to the A/S-2G and the A/S-2G has enough data for a block, the A/S-2G bids for the synchronous line and proceeds in standard bisynchronous protocol. See the Data Flow Diagrams on pages 15 through 19.

#### NOTE
Bracketed sections indicate a selectable option. Arrows indicate the direction of data flow.

### 4.1.8 VERIFICATION OF DATA RECESSION

When operating in full duplex mode from the asynchronous side, SW3, Switches #1 and #2 permit visual assurance of accurate and complete transmission. When SW3, Switch #1 is ON, the A/S-2G will immediately echo back all the data it receives from the asynchronous device. When SW3, Switch #2 is ON, the A/S-2G will send a CR, LF, and EOT to the asynchronous device after a complete transmission and a line turn-around have successfully been completed.

### 4.1.9 LINE TURNAROUND

The final record transmitted from the asynchronous side must be terminated with a “Control D” (ASCII 04 Hex) character. This notifies the A/S-2G that the asynchronous device has completed its entry and is relinquishing the line. After all data is sent, the A/S-2G will send an EOT sequence to the synchronous side.

### Data Flow — A/S-2G to Synchronous Device

<table>
<thead>
<tr>
<th>Bisynchronous Device</th>
<th>A/S-2G Converter</th>
<th>Asynchronous Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Bid</td>
<td>ENQ</td>
<td></td>
</tr>
<tr>
<td>AA AA 32 32 32 2D FF FF</td>
<td>Send block A</td>
<td></td>
</tr>
</tbody>
</table>

Characters up to maximum BSC Block size (2770, 2780, 3780) or one 128 character record (3741) terminated by CR (0D Hex) = Block A of data received in start/stop format

(Echo all but CR LF)
**Data Flow — A/S-2G to Synchronous Device**

*Assumes block size of 80 is selected.*
Data Flow — A/S-2G to Synchronous Device

### Bisynchronous Device

- ACK 1
- NAK

### A/S-2G Converter

- X-OFF: Holds up transmission while buffer clears DC3 (ASCII 13 Hex) or drop DTR CTS or user-specified lead
- X-ON: Allows resumption of transmission DC1 (ASCII 11 Hex) or raise DTR

### Asynchronous Device

- ACK 0
- WAK

**If A/S-2G buffer is nearly full when asynchronous device is transmitting:**

- Send block C

**If data not properly received by synchronous device or synchronous device has no WAK capability and buffer is full:**

- Send block D
- Resend block D

**If synchronous device has WAK capability and buffer is full:**

- Send block E
- Send block E

**2-second interval**

WAK

AA AA 32 32 32 6B FF FF
Data Flow — A/S-2G to Synchronous Device

<table>
<thead>
<tr>
<th>Bisynchronous Device</th>
<th>A/S-2G Converter</th>
<th>Asynchronous Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAK</td>
<td>ENQ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-second interval</td>
<td></td>
</tr>
<tr>
<td>WAK resets ENQ counter</td>
<td>ENQ</td>
<td></td>
</tr>
<tr>
<td>ACK 1</td>
<td>Send block F</td>
<td>(Echo CR LF)</td>
</tr>
<tr>
<td>ACK 0</td>
<td></td>
<td>(Echo all but CR LF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sync device buffer space available</td>
<td></td>
<td>Line release or turnaround:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If data not yet available from asynchronous device:</td>
<td></td>
<td>Send block G,</td>
</tr>
<tr>
<td>If over 3-second interval</td>
<td></td>
<td>(end with EOT Hex 04)</td>
</tr>
<tr>
<td>AA 32 32 32 32 02 2D FF FF</td>
<td>TTD</td>
<td>(Echo all but CR LF EOT)</td>
</tr>
<tr>
<td>NAK</td>
<td></td>
<td>Send block G</td>
</tr>
<tr>
<td>AA AA 32 32 32 3D FF FF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Data Flow — A/S-2G to Synchronous Device

**Bisynchronous Device**

<table>
<thead>
<tr>
<th>IF 2270 - 2780</th>
<th>AA AA 32 32 32 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(text up to 80 characters),</td>
<td></td>
</tr>
<tr>
<td>IF, BCC1, BCC2; etc. (last record 03, BCC1, BCC2, FF FF)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IF 3780</th>
<th>AA AA 32 32 32 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(text up to 80* characters with records separated by 1E, last record in block 1E, 03, BCC1, BCC2, FF FF)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IF 3741</th>
<th>AA AA 32 32 32 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(up to 128 characters), 03, BCC1, BCC2, FF FF</td>
<td></td>
</tr>
</tbody>
</table>

**A/S-2G Converter**

<table>
<thead>
<tr>
<th>ACK 1</th>
<th>AA AA 32 32 32 37 FF FF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send EOT</td>
<td></td>
</tr>
</tbody>
</table>

**Asynchronous Device**

<table>
<thead>
<tr>
<th>(Echo CR LF EOT)</th>
<th></th>
</tr>
</thead>
</table>

*Line is now idle*

*Assumes block size of 80 is selected.*
4.2 SYNCHRONOUS DEVICE TO ASYNCHRONOUS DEVICE

4.2.1 LINE CONTROL
When the A/S-2G is initially connected to an AC power source or reset, the synchronous device can gain control of the line by sending an ENQ.

When the asynchronous side has control of the line, a turnaround cannot occur until an “End of Transmission” character has been entered from the controlling device. This character will be a “Control D” (ASCII 04 Hex) on the asynchronous side.

4.2.2 SYNCHRONOUS INPUT DATA FORMAT
The synchronous side of the A/S-2G is programmed to receive data whose format is completely specified by the protocol in use (2770, 2780, 3741, or 3780). It will be in EBCDIC code at a data rate of up to 9600 bps.

4.2.3 DATA CONVERSION
The A/S-2G converts all synchronous EBCDIC data characters byte-for-byte to ASCII characters. The A/S-2G strips synchronization and protocol characters and adds asynchronous start and stop bits. The only exceptions in translating EBCDIC characters to ASCII Characters are listed in Tables 4-3 and 4-4 below.

4.2.4 FLOW CONTROL
The input buffer (RAM) is capable of storing up to a maximum of 1720 characters. The synchronous device can continuously send data to the A/S-2G so long as RAM is available. When a nearly-full state is reached (as determined by the selected block size), the A/S-2G will send a WAK (Wait Acknowledgement) to halt synchronous transmission until memory is available.

<table>
<thead>
<tr>
<th>EBCDIC</th>
<th>to</th>
<th>ASCII</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL (New Line) (Hex 15)</td>
<td></td>
<td>CR LF</td>
</tr>
<tr>
<td>EE or 27</td>
<td></td>
<td>ESC</td>
</tr>
<tr>
<td>ESC S</td>
<td></td>
<td>CR LF CR LF</td>
</tr>
<tr>
<td>ESC T</td>
<td></td>
<td>CR LF CR LF CR LF</td>
</tr>
<tr>
<td>ESC A</td>
<td></td>
<td>FF</td>
</tr>
<tr>
<td>ESC M</td>
<td></td>
<td>CR, Suppress LF</td>
</tr>
<tr>
<td>all other escapes</td>
<td></td>
<td>CR LF</td>
</tr>
</tbody>
</table>

Table 4-3. EBCDIC characters translated to ASCII.

4.2.5 VERIFICATION OF DATA RECEPTION
The A/S-2G uses the standard synchronous protocol, ensuring data receipt and integrity through the standard ACK (Positive Acknowledgement), NAK (Negative Acknowledgement), and CRC-16 (cyclic redundancy check 16th degree polynomial structures).

4.2.6 LINE TURNAROUND
The final transmission from the synchronous side will be the EOT sequence (EBCDIC Hex 37). This releases the line and allows the A/S-2G to enter an idle mode wherein it will accept a line bid from either side.
Should the A/S-2G receive a DLE EOT (disconnect), the A/S-2G will cycle the synchronous DTR lead off for 2 seconds. This action will disconnect a phone line if the DTR B jumper is set for CNT.

**NOTE**
The A/S-2G will cycle the synchronous DTR lead off for 2 seconds whether the DLE EOT sequence comes from the synchronous or asynchronous side.

<table>
<thead>
<tr>
<th>Character</th>
<th>Hex</th>
<th>Character</th>
<th>Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUL</td>
<td>00</td>
<td>ACK</td>
<td>2E</td>
</tr>
<tr>
<td>SOH</td>
<td>01</td>
<td>DLE</td>
<td>10</td>
</tr>
<tr>
<td>STX</td>
<td>02</td>
<td>NAK</td>
<td>3D</td>
</tr>
<tr>
<td>ETX</td>
<td>03</td>
<td>SYN</td>
<td>32</td>
</tr>
<tr>
<td>EOT</td>
<td>37</td>
<td>ETB</td>
<td>26</td>
</tr>
<tr>
<td>ENQ</td>
<td>2D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-4. EBCDIC characters stripped.
## Data Flow — A/S-2G to Asynchronous Device

<table>
<thead>
<tr>
<th>Bisynchronous Device</th>
<th>A/S-2G Converter</th>
<th>Asynchronous Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENQ</td>
<td>ACK 0</td>
<td></td>
</tr>
<tr>
<td>Send data block A</td>
<td>ACK 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Send block A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unformatted mode—successive characters (including spaces) appear one after another as sent</td>
</tr>
<tr>
<td>If A/S-2G buffer is nearly full when synchronous device is transmitting:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Send data block B</td>
<td>2-second interval</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WAK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-second interval</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WAK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Send block B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WAK resets ENQ counter with respect to ENQ time out</td>
</tr>
<tr>
<td>ENQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACK 0 (when buffer available)</td>
<td></td>
</tr>
<tr>
<td>Send data block C</td>
<td>ACK 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Send block C</td>
<td></td>
</tr>
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## Data Flow — A/S-2G to Asynchronous Device

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<th>Bisynchronous Device</th>
<th>A/S-2G Converter</th>
<th>Asynchronous Device</th>
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<tr>
<td>Send data block D</td>
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<tr>
<td>Send data block D</td>
<td>ACK 0 when available</td>
<td>Send block D</td>
</tr>
<tr>
<td>Retransmit block E</td>
<td>ACK 1 (when correctly received)</td>
<td>Send block E</td>
</tr>
</tbody>
</table>

If data not properly received by A/S-2G:

| Send data block E    | NAK              |                     |
| Retransmit block E   | ACK 1 (when correctly received) | Send block E        |

If data not yet available from synchronous device while synchronous line to A/S-2G is engaged:

- 2-second interval from previous ACK

| TTD                  | NAK              |                     |
| TTD                  | NAK              |                     |

Continues until data available
## Data Flow — A/S-2G to Asynchronous Device

<table>
<thead>
<tr>
<th>Bisynchronous Device</th>
<th>A/S-2G Converter</th>
<th>Asynchronous Device</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Line release or turnaround</strong></td>
<td><strong>Send data block F (last block)</strong></td>
<td><strong>Send C R LF EOT to asynchronous device if SW3, switch #2 is ON</strong></td>
</tr>
<tr>
<td><strong>Send block F</strong></td>
<td><strong>ACK 0</strong></td>
<td></td>
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<tr>
<td><strong>EOT</strong></td>
<td></td>
<td><strong>Line can now be turned around or A/S-2G in idle mode</strong></td>
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</table>
5.0 Conversions and Connections

5.1 TRANSPARENCY MODE OF OPERATION

With a special transparency PROM installed, the A/S-2G will communicate with a host system in IBM binary synchronous transparent mode. To special-order the transparency PROM, please call technical support.

In transparent mode, no character translations are performed in either direction, allowing transmission of binary file such as raw data or program object files.

In accordance with IBM specifications, each data block is bracketed with a protocol envelope consisting of a DLE STX (EBCDIC 10 Hex, 02 Hex) at the beginning and DLE ETB (EBCDIC 10 Hex, 26 Hex) at the end. Should a DLE (10 Hex) occur within the data block, a second DLE (10 Hex) is inserted by the sending device to eliminate the possibility of a legal DLE sequence occurring by chance in the data. The A/S-2G software automatically inserts or strips the extra DLE (10 Hex) when necessary.

Transparency mode always sends fixed length blocks. Block size is selected with SW2, Switches #5 and #6. The variable/fixed switch only pertains to the last (partial) block received from the asynchronous port. The A/S-2G software detects the end of incoming asynchronous data in one of two ways:

1. Receipt of an ASCII ESC Control-D sequence (1B Hex, 04 Hex), with no other data following for one second.
2. No asynchronous data received for a period of twelve seconds.

When one of these conditions occurs, the A/S-2G will transmit the last block terminated with DLE ETX. Upon acknowledgement of this last block, an EOT sequence is sent.

The transparency mode software will accept data blocks of any size (assuming no memory overflow) and will handle variable length or fixed blocks.

5.2 INSTALLING OR REPLACING PROMS

1. Unplug the A/S-2G from the AC power.
2. Remove the cover of the A/S-2G.
3. To locate the PROM, see Figure 5-2 on page 28. The PROM is located on U11, between U10 and U12.
4. Using a PROM extraction tool or a small screwdriver, pry the PROM out of the socket until it is loose. Then, slide the tool or your fingers under the PROM and gently lift up. You must lift directly upward to avoid damaging the teeth of the PROM.
5. Now insert your new PROM. It may require its pins to be pushed in a little. If so, use a table top to do this. This will ensure that the pins stay aligned.

Caution

Note the orientation of the indentation on one of the prom’s short ends—it must line up with the matching indentation on the socket into which it is inserted.
5.3 RS-232 CABLE CHART

RS-232C pins are defined as follows:

1 = Chassis (or Frame or Protective) Ground  F-GND, C-GND, or P-GND
2 = Transmit Data  TD or TXD
3 = Receive Data  RD or RXD
4 = Request to Send  RTS
5 = Clear to Send  CTS
6 = Data Set Ready  DSR
7 = Signal Ground  S-GND
8 = Carrier Detect  CD
15 = Transmit Signal Element Timing (Clock)  T-CLK or TXCLK
17 = Receive Signal Element Timing (Clock)  R-CLK or TXCLK
20 = Data Terminal Ready  DTR
22 = Ring Indicator  RI

**RS-232 Interface**

Figure 5-1. The RS-232 Interface.
## 5.4 CODE CONVERSIONS

The conversions used in the standard 2770, 2780, 3741, and 3780 PROMs are shown in the following charts. Your PROM can be customized. Please call Technical Support if you have particular translation requirements.

### Abbreviations:

- Dir. = Direction of Conversion
- NP = No pass (no translation in either direction)

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<td></td>
</tr>
<tr>
<td>ESC M</td>
<td>CR</td>
<td>Suppress LF for underscore</td>
</tr>
<tr>
<td>ESC S</td>
<td>CR LF</td>
<td>Two CR LF sequences</td>
</tr>
<tr>
<td>ESC T</td>
<td>CR LF</td>
<td>Three CR LF sequences</td>
</tr>
<tr>
<td>Any other ESC</td>
<td>CR LF</td>
<td>sequence</td>
</tr>
<tr>
<td>NL</td>
<td>CR LF</td>
<td></td>
</tr>
</tbody>
</table>

ASCII to EBCDIC

<table>
<thead>
<tr>
<th>ASCII</th>
<th>EBCDIC</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>NL</td>
<td>This occurs only when SW3, Switch #3 is OFF.</td>
</tr>
</tbody>
</table>
5.5 PRINTED CIRCUIT BOARD LAYOUT

Figure 5-2. Printed Board Circuit Layout.