

COM-422
User's Guide

COM-422

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Contents

CHAPTER 1: INTRODUCTION

1.1	Overview	1-1
1.2	Specifications	1-3

CHAPTER 2: INSPECTION, CONFIGURATION, & INSTALLATION

2.1	Inspection	2-1
2.2	Configuration Options	2-1
2.3	Connector Pin Assignments	2-4
2.4	Board Installation	2-4
2.5	Notice!!	2-5

CHAPTER 3: PROGRAMMING

3.1	Setting Up For 56 Kbaud	3-1
3.2	Testing RS-232	3-2



1.1 OVERVIEW

The COM-422 is an I/O serial expansion board for the IBM PC/XT/AT and compatibles. The Board plugs directly into an accessory slot of the PC, where it may serve as an interface for instruments, peripherals, networks, other PCs, etc.

Board interface capabilities include RS-422, RS-232, and Current Loop (4-20 mA). These interfaces use a 25-pin D connector (for RS-232 and Current Loop) and a 9-pin D connector (for RS-422).

The RS-232 interface includes all the standard bus-control protocols (Data Set Ready, Clear To Send, etc.). These protocols may be disabled, if you prefer, using DIP switches on the Board.

The RS-422 interface may be set to use standard Clear To Send and Request To Send control lines, or it may be set to simply send and receive data. Again, these settings use DIP switches on the Board.

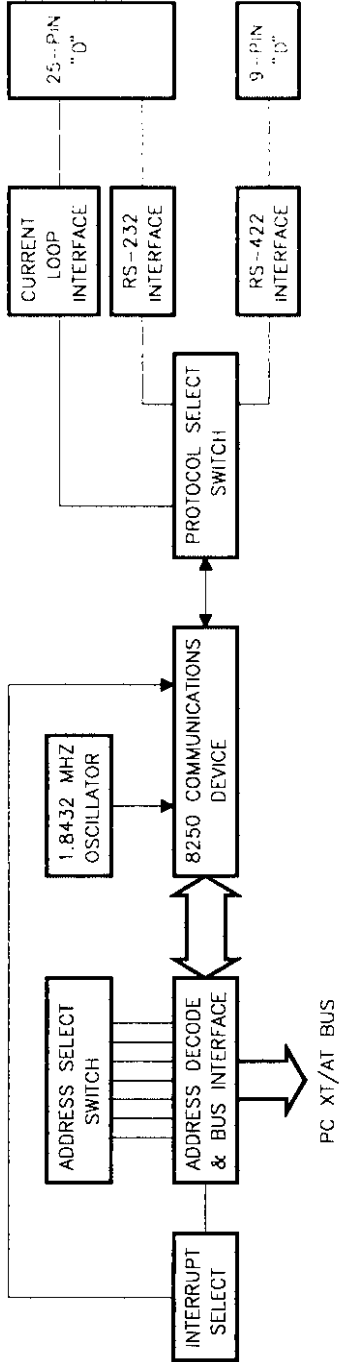
The COM-422 is capable of communicating at up to 56 kilobaud (up to 4800 baud in Current Loop) over distances to 1.2 kilometers (0.75 mile) with the RS-422 interface. The data transfer rate is software-selectable.

Board design uses the industry-standard 8250 asynchronous communications chip. The board may use the COM1 or COM2 serial ports, and it configures for any required I/O address and Interrupt Level.

Parity may be even, odd, or none, while character length may be 5, 6, 7, or 8 data bits with 1, 1.5, or 2 stop bits. (Note that the maximum character length is nine bits, including stop bits.) These configurations are software-selectable.

The next page contains a block diagram of the COM-422.

COM-422 USER GUIDE



1.2 SPECIFICATIONS

Power Supplies

+5 volt	500 mA typ, 600 mA max.
+15 volt	30 mA typ, 45 mA max.
-15 volt	30 mA typ, 45 mA max.

Environmental

Operating Temp.	0 to 50 °C.
Storage Temp.	-55 to +125 °C.
Humidity	0 to 95% noncondensing.



INSPECTION, CONFIGURATION, & INSTALLATION

2.1 INSPECTION

After removing the wrapped Board (COM-422 board) from its outer shipping carton, proceed as follows:

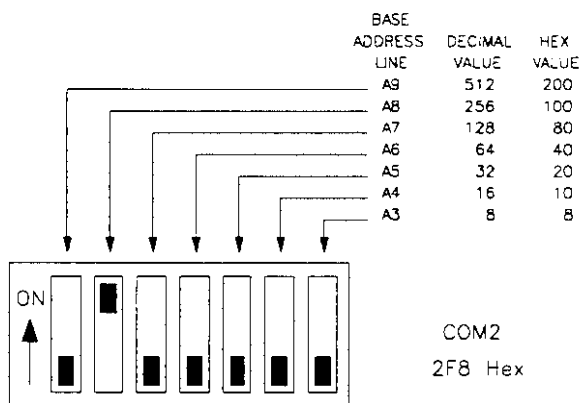
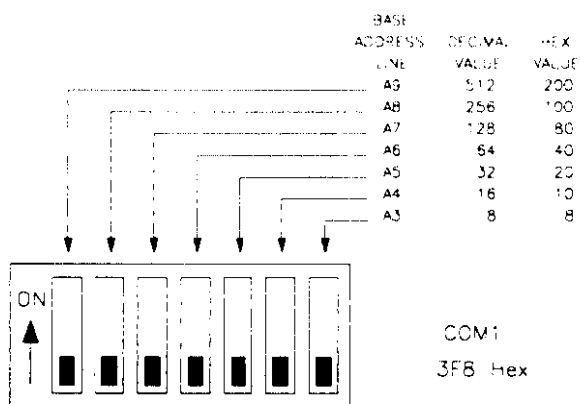
1. Before unwrapping the Board, place one hand firmly on a bare-metal portion of the computer chassis to discharge static electricity from yourself and the Board (the computer must be turned Off but grounded).
2. Carefully remove the Board from its anti-static wrapping material. You may wish to save the wrapping material for possible future use; if so, store it in a safe place.
3. Inspect the Board for signs of damage. If any damage is apparent, return the Board to the factory.
4. Check the remaining contents of your package against the packing list to be sure your order is complete. Report any missing items to the factory immediately.
5. When you are satisfied with preliminary inspection, you are ready to configure the Board. Refer to the next section for configuration options.

2.2 CONFIGURATION OPTIONS

Base Address Switch

Use the Board's 7-position DIP switch to set the Base Address. While the Base Address may be anywhere in the PC's I/O address space, its setting for Communications Ports COM1 or COM2 must be 3F8h or 2F8h, respectively. The DIP switch settings for these addresses are illustrated as follows:

COM-422 USER GUIDE

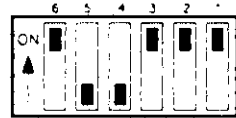


Note that a switch in the On position has no value, but a switch in the Off position sets the Binary weight of the corresponding Base Address bit (512, 256, 128, 64, 32, 16, or 8). The resulting Base Address is the sum of all the Off settings.

Protocol Selection

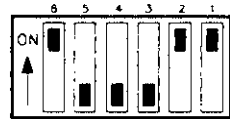
The COM-422 board offers five different user-selectable communication protocols. Protocol selection depends on the setting of the PROTOCOL SEL Switch. The protocols are as follows:

1. RS-232 with all standard IBM PC/XT/AT compatible bus control signals (such as Request-To-Send, Data-Terminal-Ready, Clear-To-Send).



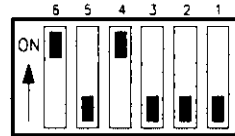
RS-232 WITH STANDARD CONTROL SIGNALS

2. RS-232 without bus control signals (only data inputs and outputs).



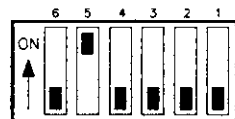
RS-232 WITHOUT STANDARD CONTROL SIGNALS

3. Current Loop.



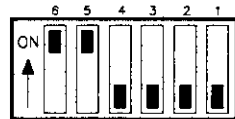
CURRENT LOOP

4. RS-422 with Request-To-Send and Clear-To-Send control signals.



RS-422 WITH RTS AND CTS ENABLED

5. RS-422 without RTS and CTS control signals.

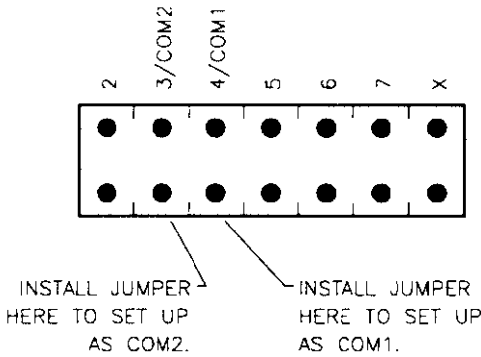


RS-422 WITHOUT CTS OR RTS SIGNALS

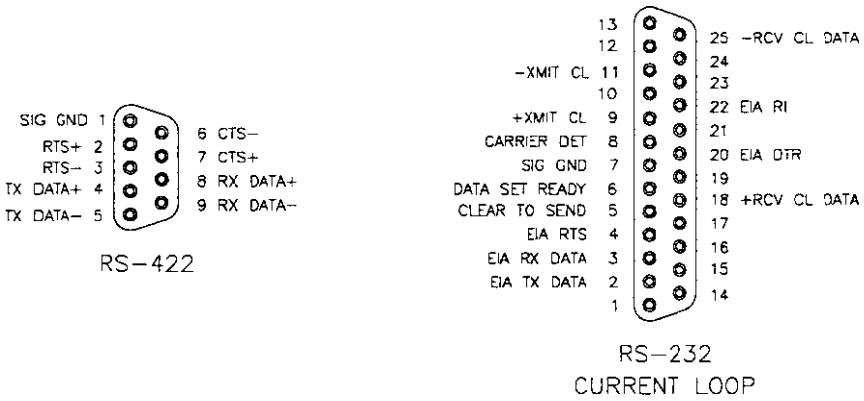
PROTOCOL SEL Switch settings for these protocols are shown in the diagrams.

Interrupt Levels

The COM-422 board allows access to Interrupt Levels 2-7. If the Board is to be installed as a COM1 or COM2 port, it must be set to Interrupt Level 4 or 3, respectively. The Level is set by jumpers on the IRQ LEVEL connector (J3). Simply place the jumper across the two pins of the required Interrupt Level position; available positions are as shown in the diagram.



2.3 I/O CONNECTOR PIN ASSIGNMENTS



2.4 BOARD INSTALLATION

To install the Board in a PC, proceed as follows.

WARNING!

ANY ATTEMPT TO INSERT OR REMOVE ANY ADAPTER BOARD WITH COMPUTER POWER ON COULD DAMAGE YOUR COMPUTER!

1. Turn Off power to the PC and all attached equipment.
2. Remove the cover of the PC.
3. Choose an available option slot. Loosen and remove the retainer screw at the top of the blank adapter plate. Then slide the plate up and out to remove.
4. Before touching the Board, place one hand on any metallic part of the PC chassis (but not on any components) to discharge any static electricity from your body.
5. Make sure the Board switches have been properly set (refer to the configuration sections).
6. Align the Board connector with the desired accessory slot and with the corresponding rear-panel slot. Gently press the Board into the socket and secure with the retainer screw for the rear-panel adapter-plate.
7. Replace the computer cover.
8. Plug in all cords and cables. Turn the power to the computer back on. You are now ready to make any necessary system connections.

2.5 NOTICE!!

After power-up, the COM-422 requires a software reset of its UART. Normally, your programming language or your software package performs this reset upon opening the COM port. However, some languages (such as ITT BASICA) do not.

If you are having difficulty communicating with a COM-422, try writing Data 0 to Address &H3FC (for COM1) or &H2FC (for COM2) prior to opening the COM port. This action should reset the UART and allow proper operation. In ITT BASIC, use the following instruction:

```
10 OUT &H3FC,0           'For COM1
```

If you continue to experience difficulty, please contact the factory.

■ ■ ■

3.1 SETTING UP FOR 56 KBAUD

Though most versions of BASIC (and DOS) do not recognize communications speeds above 9600 Baud (sometimes 19.2 kilobaud) on COM1 or COM2, you may override a small portion of their initialization routine and operate the COM-422 boards at 38.4 or 56 kilobaud. To perform this process, you must set the Board up as a COM1 or COM2 and then override the Baud Rate Registers in the 8250 interface adapter (on the Board).

The following is a simple test routine that communicates between two COM-422 boards set as COM1 and COM2 (see Section 2.2 for settings). The routine tests communications at 56 kilobaud.

```

10 OPEN "com1:4800" AS #1           'Set up standard COM1
20 OPEN "com2:4800" AS #2           'Set up standard COM2
30 T1$ = "testing COM1 TX/COM2 RX" 'Define test transmit data
60 '**** start of Baud rate override routine ****
70 DUMMY = INP(&H3FB)                'Read Control Register
80 OUT &H3FB,128:OUT &H2FB,128      'Select Baud Rate Control
Registers
90 OUT,&H3FB,2:OUT &H3FB,0          'Set COM1 at 56 kilobaud
100 OUT &H2FB,2:OUT &H2FB,0        'Set COM2 at 56 kilobaud
110                                 'Note that if selecting 38.4
120                                 'KBaud, Write a 3 instead of
130                                 '2 to &H3FB and &H2FB
140 OUT &H3FB,DUMMY:OUT &H2FB,DUMMY 'Reset Control Register
150 PRINT #1, T1$                   'Transmit data from COM1
160 INPUT #2, R2$                   'Store COM2 data in R2$
170 PRINT R2$                        'Print received results
180 '
190 IF T1$ <> R2$ THEN PRINT "error in transmission"
200 '
210 CLOSE                            'Close communications ports
220 END

```

3.2 TESTING RS-232

```

10 KEY OFF: SCREEN 0,0: WIDTH 40: COLOR 7,0: CLS
11 FOR I=1 TO 10:KEY I,"":NEXT
12 CLOSE: DEFINT A-Z: FALSE=0: TRUE=NOT FALSE: KOFF$=CHR$(19):
XON$=CHR$(17):ON ERROR GOTO 460:T=0:ECH$=""
15 DEF SEG=0: IF (PEEK(&H410) AND &H30)=&H30 THEN WIDTH
80:T=20:MODE$="b":DEF SEG:GOTO 30
16 FOR I=1 TO 10:KEY I,"":NEXT
17 LOCATE 25,10+T/2:PRINT"F1 = 40 COLUMN          F2 = 80 COLUMN"
18 DEF SEG
30 WIDTH "com1:",255:DEF SEG
40 LOCATE 2: PRINT TAB(10+T) "COMMUNICATIONS MENU"
50 LOCATE 6,3+T: PRINT "Choose one of the following:"
60 LOCATE 9,10+T: PRINT "1 Description of program"
70 PRINT TAB(10+T) "2 Dow Jones/News Retrieval"
80 PRINT TAB(10+T) "3 IEM Personal Computer"
90 PRINT TAB(10+T) "4 Series/1"
100 PRINT TAB(10+T) "5 THE SOURCE"
110 PRINT TAB(10+T) "6 Other service"
115 PRINT TAB(10+T) "7 End program"
120 LOCATE 18: PRINT SPACE$(40+T): LOCATE 18,3+T,1:PRINT
"choice";
122 A$=INKEY$:IF A$="" THEN 122
123 IF LEN(A$)=1 THEN LT=VAL(A$):GOTO 130
124 IF MODE$="b" THEN LT=0:GOTO 130
125 B$=MID$(A$,2,1)
126 IF ASC(B$)=59 THEN WIDTH 40:T=0:CLS:GOTO 17 ELSE IF
ASC(B$)=60 THEN WIDTH 80:T=20:CLS:GOTO 17 ELSE LT=0:GOTO 130
127 GOTO 122
130 IF LT=7 THEN CLS: PRINT TAB(10+T) "- COMMUNICATION ENDED -":
END ELSE IF (LT=2 OR LT=4 OR LT=5) THEN 230 ELSE IF LT=1 THEN
GOSUB 530:GOTO 10:ELSE IF (LT<1 OR LT>7) THEN FL=1: PRINT: PRINT
TAB(3+T) "Invalid choice, try again"
140 IF FL=1 THEN FOR I=1 TO 2500: NEXT: LOCATE 19: PRINT
SPACE$(40+T):FL=0: GOTO 120
145 CLS: LOCATE 1,10+T: PRINT "USER DEFINED LINK":IF LT=3 THEN
LOCATE ,3+T: PRINT "TO ANOTHER PERSONAL COMPUTER"
150 LOCATE 4,3+T,1:PRINT "BAUD RATE ";:GOSUB 465: SPEED$=B$
160 LOCATE 5,3+T,1:PRINT "PARITY ";:GOSUB 465: PARITY$=B$

```

CHAPTER 3: PROGRAMMING

```

170 LOCATE 6,3+T,1:PRINT "NUMBER OF BITS PER CHARACTER ";:GOSUB
465:BITS$=B$
180 LOCATE 7,3+T,1:PRINT "NUMBER OF STOP BITS ";:GOSUB 465:
STP$=B$
185 LOCATE 8,3+T,1:PRINT "CHARACTERS ECHOED TO SCREEN (Y/N)
";:GOSUB 465: ECH$=B$
190 LOCATE 10,3+T,1: PRINT "Data entered correctly (Y/N)
";:GOSUB 465:CR$=B$
200 IF CR$="N" OR CR$="n" THEN 145 ELSE GOSUB 480
210 LOCATE
21,3:COMFIL$="COM1:"+SPEED$+",""+PARITY$+",""+BITS$+",""+STP$
220 OPEN COMFIL$ AS #1
230 IF LT=4 THEN NM$="Series/1":GOSUB 470:OPEN "com1:300,e,7,2"
AS 1
240 IF LT=2 THEN NM$="Dow Jones News/Retrieval":GOSUB 470:OPEN
"com1:300,e,7" AS 1
250 IF LT=5 THEN NM$="THE SOURCE":GOSUB 470:OPEN "com1:300,e,7"
AS 1
260 OPEN "SCRN:" FOR OUTPUT AS #2
270 LOCATE ,,1
280 PAUSE=FALSE:ON ERROR GOTO 460
290 B$=INKEY$:IF B$="" THEN 320
300 IF LEN(B$)>1 THEN IF ASC(MID$(B$,2,1))=68 THEN 450 ELSE 320
ELSE IF B$=CHR$(8) THEN LOCATE ,POS(0)-1,1:PRINT " ";:LOCATE
,POS(0)-1,1
310 PRINT #1,B$,: IF ECH$="Y" OR ECH$="y" THEN PRINT#2,B$;
320 IF EOF(1) THEN 290
330 IF LOC(1)>128 THEN PAUSE=TRUE:PRINT#1,XOFF$;
340 A$=INPUT$(LOC(1),#1)
360 FOR I=1 TO LEN(A$)
370 IF (ASC(MID$(A$,I,1))<31 AND MID$(A$,I,1) <>CHR$(13)) OR
MID$(A$,I,1)=CHR$(127) THEN 410
380 IF MID$(A$,I,1)=CHR$(10) THEN MID$(A$,I,1)=" "
400 PRINT MID$(A$,I,1);
410 NEXT I
420 IF LOC(1)>0 THEN 290
430 IF PAUSE THEN PAUSE=FALSE:PRINT#1,XON$;
440 GOTO 290
450 CLOSE: ON ERROR GOTO 0: GOTO 10
460 IF ERR=68 THEN CLS: LOCATE 12,8+T: PRINT "THIS PROGRAM
REQUIRES THE":PRINT TAB(3+T) "ASYNCHRONOUS COMMUNICATIONS
ADAPTER.": END

```


COM-422 USER GUIDE

```
461 IF ERR=24 THEN CLS: LOCATE 12,,1:PRINT "A DEVICE TIMEOUT
ERROR HAS OCCURRED.":PRINT "MAKE SURE THE HARDWARE IS
CORRECTLY":PRINT "SET UP, THEN PRESS ENTER.":GOSUB 465:
CLS:RESUME
462 RESUME
465 A$="":B$="":CR$="": WHILE A$<>CHR$(13)
466 A$=INKEY$: IF A$="" THEN 466 ELSE IF LEN(A$)>1 THEN IF
ASC(MID$(A$,2,1))=68 THEN 450 ELSE 466: ELSE IF A$<>CHR$(8) THEN
PRINT A$;: ELSE LOCATE ,POS(0)-1,1:PRINT " ";:LOCATE ,POS(0)-
1,1:B$=MID$(B$,1,LEN(B$)-1)
467 IF A$<>CHR$(13) AND A$<>CHR$(8) THEN B$=B$+A$
468 WEND:RETURN
470 CLS: LOCATE 1,12+T: PRINT NM$:PRINT
480 PRINT:PRINT:PRINT TAB(3+T) "~ Place your call, and insert
the"
490 PRINT TAB(3+T) " phone receiver into the modem, or"
495 PRINT TAB(3+T) " switch your data set from talk to"
500 PRINT TAB(3+T) " data. Then press ENTER to begin.  ":
PRINT: PRINT
510 PRINT TAB(3+T) "- PRESS F10 TO GO TO MENU":PRINT
512 GOSUB 465
515 RETURN
530 CLS: LOCATE 1,15+T: PRINT "DESCRIPTION"
540 LOCATE 4,3+T: PRINT "An asynchronous communication link"
550 PRINT TAB(3+T) "will be established between the"
560 PRINT TAB(3+T) "selected service and the"
570 PRINT TAB(3+T) "PERSONAL COMPUTER, as follows:"
580 LOCATE 9,3+T: PRINT "Baud rate";TAB(13+T)"300"
590 PRINT TAB(3+T) "Parity";TAB(14+T)"E"
600 PRINT TAB(3+T) "Data bits";TAB(14+T);"7"
610 PRINT TAB(3+T) "Stop bits";TAB(14+T);"1 Dow Jones, THE
SOURCE"
620 PRINT TAB(14+T) "2 Series/1"
630 LOCATE 15,3+T: PRINT "Options 3 and 6 allow for the above"
640 PRINT TAB(3+T) "characteristics to be supplied by"
650 PRINT TAB(3+T) "the user to define a communication"
660 PRINT TAB(3+T) "link to other services or computers."
661 IF MODE$="b" THEN 670
665 LOCATE 20,3+T: PRINT "You can select 40 column display or"
666 PRINT TAB(3+T) "80 column display by pressing F1 or"
667 PRINT TAB(3+T) "F2 before selecting menu choice."
670 LOCATE 24,3+T: PRINT "PRESS ANY KEY TO GO TO MENU";
671 CR$=INKEY$:IF CR$="" THEN 671 ELSE RETURN
```