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1. Specifications

Indicators —	LEDs: (16) active port, (4) bank, TXD, RXD, RTS, CTS, Power, and Broadcast
Speed —	200 bps to 19.2 Kbps
Protocol —	Asynchronous
Leads Switched —	TD, RD, RTS, CTS
Connectors —	(17) DB25 female
Power —	115/230 VAC, 60/50 Hz (autosensing)
Size —	3.5”H x 17.3”W x 9”D (8.9 x 43.9 x 22.5 cm)
Weight —	Base unit: 7 lb. (3.2 kg); Expansion unit: 4 lb. (1 kg)

2. Introduction

The COS-16 brings the convenience of code-based RS-232 switching to sites with multiple terminals, printers, and peripherals. The base unit switches one control port among up to 16 ports. With each expansion unit you install, you add 16 additional ports, up to a total of 64.

Code-based switching lets you control the switch from your terminal, by sending a two-character ASCII switching code. You get the reliability of a mechanical switch, but you never have to leave your office to set it.

A bank of DIP switches, conveniently located on the bottom of the unit, governs the selection of one of the code characters. The DIP bank is quite easy to locate and may be changed quickly in an emergency.

You can work with all the files a mechanical switch will handle—even binary and graphics files. A special feature, called code repetition, gives the switch the ability to distinguish between switching instructions and the “lookalikes” that sometimes

occur in data files. With code repetition enabled, the switch will only react to instructions that have been repeated twice, four times, or up to eight times in succession. Repetition considerably reduces the chances of false switching.

A broadcast mode makes it easy to mass-address a group of terminals or an array of laboratory instruments by directing the information on the common port to all 16 device ports simultaneously.

You’ll spend a minimum of time and trouble installing and configuring your COS-16. You can set and change the critical jumper banks on the COS-16 much more easily than on other switches—they’re set in a recess on the bottom of the case, rather than deep within the body of the switch.

To install the COS-16, the tools you need are a flathead screwdriver and a tool with a point small enough to set DIP switches. If you have ordered expansion units, you’ll find assembly instructions at the end of this book, in Appendix D.

3. Installation

3.1 Setting the DIP Switch Banks

Turn the COS-16 upside-down. Two banks of DIP switches lie in the center of the case, towards the face of the unit. SW1 lies closer to the middle of the unit, and SW2 lies closer to the face of the unit.

Both banks govern portions of your switching code, the two-character ASCII code that sets the switch to the proper port. The code consists of the following:

- a prefix character, which signals the switch to an upcoming action
- and a port character, which directs the Switch to the proper port.

Three of the four switch charts you'll use to set the banks are posted to the left of the recess, and are also reprinted in the Quick Setup Guide. A fourth, larger chart is printed in Appendix A.

The 0, or off position for all DIP switches is the left position. The 1, or on position for all DIP switches is the right position.

3.1.1 FUNCTIONS OF BANK 1

Prefix Code Repetition (Switches 1 through 4)

If your prefix code shows up in the data stream, the switch will react as if it had received a switching instruction. To prevent false switches, you should make the prefix code a character that does not occur in your files.

A more effective measure is to require that the switch receive two, four, or eight repetitions of the prefix code before it actually switches. The Prefix Code Repetition feature gives you this option. The chart below (also on the bottom of the case) gives the arrangement of the first four DIP switches.

Prefix Codes Required	Switch # and Position			
	1	2	3	4
1	1	0	0	0
2	0	1	0	0
4	0	0	1	0
8	0	0	0	1

Broadcast (Switch 5)

Broadcast mode distributes the data from the common port to all ports. It is useful for simultaneous transmission or control of all input devices. You can set it with the DIP switches, or set it using an ASCII sequence (see Section 4.3). The chart below, and on the bottom of the case, gives the setting.

Broadcast Mode	Switch 5 Position
OFF	0
ON	1

Baud Rate Select (Switches 6 through 8)

The speeds the COS-16 runs at range from 150 bps up to 19,200 bps. Use the final three switches of Bank 1 to set the COS properly. The chart below, also printed on the case, gives the arrangement.

Speed (bps)	Switch # and Position		
	6	7	8
150	1	1	1
300	0	1	1
600	1	0	1
1200	0	0	1
2400	1	1	0
4800	0	1	0
9600	1	0	0
19,200	0	0	0

3.1.2 FUNCTIONS OF BANK 2

Prefix Code (Switches 1 through 7)

You can use any ASCII character for your prefix code, but bear in mind that it will be passed through the output port to the connected device. If you choose a printable character, and use the COS-16 with printers or other output devices, the prefix will print at the beginning of your file.

For this reason, a control character or other non-printable ASCII code is a wiser choice. You should also choose a character that should never show up in your data files, to eliminate the possibility of a false switch. If you are working with binary files, such as graphics or communications-package data,

CODE OPERATED SWITCH-16

you should consider the Prefix Code Repetition feature discussed in Section 3.1.1 above.

The COS-16 arrives with a factory-set default prefix of ^V (Control V).

The chart for non-printable prefix codes appears below, in Figure 3.1, while the printable prefix codes appear in Appendix A.

Parity (Switch 8)

Use Switch 8 to set odd or even parity.

Parity	Switch 8 Setting
Even/Mark	0
Odd/Space	1
No Parity	1

3.2 Powering and Cabling the Switch

Make sure that the power switch, mounted on the rear of the unit, is off. Attach one end of the power cable to the AC power connector on the COS-16. Attach the other to your wall outlet or uninterruptible power supply.

Before you make connections, check the schematic in Appendix B to make sure your cables are pinned properly. Connect the cable from your modem or control terminal to the connector marked *Modem*. Connect your device cables to Ports 1 through 16.

When you have cabled the switch, you can activate the unit by flipping the rear-mounted power switch to ON.

Note: Each time you switch the COS-16 on, you reset the COS and close all ports.

Control Character	Code	Switch # and Setting						
		1	2	3	4	5	6	7
Ctrl-@	NUL	ON	ON	ON	ON	ON	ON	ON
Ctrl-A	SOH	OFF	ON	ON	ON	ON	ON	ON
Ctrl-B	STX	ON	OFF	ON	ON	ON	ON	ON
Ctrl-C	ETX	OFF	OFF	ON	ON	ON	ON	ON
Ctrl-D	EOT	ON	ON	OFF	ON	ON	ON	ON
Ctrl-E	ENQ	OFF	ON	OFF	ON	ON	ON	ON
Ctrl-F	ACK	ON	OFF	OFF	ON	ON	ON	ON
Ctrl-G	BEL	OFF	OFF	OFF	ON	ON	ON	ON
Ctrl-H	BS	ON	ON	ON	OFF	ON	ON	ON
Ctrl-I	UL	OFF	ON	ON	OFF	ON	ON	ON
Ctrl-J	LF	ON	OFF	ON	OFF	ON	ON	ON
Ctrl-K	VT	OFF	OFF	ON	OFF	ON	ON	ON
Ctrl-L	FF	ON	ON	OFF	OFF	ON	ON	ON
Ctrl-M	CR	OFF	ON	OFF	OFF	ON	ON	ON
Ctrl-N	SO	ON	OFF	OFF	OFF	ON	ON	ON
Ctrl-O	SI	OFF	OFF	OFF	OFF	ON	ON	ON
Ctrl-P	DLE	ON	ON	ON	ON	OFF	ON	ON
Ctrl-Q	DC1	OFF	ON	ON	ON	OFF	ON	ON
Ctrl-R	DC2	ON	OFF	ON	ON	OFF	ON	ON
Ctrl-S	DC3	OFF	OFF	ON	ON	OFF	ON	ON
Ctrl-T	DC4	ON	ON	OFF	ON	OFF	ON	ON
Ctrl-U	NAK	OFF	ON	OFF	ON	OFF	ON	ON
Ctrl-V	SYN	ON	OFF	OFF	ON	OFF	ON	ON
Ctrl-W	ETB	OFF	OFF	OFF	ON	OFF	ON	ON
Ctrl-X	CAN	ON	ON	ON	OFF	OFF	ON	ON
Ctrl-Y	EM	OFF	ON	ON	OFF	OFF	ON	ON
Ctrl-Z	SUB	ON	OFF	ON	OFF	OFF	ON	ON
Ctrl-[	ESC	OFF	OFF	ON	OFF	OFF	ON	ON
Ctrl-\	FS	ON	ON	OFF	OFF	OFF	ON	ON
Ctrl-]	GS	OFF	ON	OFF	OFF	OFF	ON	ON
Ctrl-^	RS	ON	OFF	OFF	OFF	OFF	ON	ON
Ctrl-__	US	OFF	OFF	OFF	OFF	OFF	ON	ON

Figure 3.1 Non-printable Prefix Codes.

4. Operation

4.1 Front-Panel Indicators

The base unit of the COS-16 displays a total of 25 LEDs on the front panel. They're grouped into a bank of 5 for status information, a bank of 4 for section information, and a bank of 16 for port information.

4.1.1 Status LEDs

From left to right, the status LEDs are:

- PWR — indicates that the unit is switched on.
- TXD — transmit data, indicates that data is passing from Pin 2 of the common port to Pin 2 of the selected port.
- RXD — receive data, indicates that data is being received at Pin 3 of the common port.
- RTS — request to send, indicates a high RS-232 signal at both Pin 4, the output lead, of the common port and Pin 4 of the selected port.
- CTS — clear to send, indicates a high RS-232 signal received at Pin 5 of the common port.
- ALL — indicates that the unit is set in Broadcast mode and all ports have been opened.

4.1.2 Section and Active Port LEDs

Each base unit can accommodate three additional expansion units, and all units are assigned LEDs in the group labeled *Section*. Whenever a port in a particular COS-16 is addressed, the corresponding LED will light in the Section grouping, and one of the LEDs in the Active Port grouping will light as well.

When one of the first 16 ports on the base unit is selected, Section LED 1 will light. When one of Ports 17 through 32 is selected, Section LED 2 will light. Section LED 3 corresponds with the third bank of ports, Ports 33 through 48, and Section LED 4 corresponds with the fourth bank of ports, Banks 49 through 64.

A simple formula gives the port that has been selected. Subtract one from the number above the lit Section LED, multiply the result by 16, and add the number above the lit Active Port LED. If the Section 3 LED and the Active Port 9 LED are lit, the formula indicates that the 41st port is active.

4.2 Selecting a Port

To choose a port, refer to the chart below for the ASCII character assigned to the port you wish to select. You'll use this character as the tail of the two-character switching code.

Once you have found the proper port-selection character, send the switching code. Send the prefix character, and follow it immediately with the port-selection character. If you have enabled the Prefix Code Repetition feature, you'll have to repeat the prefix code before you select the port.

Base Unit Port Code	Expansion Unit		
	1 Port Code	2 Port Code	3 Port Code
1 @	17 P	33 '	49 p
2 A	18 Q	34 a	50 q
3 B	19 R	35 b	51 r
4 C	20 S	36 c	52 s
5 D	21 T	37 d	53 t
6 E	22 U	38 e	54 u
7 F	23 V	39 f	55 v
8 G	24 W	40 g	56 w
9 H	25 X	41 h	57 x
10 I	26 Y	42 i	58 y
11 J	27 Z	43 j	59 z
12 K	28 [	44 K	60 {
13 L	29 \	45 L	61 |
14 M	30]	46 m	62 }
15 N	31 ^	47 n	63 ~
16 O	32 —	48 o	64 DEL

Figure 4.1 Port Codes.

The common port will remain connected to the selected port until another code sequence is issued.

Note: The prefix code is sent out the selected port, but the port-select character does not exit the switch. Upon receipt of the prefix character, all ports close briefly, after which the selected port opens during the stop-bit time of the port select character. All the data that follows the port-select character is sent out the selected port, including the next prefix code.

If your switch were configured for a prefix character of Ctrl-V, required four repetitions of the prefix code, and you wished to connect to port 14, you would send the following sequence:

Ctrl-V Ctrl-V Ctrl-V Ctrl-V M.

4.3 Requesting Broadcast Mode with Codes

Rather than selecting broadcast mode with the DIP switch, you can request it from your terminal. To open all ports, you should send your prefix code, followed by Ctrl-X (CAN). To close all ports, enter the prefix code, and follow it with a space character.

ASCII Code Chart

Since the prefix code is transmitted through the opened port, it is best to select a non-printable Prefix Code when setting sw1 through sw7 on

Bank 2 of the Setup switches. However, if you require printable codes, refer to full code listing given in the ASCII code chart below.

ASCII CODE	Switch # and Setting						
	B1	B2	B3	B4	B5	B6	B7
NUL	1	1	1	1	1	1	1
SOH	0	1	1	1	1	1	1
STX	1	0	1	1	1	1	1
ETX	0	0	1	1	1	1	1
EOT	1	1	0	1	1	1	1
ENQ	0	1	0	1	1	1	1
ACK	1	0	0	1	1	1	1
BEL	0	0	0	1	1	1	1
BS	1	1	1	0	1	1	1
HT	0	1	1	0	1	1	1
LF	1	0	1	0	1	1	1
VT	0	0	1	0	1	1	1
FF	1	1	0	0	1	1	1
CR	0	1	0	0	1	1	1
SO	1	0	0	0	1	1	1
SI	0	0	0	0	1	1	1
DLE	1	1	1	1	0	1	1
DC1	0	1	1	1	0	1	1
DC2	1	0	1	1	0	1	1
DC3	0	0	1	1	0	1	1
DC4	1	1	0	1	0	1	1
NAK	0	1	0	1	0	1	1
SYN	1	0	0	1	0	1	1
ETB	0	0	0	1	0	1	1
CAN	1	1	1	0	0	1	1
EM	0	1	1	0	0	1	1
SUB	1	0	1	0	0	1	1
ESC	0	0	1	0	0	1	1
FS	1	1	0	0	0	1	1
GS	0	1	0	0	0	1	1
RS	1	0	0	0	0	1	1
US	0	0	0	0	0	1	1
SP	1	1	1	1	1	0	1
!	0	1	1	1	1	0	1
"	1	0	1	1	1	0	1
#	0	0	1	1	1	0	1
\$	1	1	0	1	1	0	1
%	0	1	0	1	1	0	1

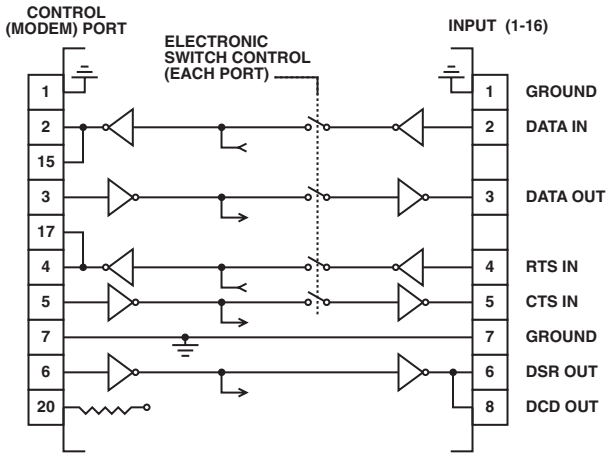
CODE OPERATED SWITCH-16

ASCII CODE	Switch # and Setting						
	B1	B2	B3	B4	B5	B6	B7
&	1	0	0	1	1	0	1
'	0	0	0	1	1	0	1
(	1	1	1	0	1	0	1
)	0	1	1	0	1	0	1
*	1	0	1	0	1	0	1
+	0	0	1	0	1	0	1
,	1	1	0	0	1	0	1
-	0	1	0	0	1	0	1
.	1	0	0	0	1	0	1
/	0	0	0	0	1	0	1
0	1	1	1	1	0	0	1
1	0	1	1	1	0	0	1
2	1	0	1	1	0	0	1
3	0	0	1	1	0	0	1
4	1	1	0	1	0	0	1
5	0	1	0	1	0	0	1
6	1	0	0	1	0	0	1
7	0	0	0	1	0	0	1
8	1	1	1	0	0	0	1
9	0	1	1	0	0	0	1
:	1	0	1	0	0	0	1
;	0	0	1	0	1	0	1
<	1	1	0	0	0	0	1
=	0	1	0	0	0	0	1
>	1	0	0	0	0	0	1
?	0	0	0	0	0	0	1
@	1	1	1	1	1	1	0
A	0	1	1	1	1	1	0
B	1	0	1	1	1	1	0
C	0	0	1	1	1	1	0
D	1	1	0	1	1	1	0
E	0	1	0	1	1	1	0
F	1	0	0	1	1	1	0
G	0	0	0	1	1	1	0
H	1	1	1	0	1	1	0
I	0	1	1	0	1	1	0
J	1	0	1	0	1	1	0
K	0	0	1	0	1	1	0
L	1	1	0	0	1	1	0
M	0	1	0	0	1	1	0
N	1	0	0	0	1	1	0
O	0	0	0	0	1	1	0
P	1	1	1	1	0	1	0
Q	0	1	1	1	0	1	0
R	1	0	1	1	0	1	0

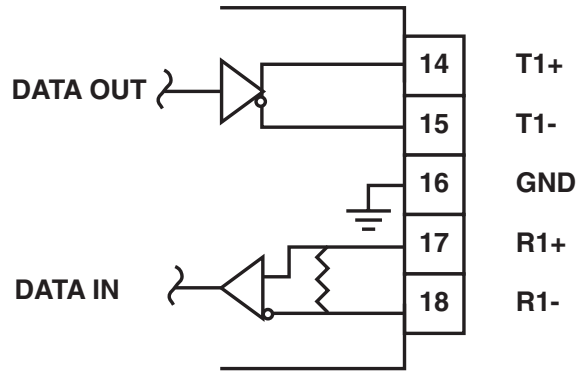
ASCII CODE	Switch # and Setting						
	B1	B2	B3	B4	B5	B6	B7
&	1	0	0	1	1	0	1
S	0	0	1	1	0	1	0
T	1	1	0	1	0	1	0
U	0	1	0	1	0	1	0
V	1	0	0	1	0	1	0
W	0	0	0	1	0	1	0
X	1	1	1	0	0	1	0
Y	0	1	1	0	0	1	0
Z	1	0	1	0	0	1	0
[	0	0	1	0	0	1	0
\	1	1	0	0	0	1	0
]	0	1	0	0	0	1	0
^	1	0	0	0	0	1	0
_	0	0	0	0	0	1	0
`	1	1	1	1	1	0	0
a	0	1	1	1	1	0	0
b	1	0	1	1	1	0	0
c	0	0	1	1	1	0	0
d	1	1	0	1	1	0	0
e	0	1	0	1	1	0	0
f	1	0	0	1	1	0	0
g	0	0	0	1	1	0	0
h	1	1	1	0	1	0	0
i	0	1	1	0	1	0	0
j	1	0	1	0	1	0	0
k	0	0	1	0	1	0	0
l	1	1	0	0	1	0	0
m	0	1	0	0	1	0	0
n	1	0	0	0	1	0	0
o	0	0	0	0	1	0	0
p	1	1	1	1	0	0	0
q	0	1	1	1	0	0	0
r	1	0	1	1	0	0	0
s	0	0	1	1	0	0	0
t	1	1	0	1	0	0	0
u	0	1	0	1	0	0	0
v	1	0	0	1	0	0	0
w	0	0	0	1	0	0	0
x	1	1	1	0	0	0	0
y	0	1	1	0	0	0	0
z	1	0	1	0	0	0	0
{	0	0	1	0	0	0	0
|	1	1	0	0	0	0	0
}	0	1	0	0	0	0	0
~	1	0	0	0	0	0	0
DEL	0	0	0	0	0	0	0

Appendix B: Connector Schematics

You may require cross-pinned cable to connect the switch to your terminal and to your devices. Use the figures below to choose the proper cable for your site.



RS-232 Connector Pinning



RS-422 Connector Pinning

Appendix C: Board Diagram

The base unit is drawn below, up to the 8th connector. The remainder of the board contains no items of significant interest.

You may need to remove the power unit in order to change the input voltage for the switch. (see section 3.2). A jumper within the case governs the voltage, and may be adjusted to the proper setting (115 or 230 V) within a matter of minutes.

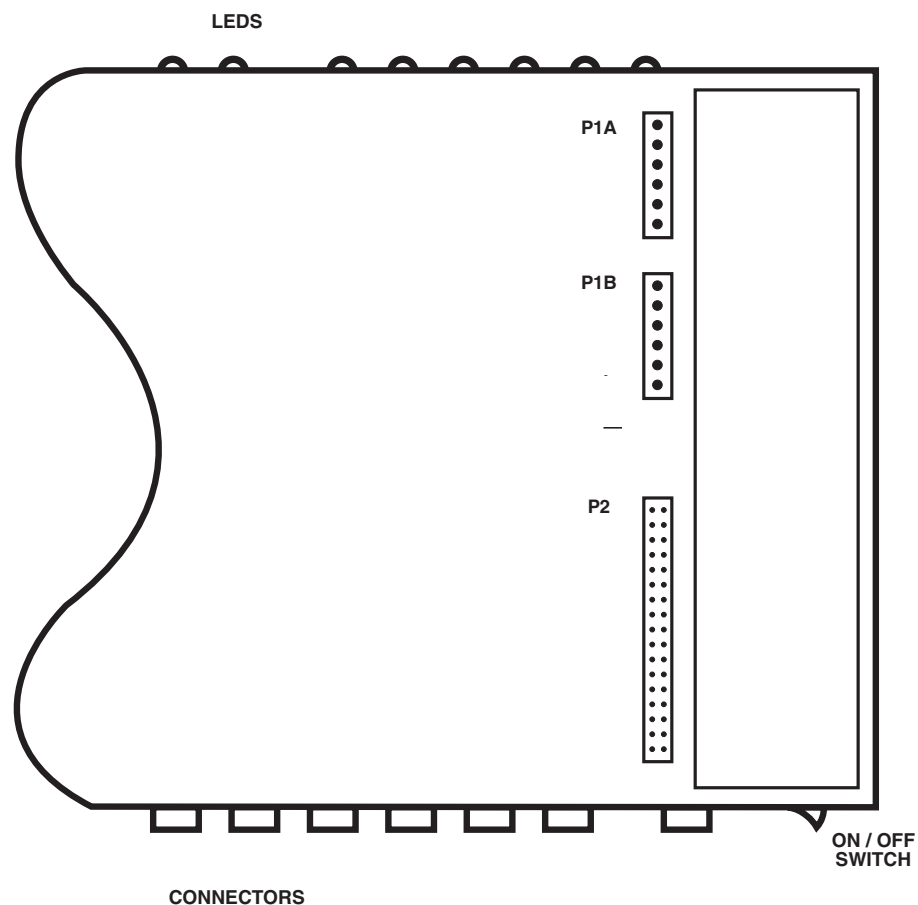
You must first unplug the unit and remove the power cord. Then remove the top and rackmount sides of the base unit by removing the 12 slot screws on the sides. Also remove the pair of large screws directly underneath the power unit.

Then, pull the power connector out of its socket (at position P1A) and carefully remove the power unit from the body of the unit.

You must now remove the cover of the power unit by removing the four slotted case screws. At one end of the power unit lies the transformer, at the other lies the jumper bank.

You'll see a white jumper with a black loop of wire connected to it. The bank beneath has two positions, marked 115 V and 230 V. By gripping the loop of wire, you may remove the jumper from the bank. Set the jumper to the voltage setting you desire.

You may now replace the cover of the power unit and return it to the case.



Appendix D: Expanding the COS-16

To install add-on modules, follow these steps:

1. Locate DIP switch SW3 at each add-on module; set the DIP switch on each module as follows:

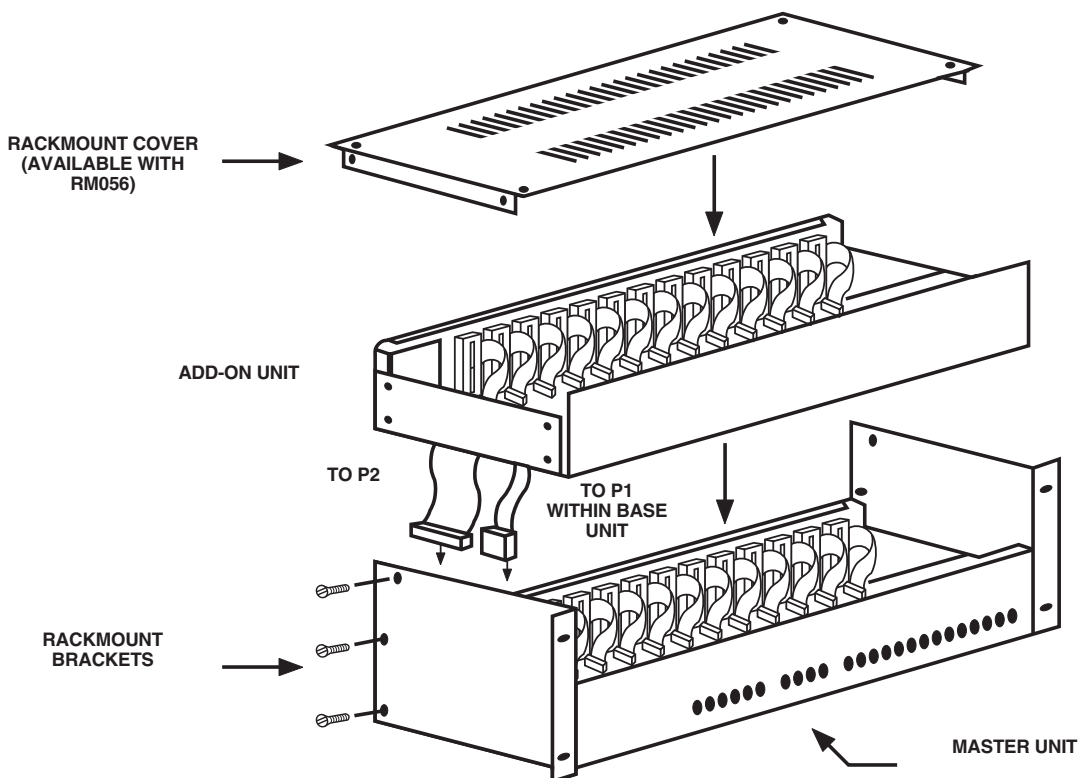
If the only add-on is Section 2 (32 ports total), then set Switches 1 and 2 ON, with 3 and 4 OFF.

If you are adding Section 3 as well (48 ports total), then you must also set the DIP switches of Module 3: 1 and 3 should be set ON, with 2 and 4 OFF.

If you are adding Sections 2, 3, and 4 (64 ports total), then you should retain the previous configurations and also set the switches on Module 4: 1 and 4 to ON, 2 and 3 to OFF.

2. Remove the top cover from the base unit.
3. Place the Section 2 add-on module over the master unit. Position the add-on so the P1 and P2 connectors are accessible on the master unit.

4. Plug the add-on module's power cable at P1A into the master unit's P1B connector.
5. Plug the add-on module's ribbon cable at P2 into the master unit's P2 connector. Be sure the red stripe (Pin 1) faces the rear of the unit.
6. Repeat Steps 3 through 5 if you have the Section 3 and 4 add-on modules, with one alteration. Connect each additional add-on module to the one below it, rather than the master unit.
7. Double-check all connections.
8. Attach the left and right rackmount brackets to the entire unit. Secure the brackets with the supplied screws.
9. Attach the new rackmount top cover to the unit and secure it with the supplied screws.
10. Apply power to the unit and refer to the chapters 2 and 3 to connect and switch the ports.

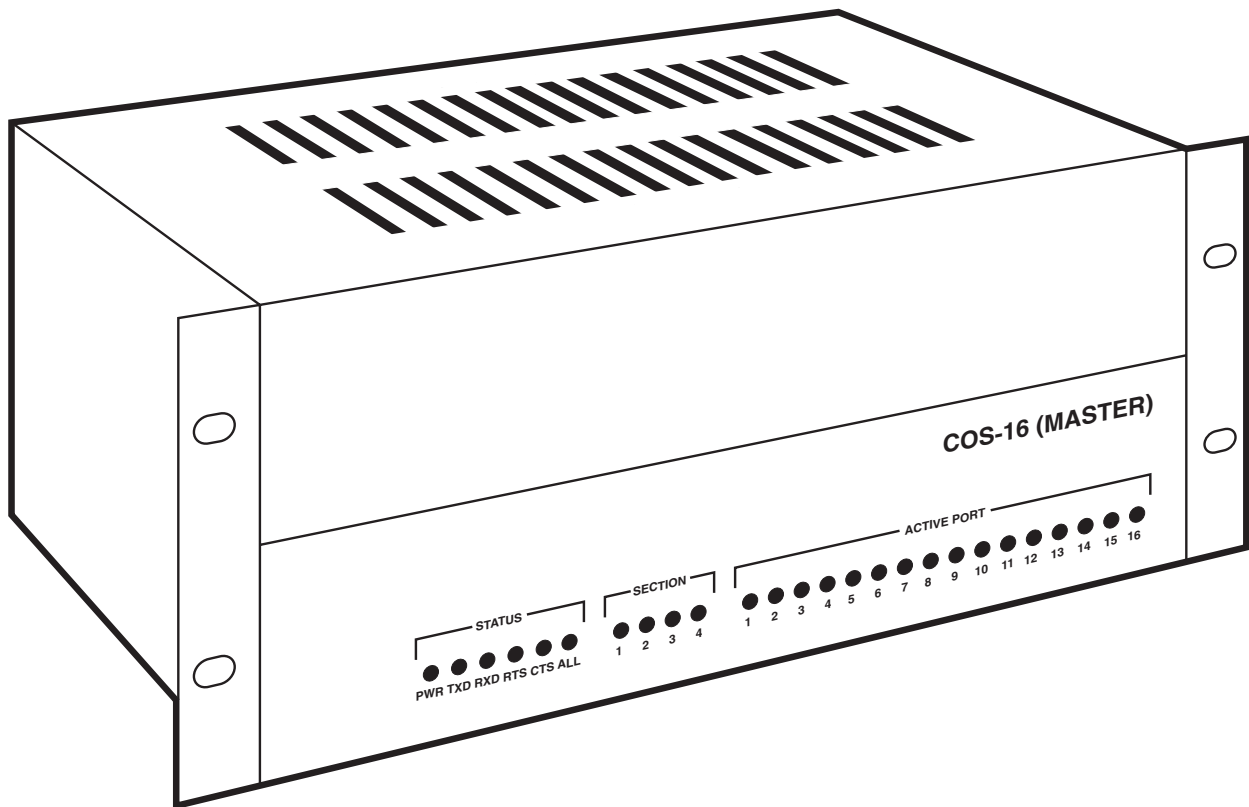


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Code Operated Switch-16 (Master and Expansion) COS-16 Master Rackmount



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