BLACK BOX®
NETWORK SERVICES

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NETWORK SERVICES

Code Operated Switch—4-Port (COS-4P)
Code Operated Switch—8-Port (COS-8P)
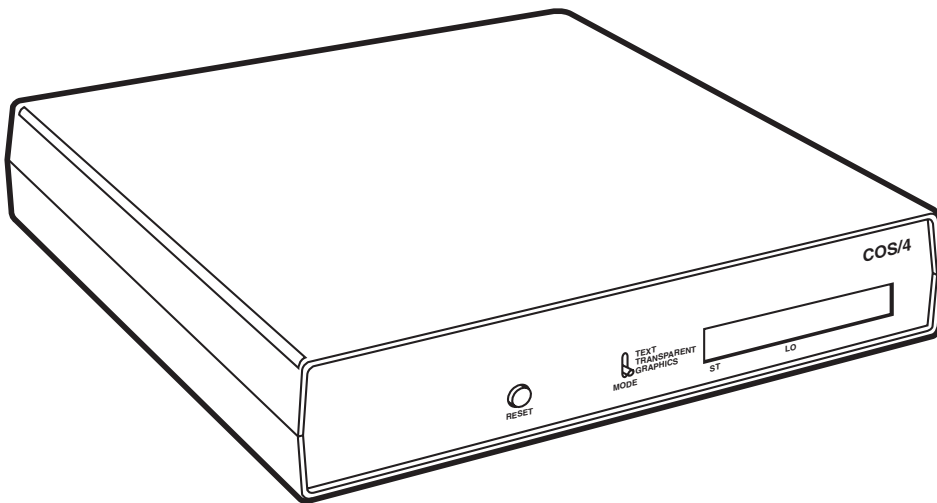
**FEDERAL COMMUNICATIONS COMMISSION
AND
CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENTS**

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 the Canadian Department of Communications.

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 le ministère des Communications du Canada.

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The SW853AE-R2 and SW854AE-R2 are CE compliant.

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

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 parato 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 bloquea 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 deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado 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 fisica 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 lineas de energia.

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 objectos liquidos 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.

1. Specifications

Circuits Supported –

Pin No.	Name	Description
1	FG	Chassis Ground, wired straight through
2	TD	DTE/DCE, switched for each channel
3	RD	DTE/DCE, switch-selectable for each channel
4	RTS	Switch-selected to be pulled up or tied to Pin 5
5	CTS	Switch-selected to be pulled up or tied to Pin 4
6	DSR	DTE/DCE, switched for each channel
7	SG	Signal Ground, wired straight through
8	DCD	Received Line Signal Detect, switch-selected to be pulled up or not pulled up
20	DTR	DTE/DCE, switch-selectable for each channel

Addressing – Two-digit code, as follows:

First digit is switch-selectable, initiates Switch Time. Factory setting is EOT (CTRL-D, hex 04, decimal 04).

Second digit assigns channel. ASCII 0-7 (hex 30-37, decimal 48-55) selects Ports 0-7.

Any port can select the channel when the unit is in switch-time mode (unless disabled by SW6 positions 1-4; see **Section 3.2.2**).

Controls – *External:* Vertical switch (mode switch); pushbutton reset; *Internal:* Baud rate; format; timeout (2.5 minutes, 5 minutes, 10 minutes, or infinite); arming character; DTE/DCE for each port

Speed – 300, 1200, 2400, 4800, 9600, 19,200, 38,400, or 76,800 bps

Temperature Tolerance – *Operating:* 32 to 122°F (0 to 50°C); *Storage:* -40 to +158°F (-20 to +70°C)

Humidity Tolerance – 15 to 95%, noncondensing

Indicators – LOCKOUT and SWITCH TIME LEDs; CHANNEL SELECTED digital display

Interface – RS-232/V.24, full duplex, asynchronous

Connectors – *SW853A-R2, SW853AE-R2:* (5) DB25 female (master port and 4 subordinate ports); *SW854A-R2, SW854AE-R2:* (9) DB25 female (master port and 8 subordinate ports)

Power – *SW853A-R2, SW854A-R2*: 115 VAC (NEMA 5-15 connector), 60 Hz; *SW853AE-R2, SW854AE-R2*: 230 VAC (IEC 320 male connector on a 2" pigtail), 50 Hz

Size – 3"H × 12.8"W × 11.3"D (7.6 × 32.5 × 28.7 cm)

Weight – 8 lb. (3.7 kg)

Enclosure – High-impact plastic

2. Introduction

The Code Operated Switch (COS for short) is an asynchronous RS-232C switch. By sending codes to the switch, a terminal or computer attached to the master port can select a printer, modem, terminal, or anything else attached to one of the subordinate ports. Or one of the subordinate devices can make the link by transmitting its own channel-address code while the switch is in Switch Time mode.

Once the link is established, all the other ports are locked out. They remain locked out until either the master port or the selected subordinate sends an arming character. When it receives the arming character, the COS breaks all switched connections and goes back to Switch Time mode.

The ports are all standard DB25 female connectors. All signal grounds (pin 7) and all chassis grounds (pin 1) are tied together. You can configure each port individually as DTE or DCE with simple DIP switches. There are also switches to configure data rate and word format (parity, character length, and number of stop bits).

For applications where the arming character might appear in ordinary data (graphics, for example), you can set up the COS so that the arming character must be preceded by an idle time. That way, if the arming character appears in the ordinary data stream, it will pass through without causing the COS to switch.

Figure 2-1 shows a typical COS installation. The computer selects a device to communicate with by sending the arming and switching code. Or one of the terminals can make the connection if it has the proper code and the COS is in Switch Time mode.

Point-to-point, multipoint, or dedicated line

Modem

Code Operated Switch

Terminal

Master

Terminals or CPUs
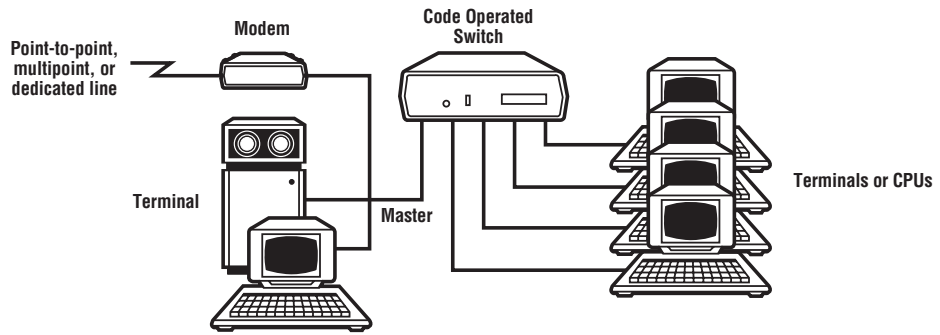
Figure 2-1. A typical application of the COS-4P.

3. Installation

To install the Code Operated Switch, all you have to do is connect it with standard RS-232 cables to the equipment you want to switch. The default settings will work in many common applications. If you need to change the defaults, you can set the internal DIP switches for the configuration you want.

Looking at the back of the COS, the connector at the far left is the master port. The rest of the connectors are the subordinate ports. From left to right, the subordinate ports are numbered 0, 1, 2, 3 on the COS-4P, and 0, 1, 2, 3, 4, 5, 6, 7 on the COS-8P.

3.1 The Default Settings

These are the default settings:

Data rate:	9600 bps
Word format:	8 data bits, 1 stop bit, no parity
Auto timeout:	Disabled
Arming character:	04 hex (EOT); CTRL-D
DTE/DCE setting:	For all ports, DCE with DSR, DTR control

If those settings suit your application, then once you hook up the cables, the COS is ready to go. If you need to change any of the settings, follow the instructions in the rest of this chapter.

3.2 Setting the DIP Switches

CAUTION

Before you set the DIP switches, make sure the power is disconnected from the COS.

See Figure 3-1 for the locations of the DIP switches.

THESE SWITCHES ARE FOR COS-8P ONLY

SW5　　　　SW4　　　　SW3　　　　SW2

115

W1

SW1

SW6

SW7

SW9

SW10

SW8

40167B

C
B
A
W4

SWT　　　LOCK

Figure 3-1. Finding the DIP switches on the circuit board.

3.2.1 DTE OR DCE?

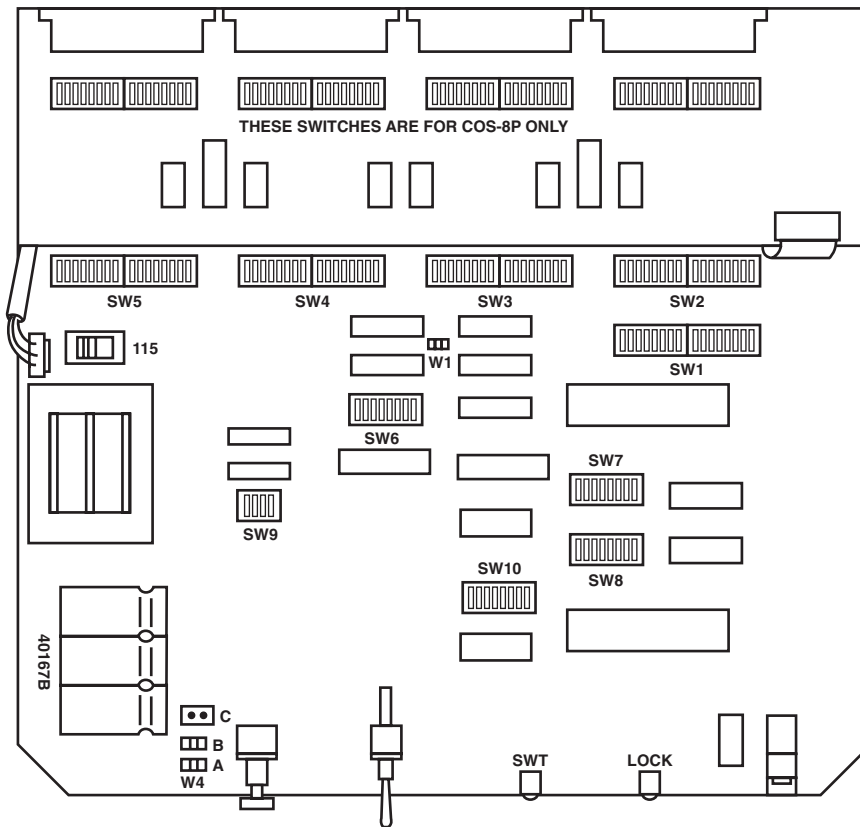Each port has two banks of DIP switches: SWA and SWB. Here's how to set the ports for DTE or DCE in most applications. If you need to know more about what "DTE" and "DCE" mean, read the explanation below. If you need to change the default control leads, see "Changing the Control Leads" on the next page.

To set a port as **DCE** (to connect to DTE equipment, such as a PC, a serial printer, a terminal, or most minicomputers), set the switches like this:

SWITCH POSITIONS

	1	2	3	4	5	6	7	8
SWA	O	O	O	O	O	C	C	O
SWB	C	O	O	C	C	C	C	C

C = CLOSED, O = OPEN

To set a port as **DTE** (to connect to DCE equipment, such as a modem or the ports on some host computers like HP® or Data General), set the switches like this:

SWITCH POSITIONS

	1	2	3	4	5	6	7	8
SWA	O	O	O	O	C	O	O	C
SWB	O	C	C	O	C	C	C	C

C = CLOSED, O = OPEN

What do "DTE" and "DCE" mean?

The difference between DTE and DCE is just a difference in pinning.

A DTE ("data-terminal equipment") device outputs data on Pin 2 and receives data on Pin 3. Its control output pins are RTS (Pin 4) and DTR (Pin 20). Its control input pins are CTS (Pin 5), DSR (Pin 6), and DCD (Pin 8). PCs, terminals, and DEC minicomputers are all DTE devices.

A DCE ("data-communication equipment" or "data circuit-terminating equipment") device is the opposite of a DTE device. It *receives* data on Pin 2 and *outputs* data on Pin 3. Its control *output* pins are CTS (Pin 5), DSR (Pin 6), and DCD (Pin 8).

When you connect two RS-232 devices with an ordinary straight-pinned cable, one of the devices must be DTE and the other DCE. That's why the COS port must be configured as the opposite of the device you're connecting to it (if you're using an ordinary straight-pinned cable).

Changing the Control Leads

Normally, you'd set up the COS port for DSR/DTR handshaking, which is what you get when you set SWA and SWB as described at the beginning of this section. If you need to use RTS and DCD as the control leads instead of DTR and DSR, set positions 1 through 4 on SWA and SWB this way:

In DCE mode, to set RTS as the control input and DCD as the control output:

<pre>
                    SWITCH POSITIONS
               1   2   3   4
      SWA   O   C   C   O
      SWB   O   O   O   O
               C = CLOSED, O = OPEN
</pre>

In DTE mode, to set RTS as the control output and DCD as the control input:

<pre>
                    SWITCH POSITIONS
               1   2   3   4
      SWA   C   O   O   C
      SWB   O   O   O   O
               C = CLOSED, O = OPEN
</pre>

Positions 5 through 8 on SWB are used to pull RTS, CTS, or DCD high, or to tie RTS to CTS.

- To tie RTS to CTS, close SWB positions 6 and 7.

- To pull RTS and CTS high, close SWB position 8.

- To pull DCD high, close SWB position 5.

CODE OPERATED SWITCH

If you're technically oriented, you can use Figure 3-2 to get an overview of how DIP switches SWA and SWB work.

Figure 3-2. How SWA and SWB work for each port.
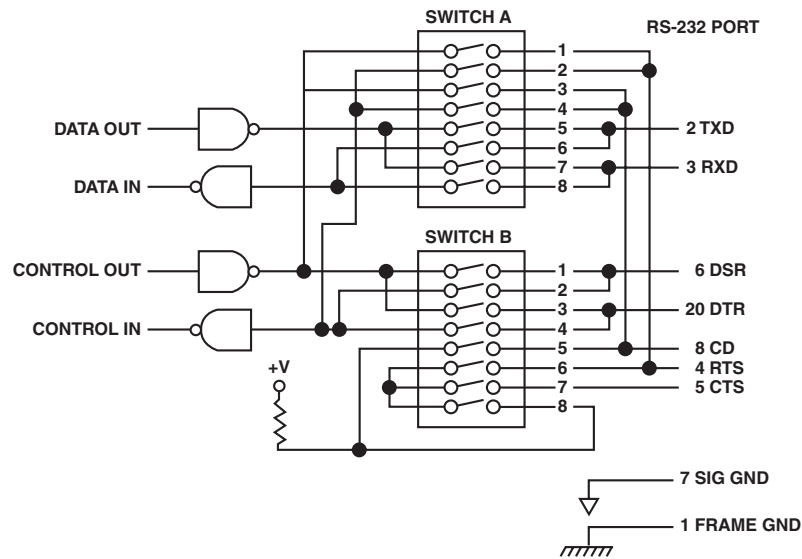
Notes on configuring the DIP switches:

- In an idle state, the COS can hold hardware-handshake or flow-control leads high *only* on the master port. Holding them high is useful when you have the master port connected to a modem.

- Input signals coming from the master port will be passed through to a connected slave port. If they are high, they will be passed through as high.

3.2.2 SWITCH SW6: SWITCH-TIME MODE AND TIMEOUT

Positions 1 through 4 of Switch SW6 control the ability to put the COS into Switch-Time Mode, and to change it from Switch-Time Mode to Channel Mode. Positions 5 through 8 control the automatic timeout (see **Section 4.3**).

Switch position	Function
1	OPEN: Slave cannot put COS into Switch-Time Mode CLOSED: Slave can put COS into Switch-Time Mode
2	OPEN: Master cannot put COS into Switch-Time Mode CLOSED: Master can put COS into Switch-Time Mode
3	OPEN: Master cannot switch COS from Switch-Time Mode to Channel Mode CLOSED: Master can switch COS from Switch-Time Mode to Channel Mode
4	OPEN: Slave cannot switch COS from Switch-Time Mode to Channel Mode CLOSED: Slave can switch COS from Switch-Time Mode to Channel Mode

Close only one of these four {
5	CLOSED: 2½-minute timeout
6	CLOSED: 5-minute timeout
7	CLOSED: 10-minute timeout
8	CLOSED: No timeout

3.2.3 SWITCH SW7

Positions 1 through 5 of Switch SW7 control the data format—parity, word length, and stop bits. Positions 7 and 8 control Graphics Mode (see **Section 4.6.3**).

Switch position	Function
1	OPEN: Even parity CLOSED: Odd parity

2 and 3: Word length

Position 2	Position 3	Word Length
CLOSED	CLOSED	5 bits
OPEN	CLOSED	6 bits
CLOSED	OPEN	7 bits
OPEN	OPEN	8 bits

4	OPEN: 2 stop bits CLOSED: 1 stop bit

5   OPEN: Parity disabled
CLOSED: Parity enabled

6   [Always open]

7   Graphics mode—see **Section 4.6.3**

7   Graphics mode—see **Section 4.6.3**

3.2.4 SWITCH SW8: ARMING CHARACTER

Arming Characters				**Switch Positions** LSB							MSB
ASCII	**CTRL**	**Hex**	**Decimal**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
NUL	@	00	0	C	C	C	C	C	C	C	C
SOH	A	01	1	O	C	C	C	C	C	C	C
STX	B	02	2	C	O	C	C	C	C	C	C
ETX	C	03	3	O	O	C	C	C	C	C	C
EOT*	**D**	**04**	**4**	**C**	**C**	**O**	**C**	**C**	**C**	**C**	**C**
ENQ	E	05	5	O	C	O	C	C	C	C	C
ACK	F	06	6	C	O	O	C	C	C	C	C
BEL	G	07	7	O	O	O	C	C	C	C	C
BS	H	08	8	C	C	C	O	C	C	C	C
HT	I	09	9	O	C	C	O	C	C	C	C
LF	J	0A	10	C	O	C	O	C	C	C	C
VT	K	0B	11	O	O	C	O	C	C	C	C
FF	L	0C	12	C	C	O	O	C	C	C	C
CR	M	0D	13	O	C	O	O	C	C	C	C
SO	N	0E	14	C	O	O	O	C	C	C	C
SI	O	0F	15	O	O	O	O	C	C	C	C
DLE	P	10	16	C	C	C	C	O	C	C	C
DC1	Q	11	17	O	C	C	C	O	C	C	C
DC2	R	12	18	C	O	C	C	O	C	C	C
DC3	S	13	19	O	O	C	C	O	C	C	C
DC4	T	14	20	C	C	O	C	O	C	C	C
NAK	U	15	21	O	C	O	C	O	C	C	C
SYN	V	16	22	C	O	O	C	O	C	C	C
ETB	W	17	23	O	O	O	C	O	C	C	C
CAN	X	18	24	C	C	C	O	O	C	C	C

*This is the default setting.

Arming Characters				Switch Positions LSB							MSB
ASCII	CTRL	Hex	Decimal	1	2	3	4	5	6	7	8
EM	Y	19	25	O	C	C	O	O	C	C	C
SUB	Z	1A	26	C	O	C	O	O	C	C	C
ESC	[	1B	27	O	O	C	O	O	C	C	C
FS	\	1C	28	C	C	O	O	O	C	C	C
GS	]	1D	29	O	C	O	O	O	C	C	C
RS	^	1E	30	C	O	O	O	O	C	C	C
US	_	1F	31	O	O	O	O	O	C	C	C
SPACE		20	32	C	C	C	C	C	O	C	C
!		21	33	O	C	C	C	C	O	C	C
"		22	34	C	O	C	C	C	O	C	C
#		23	35	O	O	C	C	C	O	C	C
$		24	36	C	C	O	C	C	O	C	C
%		25	37	O	C	O	C	C	O	C	C
&		26	38	C	O	O	C	C	O	C	C
'		27	39	O	O	O	C	C	O	C	C
(		28	40	C	C	C	O	C	O	C	C
)		29	41	O	C	C	O	C	O	C	C
.		2A	42	C	O	C	O	C	O	C	C
+		2B	43	O	O	C	O	C	O	C	C
,		2C	44	C	C	O	O	C	O	C	C
-		2D	45	O	C	O	O	C	O	C	C
.		2E	46	C	O	O	O	C	O	C	C
/		2F	47	O	O	O	O	C	O	C	C
0		30	48	C	C	C	C	O	O	C	C
1		31	49	O	C	C	C	O	O	C	C
2		32	50	C	O	C	C	O	O	C	C
3		33	51	O	O	C	C	O	O	C	C
4		34	52	C	C	O	C	O	O	C	C
5		35	53	O	C	O	C	O	O	C	C
6		36	54	C	O	O	C	O	O	C	C
7		37	55	O	O	O	C	O	O	C	C

CODE OPERATED SWITCH

| **Arming Characters** | | | | **Switch Positions** | | | | | | | |
| | | | | **LSB** | | | | | | | **MSB** |
ASCII	**CTRL**	**Hex**	**Decimal**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
8		38	56	C	C	C	O	O	O	C	C
9		39	57	O	C	C	O	O	O	C	C
:		3A	58	C	O	C	O	O	O	C	C
;		3B	59	O	O	C	O	O	O	C	C
<		3C	60	C	C	O	O	O	O	C	C
=		3D	61	O	C	O	O	O	O	C	C
>		3E	62	C	O	O	O	O	O	C	C
?		3F	63	O	O	O	O	O	O	C	C
@		40	64	C	C	C	C	C	C	O	C
A		41	65	O	C	C	C	C	C	O	C
B		42	66	C	O	C	C	C	C	O	C
C		43	67	O	O	C	C	C	C	O	C
D		44	68	C	C	O	C	C	C	O	C
E		45	69	O	C	O	C	C	C	O	C
F		46	70	C	O	O	C	C	C	O	C
G		47	71	O	O	O	C	C	C	O	C
H		48	72	C	C	C	O	C	C	O	C
I		49	73	O	C	C	O	C	C	O	C
J		4A	74	C	O	C	O	C	C	O	C
K		4B	75	O	O	C	O	C	C	O	C
L		4C	76	C	C	O	O	C	C	O	C
M		4D	77	O	C	O	O	C	C	O	C
N		4E	78	C	O	O	O	C	C	O	C
O		4F	79	O	O	O	O	C	C	O	C
P		50	80	C	C	C	C	O	C	O	C
Q		51	81	O	C	C	C	O	C	O	C
R		52	82	C	O	C	C	O	C	O	C
S		53	83	O	O	C	C	O	C	O	C
T		54	84	C	C	O	C	O	C	O	C
U		55	85	O	C	O	C	O	C	O	C
V		56	86	C	O	O	C	O	C	O	C

Arming Characters				Switch Positions LSB							MSB
ASCII	**CTRL**	**Hex**	**Decimal**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
W		57	87	O	O	O	C	O	C	O	C
X		58	88	C	C	C	O	O	C	O	C
Y		59	89	O	C	C	O	O	C	O	C
Z		5A	90	C	O	C	O	O	C	O	C
[		5B	91	O	O	C	O	O	C	O	C
		5C	92	C	C	O	O	O	C	O	C
]		5D	93	O	C	O	O	O	C	O	C
		5E	94	C	O	O	O	O	C	O	C
¨		5F	95	O	O	O	O	O	C	O	C
-		60	96	C	C	C	C	C	O	O	C
a		61	97	O	C	C	C	C	O	O	C
b		62	98	C	O	C	C	C	O	O	C
c		63	99	O	O	C	C	C	O	O	C
d		64	100	C	C	O	C	C	O	O	C
e		65	101	O	C	O	C	C	O	O	C
f		66	102	C	O	O	C	C	O	O	C
g		67	103	O	O	O	C	C	O	O	C
h		68	104	C	C	C	O	C	O	O	C
i		69	105	O	C	C	O	C	O	O	C
j		6A	106	C	O	C	O	C	O	O	C
k		6B	107	O	O	C	O	C	O	O	C
l		6C	108	C	C	O	O	C	O	O	C
m		6D	109	O	C	O	O	C	O	O	C
n		6E	110	C	O	O	O	C	O	O	C
o		6F	111	O	O	O	O	C	O	O	C
p		70	112	C	C	C	C	O	O	O	C
q		71	113	O	C	C	C	O	O	O	C
r		72	114	C	O	C	C	O	O	O	C
s		73	115	O	O	C	C	O	O	O	C
t		74	116	C	C	O	C	O	O	O	C
u		75	117	O	C	O	C	O	O	O	C

| Arming Characters | | | | Switch Positions LSB | | | | | | | MSB |
ASCII	CTRL	Hex	Decimal	1	2	3	4	5	6	7	8
v		76	118	C	O	O	C	O	O	O	C
w		77	119	O	O	O	C	O	O	O	C
x		78	120	C	C	C	O	O	O	O	C
y		79	121	O	C	C	O	O	O	O	C
z		7A	122	C	O	C	O	O	O	O	C
		7B	123	O	O	C	O	O	O	O	C
—		7C	124	C	C	O	O	O	O	O	C
		7D	125	O	C	O	O	O	O	O	C
		7E	126	C	O	O	O	O	O	O	C
DEL		7F	127	O	O	O	O	O	O	O	C

3.2.5 SWITCH SW9

See the description of Graphics Mode in **Section 4.6.3** for more an explanation of what this switch does.

Switch Position	Function
1	CLOSED = 5-word gap in transmission
2	CLOSED = 25-word gap in transmission
3	CLOSED = 50-word gap in transmission
4	CLOSED = 100-word gap in transmission

NOTE: Close only one position at a time.

3.2.6 SWITCH SW10

Sets the data speed.

Switch Position		Speed
1	CLOSED =	300 bps
2	CLOSED =	1200 bps
3	CLOSED =	2400 bps
4	CLOSED =	4800 bps
5	CLOSED =	9600 bps
6	CLOSED =	19.2 kbps
7	CLOSED =	38.4 kbps
8	CLOSED =	76.8 kbps

NOTE: Close only one position at a time.

3.3 Straps W1, W4, and W7

Strap **W1**, if installed, will disable the Switch from passing breaks. See the note on the next page.

Strap **W4** selects the power-on reset—either to switch-time mode or to port 0.

- When W4 straps A and B are in and strap C is out, switch-time mode is selected. (This is the factory-default setting.)

- When W4 straps A and B are out and strap C is in, port 0 is selected.

Strap **W7** selects whether the Code Operated Switch (COS) will go into switch time or not, when carrier detect is lost on the master port. This will disconnect any port the COS may be on if the session is terminated for any reason. The jumper setting for W7 is as follows:

- W7-a strapped: COS will NOT go into switch time when Carrier Detect is dropped on the master port.

- W7-b strapped: COS WILL go into switch time when Carrier Detect is dropped on the master port. (This is the factory-default setting.)

NOTE: Passing Breaks

The Switch does not actually pass a break; instead, it generates its own version of a break when it receives one. The Switch generates a signal when the master or slave UART receives a break. The UART raises pin 14 to a logical 1, which represents a framing error to the UART. This means that the UART thinks it has received a character with an invalid stop bit. Raising the framing-error pin starts a multivibrator timing circuit that sends a constant space signal for approximately 257 ms to the connected output port. This duration represents a break.

Once the break condition has occurred, multiple breaks cannot be sent, because the timer has no way of being retriggered. This is because the framing-error pin on the UART does not know whether the next character received is good or bad data. The only way to reset the framing-error pin on the UART is to put the switch into switch-time mode and either reconnect to the port that was connected or connect to another port.

4. Operation

4.1 Arming Character

The arming character lets the Switch know that the next character will be an instruction. You choose the arming character by setting Switch SW8 (see **Section 3.2.4**).

Normally you send the arming character as part of the data stream. When the Switch receives the arming character, it enters "switch-time mode," which means that it's waiting for an instruction. The "ST" LED on the front will light up.

4.2 Channel-Select Character

The channel-select character must come *immediately* after the arming character in the data stream. The least significant four bits of the channel-select character contain the binary number of the subordinate port that is being selected (ASCII 0-7; CTRL-@, A, B, C, D, E, F, G; etc.).

4.3 Auto Timeout

If automatic timeout is selected (see **Section 3.2.2**), the Switch will time out after the idle time you chose and go back to switch-time mode. Data in either direction will continually reset the timer.

4.4 Reset Button

The reset button will force the Switch into switch-time mode or to connect to port 0, depending on how you set strap W4 (see **Section 3.3**).

NOTE: If Auto Timeout is set, the Switch will also revert to switch-time mode after the timeout.

4.5 Lockout

The front-panel "LO" LED will light when the Switch is in lockout mode. When the Switch is in lockout mode, the subordinate ports cannot access the master port.

Only the master port can place the Switch in lockout mode and take it out of lockout mode. When the Switch is in switch-time mode, you can put it in lockout mode by sending an ASCII character 38 or higher from the master port. To get out of lockout mode, send the arming character from the master port.

NOTE: When you take the Switch out of lockout mode, both the LO and ST LEDs will be lit until a port is selected.

4.6 Modes of Operation

The switch on the front panel marked "MODE" selects Text, Transparent, or Graphics mode.

4.6.1 TEXT MODE (SWITCH UP)

In this mode, the Switch will enter switch-time mode whenever it receives an arming character. It will select the subordinate channel specified by the channel-select character (which must be the next character after the arming character). The rest of the text will pass through the Switch until another arming character is received. The arming character and the channel-select character will not pass through the Switch in this mode.

Obviously, you need to choose an arming character that will never appear in text, or the Switch will at least lose data and possibly switch to another port seemingly at random. See **Section 3.2.4** for a list of possible arming characters and how to choose one.

4.6.2 TRANSPARENT MODE (SWITCH IN MIDDLE POSITION)

In this mode, all data, including the arming character, will pass through the Switch to and from the master port and the subordinate port that was selected before entering transparent mode. This mode *completely disables* code control. All characters, printable and non-printable, are passed through.

4.6.3 GRAPHICS MODE

In graphics mode, the Switch responds to code commands, but only after a pause in the data transmission. If the arming character is not preceded by a pause, it will be passed through with the rest of the data.

You can choose the length of the pause with positions 1 through 4 of Switch SW9 (see **Section 3.2.5**). You can also decide how the pause time is counted:

1. From the time when the last character was sent from the *master port* to the subordinate port: SW7 position 7 closed, SW7 position 8 open).

2. From the time when the last character was sent from the *subordinate port* to the master port (SW7 position 7 open, SW7 position 8 closed).

3. From the time when the last character was sent in *either direction* (SW7 positions 7 and 8 closed).

4.7 Troubleshooting

If the Switch seems to switch on its own, it's receiving the arming character in the data. Here are three was to solve the problem:

1. Try choosing an arming character that won't appear in your data (see **Section 3.2.4**).

2. Try switching to graphics mode (see **Section 4.6.3**)

3. In stubborn cases, use transparent mode (see **Section 4.6.2**). The Switch will completely ignore the arming character, so it won't switch at all—not even if you tell it to switch.

If your data loses bits occasionally, try running two stop bits on the computer equipment.

If data does not pass and the Switch will not switch, check the cables and switches SWA and SWB (see **Section 3.2.1**).

CODE OPERATED SWITCH

To test your Switch, you can use this simple BASIC program:

```
10 REM*******************CODE OPERATED SWITCH TEST************************
20 OPEN "COM1:9600,N,8,1,CS,DS"AS1        : REM Set up COM1 port on PC
30 P=48                                   : REM Set port no. to 1 (ASCII 48)
40 PRINT #1,CHR$(4);                      : REM Set arming character
50 PRINT #1,CHRS(P);                      : REM Send port no. out COM1
60 T=P-48                                 : REM Convert ASCII to actual port no.
70 PRINT #1,"This is a test of port "T    : REM Send a test message out COM1
80 FOR I=1 TO 250                         : REM Set up...
90 NEXT I                                 : REM ...a delay loop
100 P=P+1                                 : REM Increment port no.
110 IF P=52 THEN GOTO 30 ELSE GOTO 40     : REM Loop back for next port
```

Note the semicolons at the ends of lines 40 and 50, which inhibit the carriage
return.