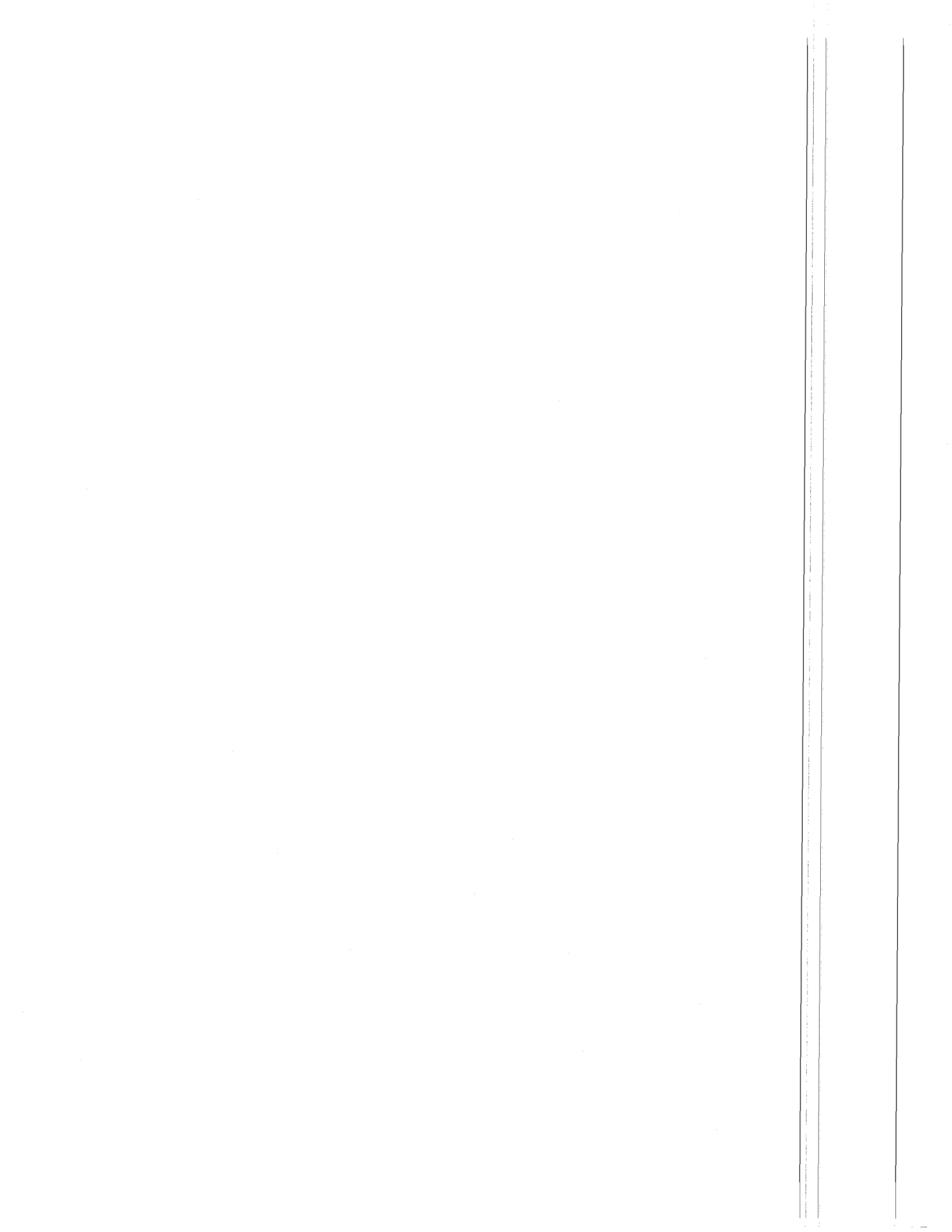


INSTRUCTION MANUAL



C20 Cassette Interface

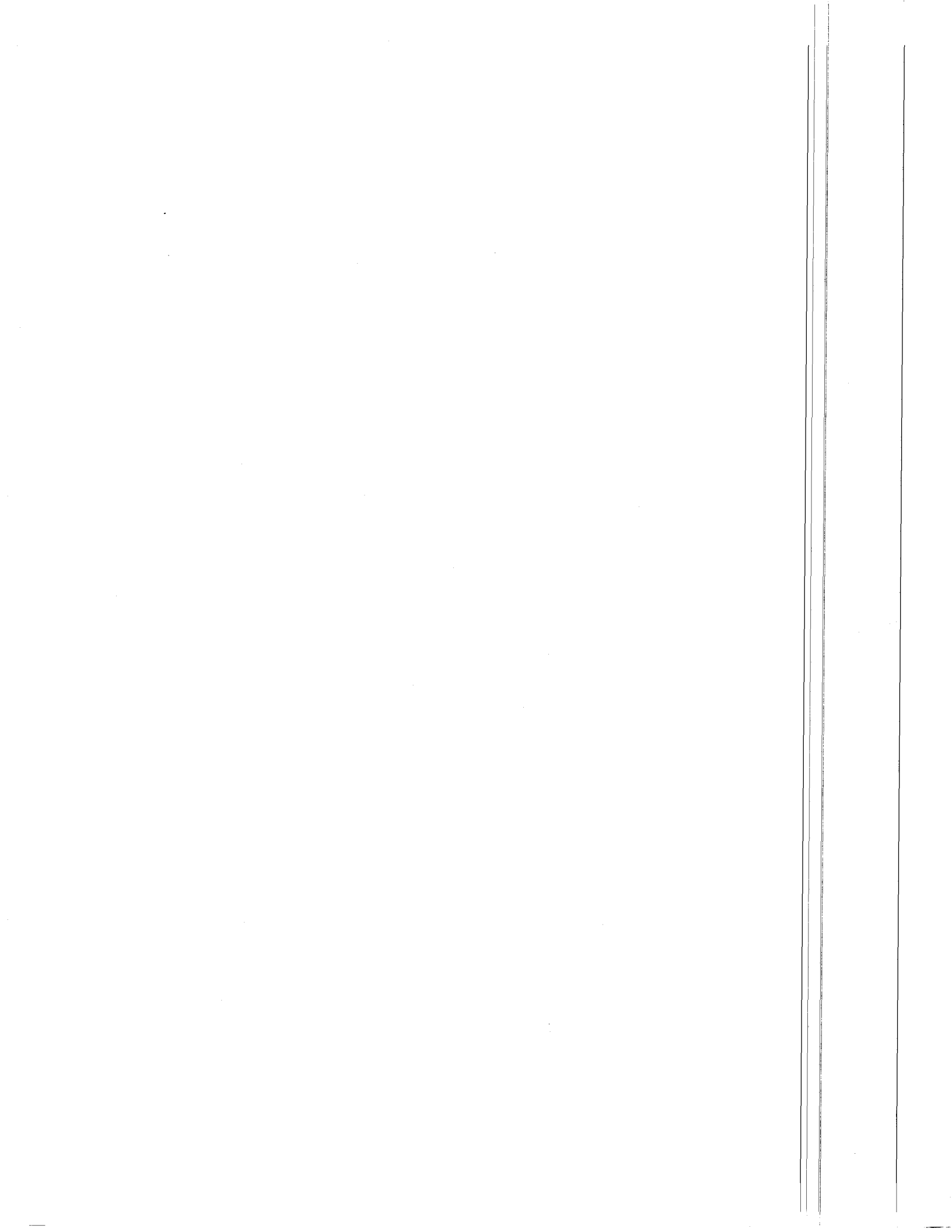
Campbell Scientific, Inc.



**C20 CASSETTE INTERFACE
INSTRUCTION MANUAL**

REVISION: 6/89

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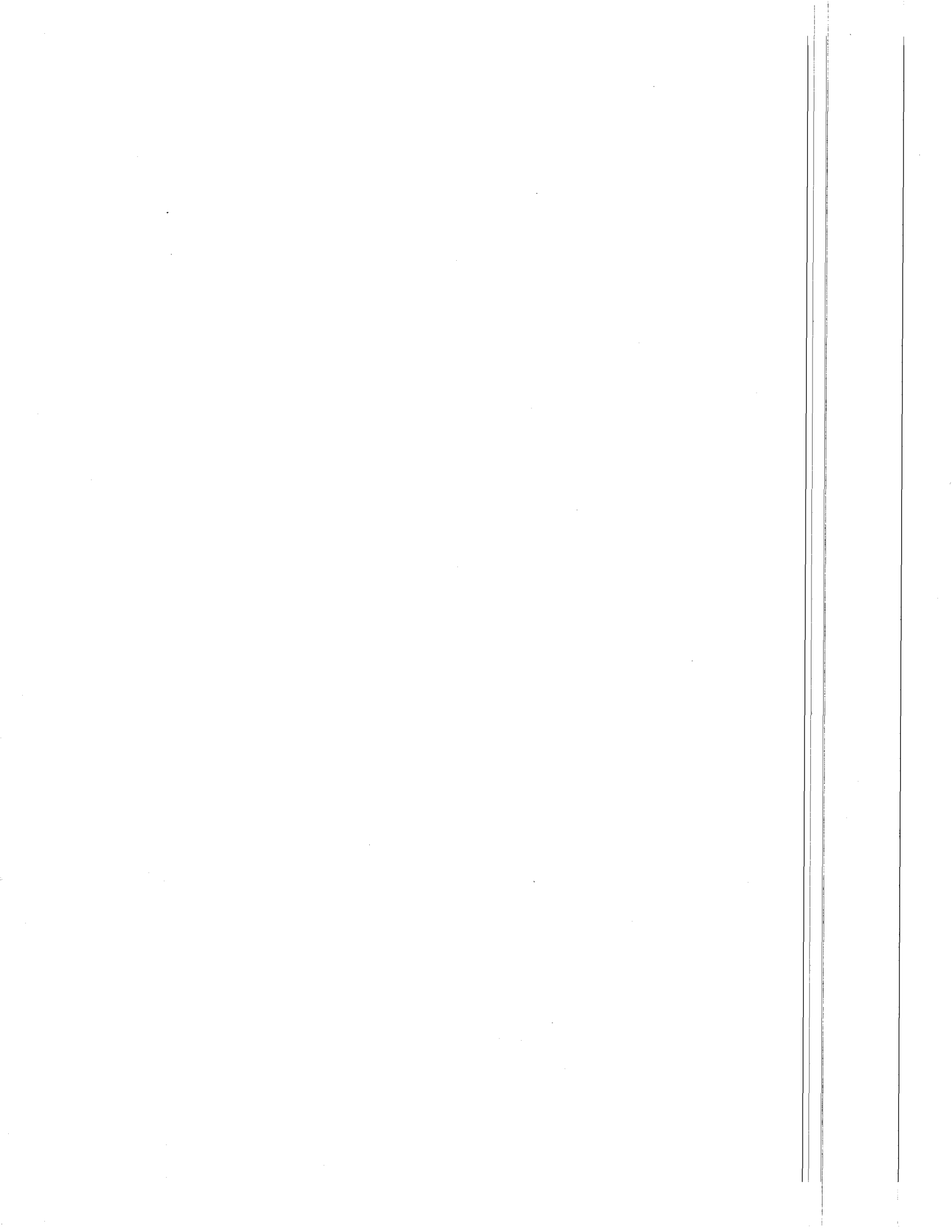
WARRANTY AND ASSISTANCE

The C20 CASSETTE INTERFACE is warranted against defects in materials and workmanship. This warranty applies for twelve months from date of delivery. CSI will repair or replace products which prove to be defective during the warranty period provided they are returned prepaid to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return warranted equipment by surface carrier prepaid. No other warranty is expressed or implied. CAMPBELL SCIENTIFIC, INC. is not liable for consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (801) 755-2342. An RMA number will be issued in order to facilitate Repair Personnel in identifying an instrument upon arrival. Please write this number clearly on the outside of the shipping container.

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover the repair.



PROLOGUE

C20 POWER SUPPLY

The C20 power supply can accommodate either a 120 VAC or 240 VAC input in a frequency range of 47-63 Hz. The voltage option is provided by the removable adaptor card accessed from the back panel of the C20. The card and the power fuse are located behind the clear plastic cover directly above the panel silk screen "47-63 Hz". When shipped from the factory, the power supply is configured for 120 VAC input. The 240 VAC input is obtained by repositioning the adaptor card. To remove the card, slide the clear plastic cover to the left and push the fuse cam arm to the extreme left so it clears the adaptor card. Carefully pull the card out with pliers or by hooking the exposed hole with a pointed object. Rotate the card 180° in the horizontal plane (i.e., maintain the original top and bottom) so the marked "240" can be read and reinsert.

The power supply sources 2 amps at 5 VDC and 400 mA at ± 12 VDC. It should not be used to power peripherals.

EARLY CR21/CR5 DATATAPE COMPATIBILITY

Attention:

Users generating datatapes with either an R235 CR5/Cassette Interface or an SC235 CR21-Cassette Connector purchased prior to May 1982, should be aware of the information contained in Appendix D.

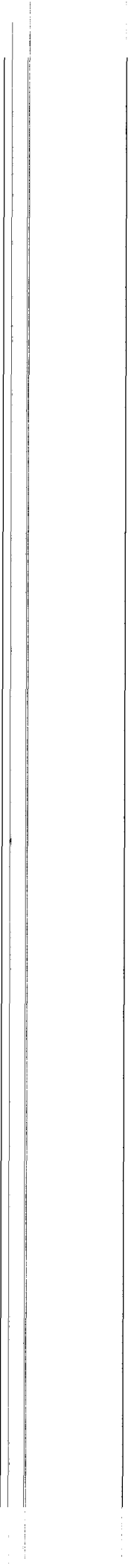


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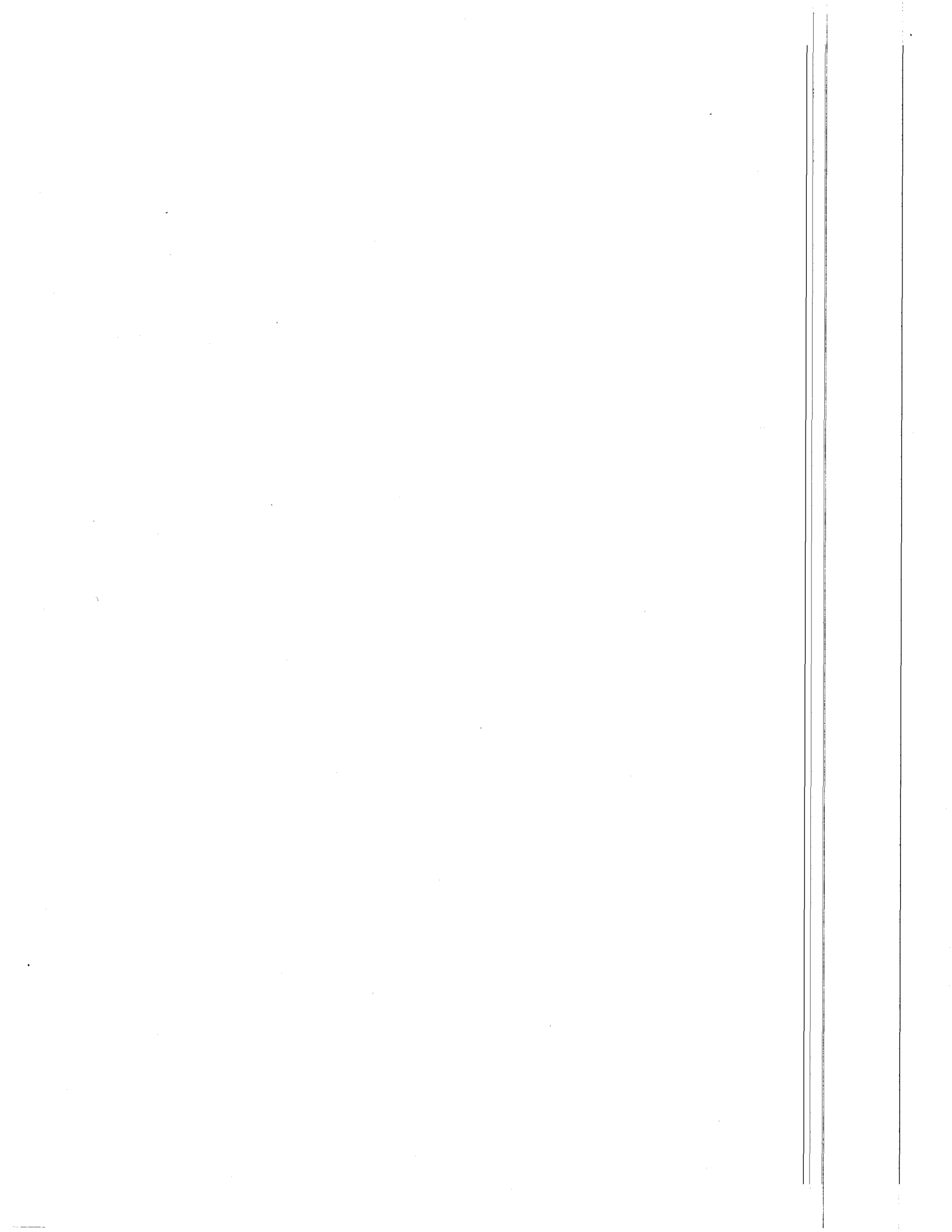


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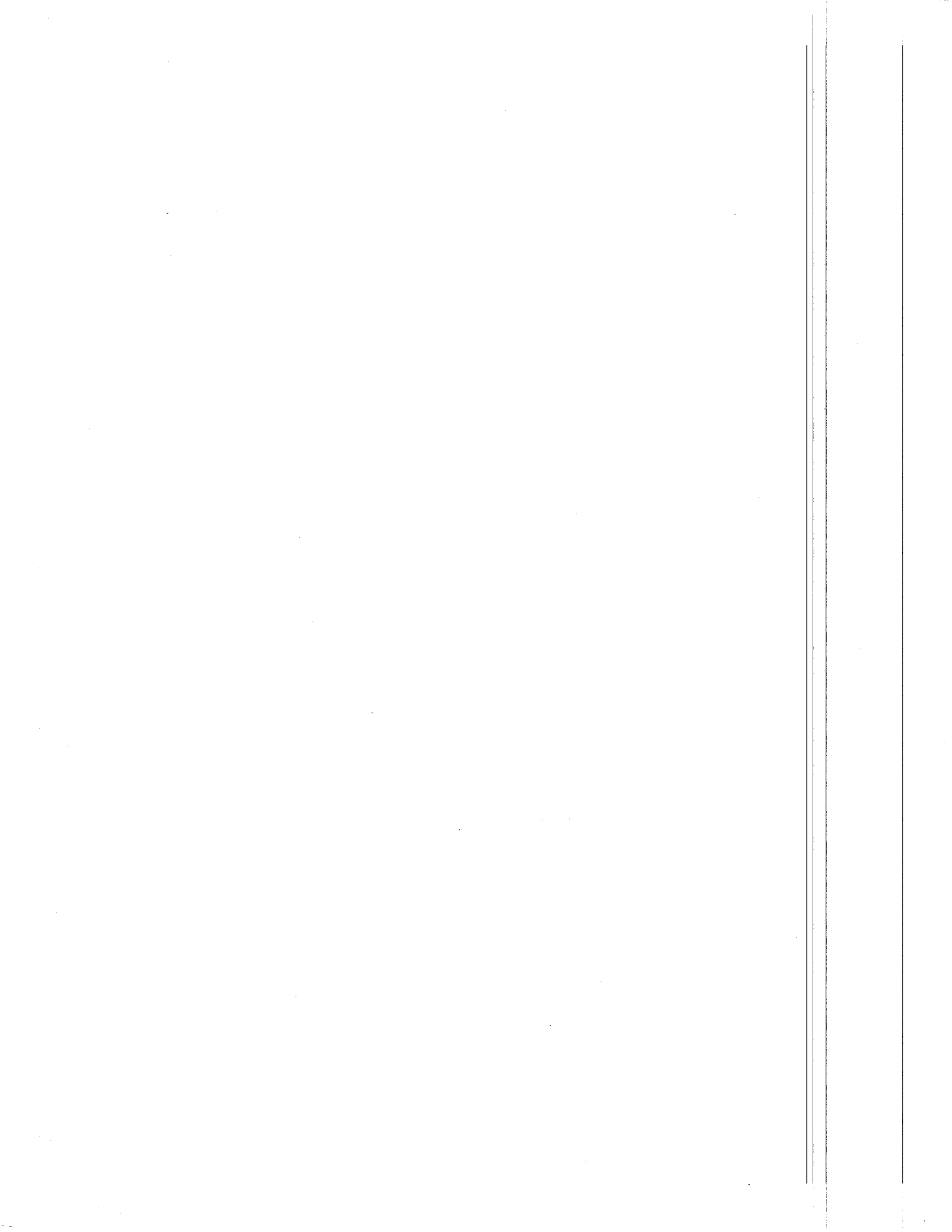
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SECTION 1. INTRODUCTION

1.1 GENERAL DESCRIPTION AND PURPOSE

Campbell Scientific's C20 CASSETTE INTERFACE allows the users of CSI's dataloggers to retrieve data stored on tape. It's main purpose is to read tapes generated by the CR5, CR21, or CR7 dataloggers, decode the format, and transmit the data in a usable form to your computer, modem, terminal, printer, or any other equipment that can communicate via the standard RS232 interface.

The C20 is designed for simple operation yet includes the flexibility to interface with most of the broad range of computers and communication equipment available today. Hardware "handshaking" (for example, using such lines as "clear to send" or "data terminal ready") through two independent RS232 ports allows the user to interface his tape recorder with either data communication type equipment (DCE) such as computers and modems or with data terminal type equipment (DTE) such as terminals or printers, or with both types of equipment simultaneously. Additionally, "software handshaking" such as single byte commands to "stop!", "send one line of data" or "send data continuously" makes communication straight forward. Such protocol is user programmable if the default protocol is incompatible with your particular equipment.

The C20 CASSETTE INTERFACE reads Campbell Scientific's new high density, high speed, high reliability tape format, Format II. For example, 180,000 low resolution data points as opposed to 8,000 can now be stored on a single side of a 60 minute cassette tape (30 minutes/side). At the 9600 bit per second (baud) rate the C20 reads, decodes and outputs the data at a rate of 100 datapoints per second (100 data points = 1000 ASCII characters = 10,000 bits). The C20 can also be switched to read tapes written in the original format, Format I.

The new format incorporates a unique error detection and correction process that greatly improves data integrity and minimizes the problems arising from damaged tapes. For example, a "burst error" that wipes out up to 16 adjacent datapoints on tape will be corrected by the C20 with no loss of data. The error correcting scheme is also optimized to correct randomly dispersed errors.

Data written to tape by CSI dataloggers using the new format can be read and output by the C20 in either of two different forms: (1) as ten-byte ASCII data values or (2) as two-byte or four-byte binary data values. Appendix B describes in detail the data

SECTION 1. INTRODUCTION

format you can expect out of your C20 and the specific advantages of each representation.

The C20 also writes to tape using CSI's high speed, high density, error-correcting format. It can write (and read back) ASCII or any other file types received from either the computer port or the terminal port.

You should by now have a sense of the capability of your tape reader. It is more than "just a tape reader" yet principally, you DO want to "simply" read your tapes. The following "quick setup procedure" will show you how to do just that.

1.2 A QUICK SET-UP PROCEDURE FOR READING TAPES

TURN ON YOUR TAPE RECORDER

Listen to your data with the volume control on midrange. You should adjust the skew position of the head if the data sounds muffled. Improper head skew cuts down the high frequency response of the tape recorder. The adjustment screw is near the head assembly (Figure 1-1) and can be adjusted back and forth until you can hear the maximum high frequency response. Refer to Appendix E for more detailed information regarding head alignment procedure.

CONNECT

Connect the two cables from the tape recorder MONITOR and REMOTE to the C20 monitor (MON) and remote (REM) located on the back panel.

PROGRAM MODE

Move switch 5 on the C20's (Figure 2-1) front panel (PROGRAM MODE) to the DEFAULT position (closed).

TAPE FORMAT

Set switches 7 and 8 on the C20's front panel to match the tape format on the tape you wish to read. If the data on the cassette tape is written in Format II then the switches should be set to the II, DECODE position (open, closed). If the data is written in Format I then the switches should be set to the I, ASCII position (open, open). For further information see Section 2.7.

TURN TAPE RECORDER ON

Rewind and turn on the tape recorder. Make sure the tape recorder is running.

PANEL LIGHTS

Watch the lights on the front panel. As soon as the tape recorder begins playing data, the green data light (LED) should light up. If it does not light up, or if the red error indicator light flashes, the C20 is not getting data or it is getting erroneous data.

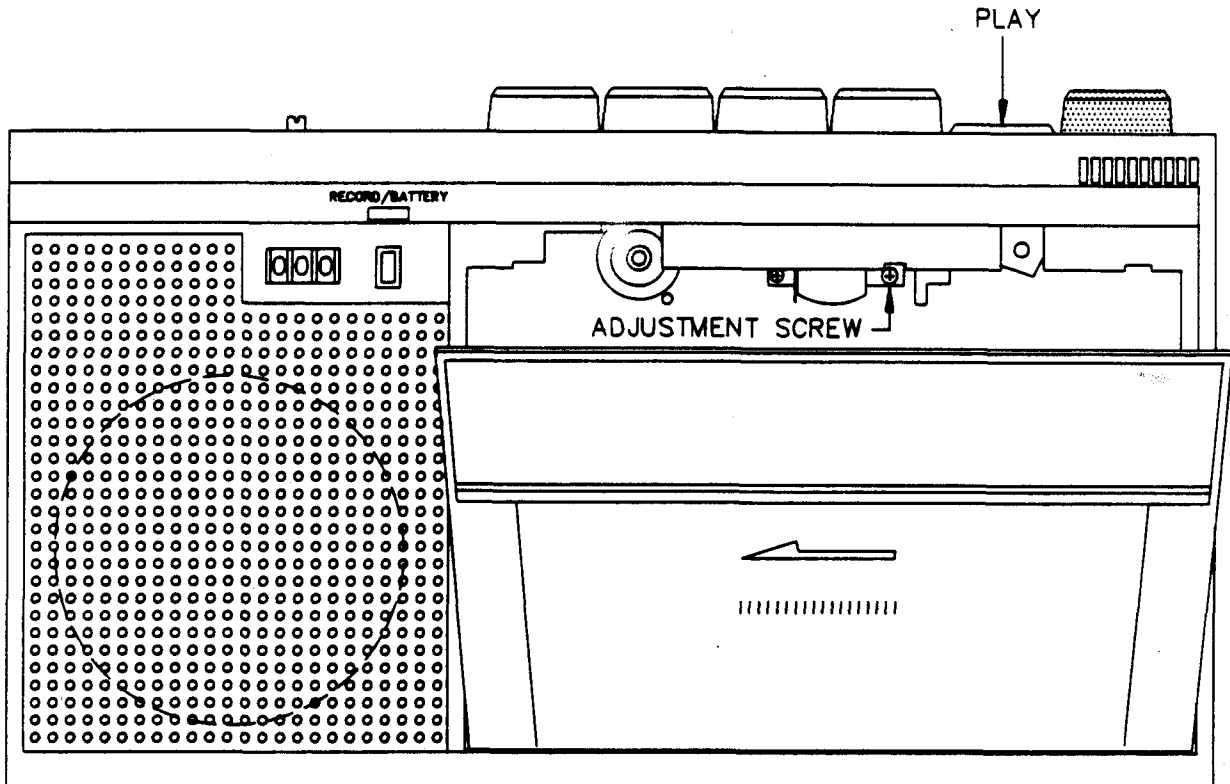


Figure 1-1. Head Alignment Adjustment Screw for Tape Recorder

ADJUSTMENT

Adjust the volume control toward both extremes until the red light starts flashing, then set it half way in between these two extremes. Now, you should be reading good data, with the green light staying on for about 3.5 seconds (the length of time for one block of data) and off for 1.5 seconds (the "gap time" between blocks of data). If the red light continues to flash, check the skew adjustment, as described in the first step.

SECTION 1. INTRODUCTION

TRANSMIT LIGHTS

See if the transmit lights at PORT A and PORT B are working. If switch 6 is open (C20 TO PORTS A AND B) then both transmit lights should begin flashing once the first block of data has been read and processed by the C20. If switch 6 is closed, only PORT B should be flashing.

CONNECTING C20 WITH VARIOUS TYPES OF EQUIPMENT

At this point you are assured that the C20 is reading tape and transmitting data out PORT B or out both ports. Using the ribbon cable supplied with your C20, connect your terminal (or any other equipment specified as "DTE") to PORT A. Connect your computer (or any other equipment specified as "DCE") to PORT B. Figure A-2 (Appendix A) illustrates in a general way the connection between the C20 and various types of equipment. Appendix A describes in detail the pin functions of each of the two serial ports (PORT A and PORT B).

If your computer and terminal are packaged as a single unit with only one RS232/C port configured as DCE, you must do one of the following: 1) connect to Port B and use the DEFAULT protocol only, or 2) connect to Port A after reconfiguring it as a DTE port (see Appendix A for details) and use either the DEFAULT or PROGRAMMABLE protocol.

SETTING BAUD RATES AND PARITY SWITCHES

Set the baud rate and parity switches to match the requirements of your specific communication equipment. Section 2 provides a complete description of the function of each switch.

PROTOCOL

Decide whether the default protocol will suffice or whether you should program the C20 with your own protocol. Your computer program can easily incorporate commands that program the C20 (see the BASIC program in Appendix C for example) or you can program it from your terminal. See Section 2 for descriptions of the PROGRAM switch.

PROGRAMMING

Program your computer to accept the data coming from PORT B of the C20 (see Appendix C for some sample programs written in BASIC). If your computer program echoes (retransmits characters it receives), set switch 6 closed (C20 TO PORT B ONLY). Otherwise, leave switch 6 open and the C20 will transmit to the terminal or printer and the computer.

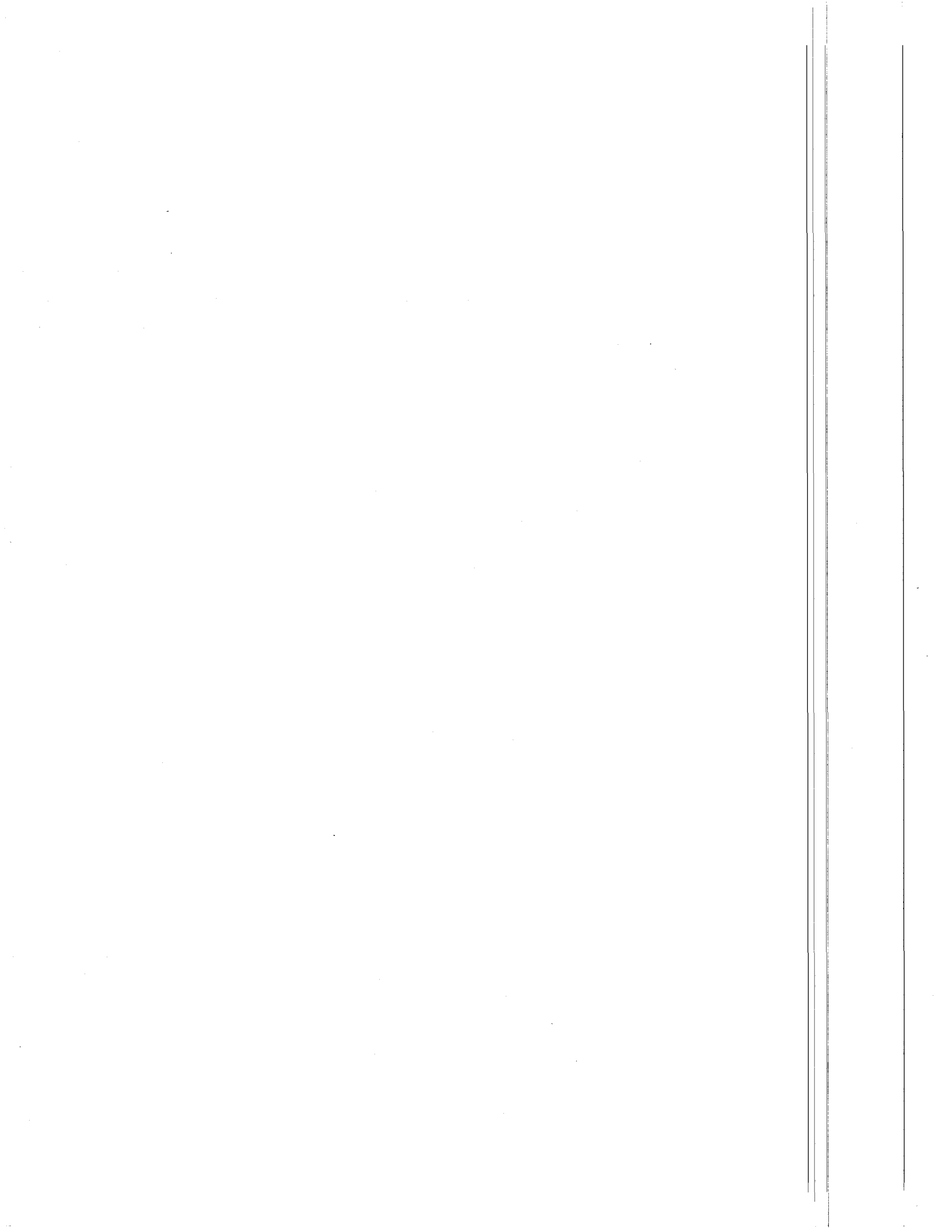
SECTION 1. INTRODUCTION

RUNNING PROGRAM

Once your C20 is set up, rewind your tape recorder, start up your program, turn on your tape recorder and watch your data come screaming out.

EXIT COMMAND

When you are finished reading the tape, give the C20 the "exit" command (default "escape" character or user programmed). The C20 will turn off the tape recorder and enter its "transparent" mode, allowing you to carry on communication between the terminal and computer without interference from the C20.



SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

2.1 GENERAL

The various operating modes of the C20 Cassette Interface are determined by the switch settings and through communication commands at either of the two serial ports (PORT A and PORT B). A switch-by-switch description follows explaining the specifics of the various modes of operation and the necessary switch settings and commands for each mode. The front panel description is reproduced in Figure 2-1 for reference.

Note! Any change in switch positions will reset the C20 to start all over again under the control of the new switch settings.

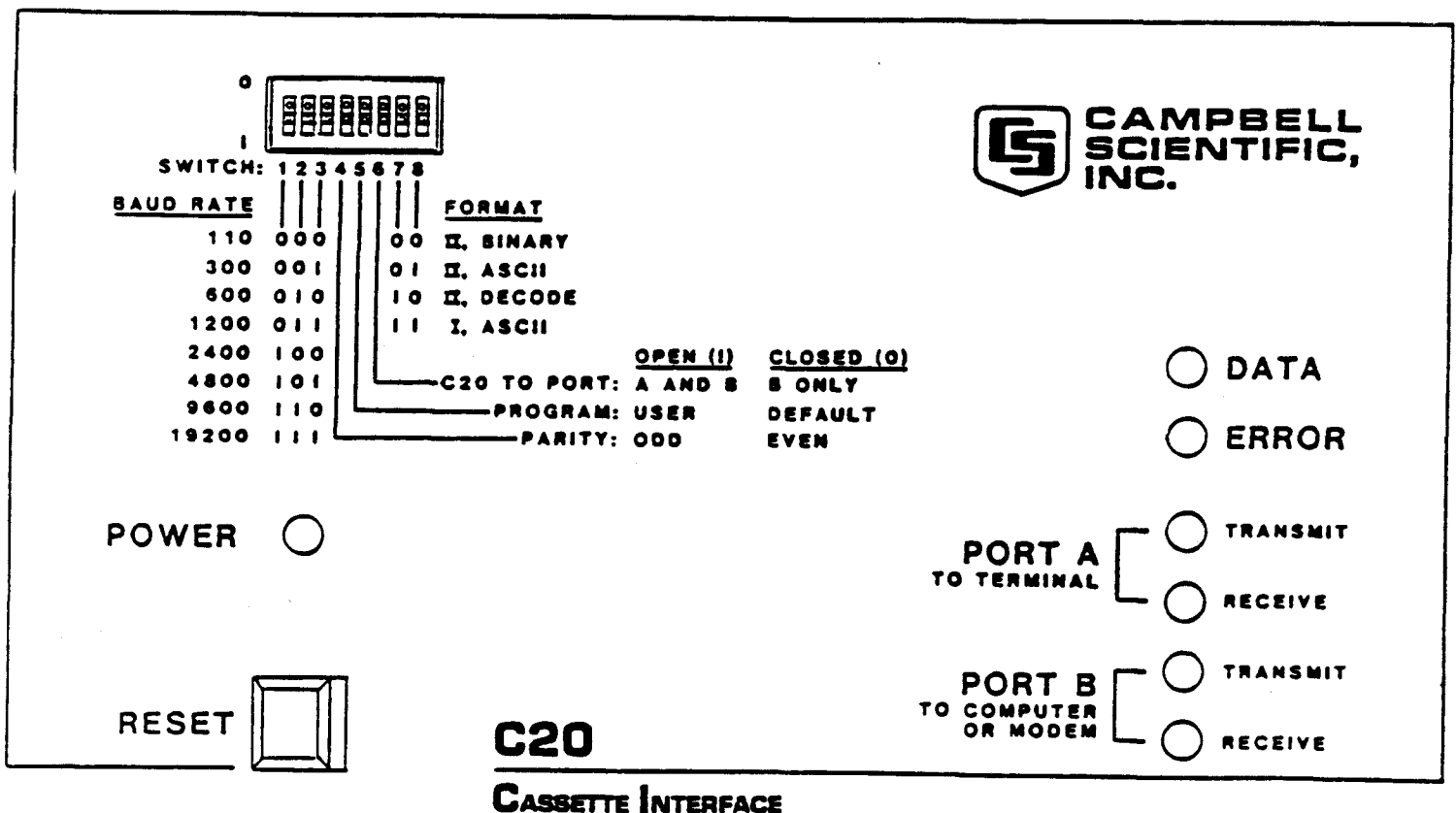


Figure 2-1. C20 Front Panel

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

2.2 BAUD RATE, PARITY AND STOP BITS

Switches 1, 2 and 3 set the communication baud rate at the two serial ports. Both ports transmit and receive at the same selected baud rate. The switch setting must match the baud rate setting on whatever equipment is connected to these ports.

Switch 4 sets the parity bit when ASCII characters are being transmitted. In these cases, 7 bits of data and the one parity bit are transmitted. Non-ASCII (BINARY) information is transmitted with 8 data bits and no parity. Section 2.7 describes the various format options.

The C20 transmits 2 stop bits after each byte to PORT B (to Computer) and only 1 stop bit after each byte to PORT A (to Terminal).

2.3 PROGRAM MODE AND COMMUNICATIONS PROTOCOL

Switch 5 determines whether the DEFAULT or USER PROGRAMMABLE communication protocol is employed. Before discussing the DEFAULT protocol and how to program your own protocol we should define the 3 features that comprise the C20 protocol.

1. Communication Commands - The C20 responds to four different communication commands. The command characters are fixed in the DEFAULT mode but the user can define the characters in the PROGRAMMABLE mode. The function of the commands are as follows.

STOP command - transmission of characters is stopped within 1 character of the present character being transmitted when this command is received.

SEND ONE LINE command - the C20 transmits data through the end of the postamble and then stops, awaiting another command. The end of the postamble defines the end of a line of data. The amount of data contained in one line is a function of the output format defined in Section 2.7.

SEND CONTINUOUSLY command - the C20 transmits data continuously until another command is received or the data tape ends.

EXIT command - terminates the C20's read program, stops the tape recorder and causes the C20 to enter the "transparent" mode where it passes any communication it receives between it's ports. Resetting the C20 or changing a switch position is the only way the tape read mode can be reentered.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

2. Postamble - The postamble is one or more characters following a group of data and defines the end of a line of data. There are 2 fixed postambles in the DEFAULT mode depending on the position of switch 6 whereas the user may define up to a 16 ASCII character postamble in the PROGRAMMABLE mode.
3. Preamble Delay - This parameter is the time delay between the C20 receiving a transmission command and the transmission of the first character. The preamble delay in the DEFAULT mode is fixed at 1 msec but can be user specified in the PROGRAMMABLE mode.

2.4 DEFAULT MODE PROTOCOL

With switch 5 in the DEFAULT position (closed), the C20 is in the tape READ mode and will operate with the preprogrammed protocol shown in Table 2-1.

TABLE 2-1. DEFAULT MODE PROTOCOL

COMMUNICATION COMMANDS	ASCII CHARACTER
"STOP!"	12 hex (19 dec, ^S)
"SEND ONE LINE"	11 hex (17 dec, ^Q)
"SEND CONTINUOUS"	14 hex (20 dec, ^T)
"EXIT"	1B hex (27 dec, ESC)
POSTAMBLE	
Switch 6 set to B only	0D hex (13 dec, CR)
Switch 6 set to A and B	0D, 0A hex (13, 10 dec; CR, LF)
PREAMBLE DELAY	1 msec

Note that the DEFAULT postamble depends upon the setting of Switch 6. Many computers echo the characters (full duplex) they receive and generate line feeds (LF) after they receive a carriage return (CR). For these situations, Switch 6 should be set to "B port only" and the postamble is a CR. For situations where the data is going to a terminal only or where the computer does not echo and can tolerate a LF postamble, Switch 6 should be in the "A and B" port position.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

If the C20 does not receive a command in the DEFAULT mode, it begins transmission as soon as it finds, reads and processes the first complete block of data on tape. Once found, a FORMAT II block of data takes 3.5 sec. to read. Thus, data can be read continuously into equipment that cannot issue a "start" command. CAUTION! If your computer is not ready for data, make sure the tape recorder is turned off until it is ready. The C20 still responds to any command you give it in this mode, e.g., STOP (^S), SEND ONE LINE (^Q), etc. Remember, if you change a switch or reset the C20, it forgets any previous commands and starts over from scratch. Therefore, do not start running your computer program and then reset the C20 and expect it to perform correctly.

In short, remember the following sequential procedure when operating in the DEFAULT mode: (1) make sure the C20 switch positions are all set correctly and that the C20 is operable (2) then call up your computer's tape read program (the C20 will not interfere with communication between terminal and computer except for the command characters) (3) finally, turn on the tape recorder.

2.5 USER PROGRAMMABLE MODE PROTOCOL

The USER PROGRAMMABLE mode is available for those cases when the default protocol is incompatible with your system. Even if you program the C20 with the default protocol you may find it easier to use the programmable mode. You will see why shortly.

First, what are the specifications of the programmed protocol?

1. Communications commands - any ASCII character can be used to designate the communication commands shown in Table 2-1. CAUTION! DO NOT use ASCII command characters that appear as part of data if your computer echoes back through the C20 to your terminal. This is discussed further in Section 2.6.
2. Postamble - the postamble can be a sequence of any ASCII characters up to 16 characters in length. The user must send a 1B hex ("ESCAPE") character to indicate the end of his postamble sequence.
3. Preamble Delay - the preamble delay parameter can be any delay between 1 msec and 900 msec in 100 msec increments. (see Table 2-2).

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

TABLE 2-2. PROGRAMMABLE PREAMBLE DELAY

DELAY	ASCII CHAR.
1 MSEC	0
100 MSEC	1
200 MSEC	2
300 MSEC	3
!	
!	
!	
900 MSEC	9

Answering any of the protocol questions other than the postamble with a carriage return inserts the default protocol.

PROGRAMMING SEQUENCE

When Switch 5 is set to the USER PROGRAMMABLE mode, the C20 sends an option menu (Table 2-3) to PORT A only and waits for an appropriate OPTION COMMAND from PORT A only.

TABLE 2-3. PROGRAMMABLE MODE PORT OPTIONS

A = READ (A)
B = READ (B)
W = WRITE (A)
V = WRITE (B)
T = TRANSPARENT
OPTION?

A means "I want to program from Port A (my terminal)".
B means "I want to program from Port B (my computer)".
W means "I want to write data to tape from Port A".
V means "I want to write data to tape from Port B".
T means "I want the C20 to be completely transparent".

OPTION A

Choosing option "A" will cause the C20 to listen to PORT A for the read protocol sequence. Prompt messages to step you through the keyboard entries are sent to PORT A only with this option.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

If your computer and terminal are packaged as a single unit with a single port configured as DCE (e.g. many HP's) you will need to reconfigure Port A as a DTE port (see Appendix A for details). Once this is done you can send the "A" option COMMAND and program the C20 manually from your terminal or with a computer routine. Once the C20 receives the "A" OPTION COMMAND, your program must wait until the PORT A prompt message is transmitted before sending the next protocol character. Regardless of how you program the C20 in situations where PORT A is reconfigured as DTE, you must first send it an "A" option command informing it you are going to program from PORT A. Single unit computers such as IBM-PC's have a single port configured as DTE and connect directly to PORT A without reconfiguration.

OPTION B

Choosing option "B" will cause the C20 to listen to PORT B, your computer in most cases. No prompts whatsoever are sent with this option. Instead, the C20 waits for the "READY TO PROGRAM" signal, a 16 hex (^V), from the computer. Until this character is received at Port B, the C20 is transparent to communication between the terminal and the computer, allowing the user to initiate their tape read program without interference from the C20. The characters immediately following the "AV" at Port B are interpreted by the C20 as the programmable tape read protocol.

Whether programming from PORT A or from PORT B the string of parameters must include one character per communication command, 0 to 16 characters as a postamble delineated with an "ESC" at the end of the postamble string and one ASCII numeral to designate the preamble delay. If an illegal character is received the C20 will reset.

After all the protocol parameters are received by the C20 in the USER PROGRAMMABLE mode, the C20 then turns on the tape recorder and reads in a block of data. Unlike the DEFAULT mode, the C20 waits for an initial start command, either "TRANSMIT ONE LINE" or "TRANSMIT CONTINUOUSLY", before it begins transmission to either port.

The advantages of option B in the USER PROGRAMMABLE mode can now be discussed. The tape recorder can be left turned on but the C20 keeps it turned off until it receives the programmable protocol. In the DEFAULT mode, you must keep your recorder off until you initiate your computer program from the terminal because the C20 begins to read the tape immediately. In addition, your terminal and computer can communicate freely after selecting the B option with the exception of using the "READY" command "^V". In the DEFAULT mode, "^S", "^Q", "^T" and "ESC" are all interpreted by the C20 as communication commands.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

Appendix C includes a simple BASIC program that programs the C20, asks for and receives one line of data, stores the data on disk, and exits the program upon command from the terminal while commanding the C20 to exit its "READ" mode and enter its "TRANSPARENT" mode.

OPTION T

Choosing Option "T" puts the C20 in a "TRANSPARENT" mode where any characters received from Port A are transmitted to Port B and visa versa. This mode allows the user to keep the C20 connected between their terminal and computer when not using the cassette interface function of the C20. Sending the C20 a "T" after power-up or reset when in the USER PROGRAMMABLE mode (switch 5 open) hides the C20's presence. Note: The "TRANSPARENT" mode can always be entered when the C20 is in the middle of reading tapes by giving it the "EXIT" command.

A specific example using the "TRANSPARENT" mode is connecting the C20 between a terminal and a modem communicating with a remote computer. When you are ready to read tapes, DO NOT exit the TRANSPARENT mode via the RESET switch as momentary power down occurs, causing the modem to hang up. Instead, exit the TRANSPARENT mode by toggling one of the panel control switches. This action resets the C20 without power interruption.

OPTIONS W AND V

Options "W" and "V" are discussed in Section 3.

2.6 PORT SELECTION, "PORT A AND B" OR "PORT B ONLY"

Switch 6 determines which port the C20 communicates through, the options being either through both ports or through Port B only. By "communicate", we mean (1) transmit data read from tape and (2) respond to commands received. In either switch position, any non-command character received at one port is transmitted out the other port.

What is the significance of this switch? It allows the C20 to operate between terminal and computer whether or not the computer echos back to the terminal. If your computer tape read program does not echo and you want data to go to both ports and commands to be read from either port, you should have switch 6 in the OPEN position, C20 TO PORT A AND B. If, on the other hand, your computer program echos, then you should have switch 6 in the CLOSED position, C20 TO PORT B ONLY. The C20 will then transmit data only to Port B while passing all echoed data received at Port B onto Port A. It will also listen only to commands from Port B while it passes anything it receives from Port A onto Port B and all non commands from Port B onto Port A. Note that if

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

your computer is echoing but you have switch 6 open, then Port A will see double characters. CAUTION! As noted above, DO NOT program your C20 with command characters that may also appear as part of your data since these characters will be interpreted as commands when echoed back by the computer.

As noted above, the position of switch 6 also determines the DEFAULT mode postamble. If B ONLY is selected, then only a CR is sent, otherwise, CR and LF are sent.

2.7 FORMAT SELECTION

The form of the data output by the C20 through PORTS A and B depends on the setting of switches 7 and 8. The four options are (1) 11, BINARY, (2) 11, ASCII, (3) 11, DECODE and (4) 1, ASCII. The front panel (Figure 2-1) shows the corresponding switch positions.

The proper setting of the FORMAT switches depends upon (1) the format of your data on tape, i.e., is the tape format CSI FORMAT I (original) or CSI FORMAT II (the new high density format) and (2) what representation you want your data transmitted in, ASCII or BINARY.

TAPE FORMAT I, ASCII - Refers to the original CSI tape format generated by all CR5 Digital Recorders and those CR21 Microloggers shipped prior to June 1982, and not updated. All tapes generated by such dataloggers must be read with the FORMAT switch position in the fourth position, 1, ASCII. The data on tape is formatted as ten character ASCII data values, including spaces.

TAPE FORMAT II - Is the standard format used in current CR21 Microloggers, 21X Microloggers, and CR7 Measurement and Control Systems. Any tapes generated by the C20 Cassette Interface also use this high density, error-correcting format. Two format switch options exist when reading FORMAT II tapes.

1. 11, DECODE output - In most cases the decoded ten character ASCII data values will be the most useful output representation of FORMAT II tapes. The values consist of a four or five digit number, decimal point, sign and data point identification. Appendix B specifies the details. Switching the C20 FORMAT switches to the 11, DECODE position causes the C20 to first decode the binary format generated by the datalogger into the ASCII representation before outputting. Seven ASCII data bits and the selected eighth parity bit are sent for each character. The user selected postamble is sent at the end of every 79th character or before the start of a new data array.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

2. 11, BINARY output - Data stored on tape by a CR21, 21X or CR7 datalogger takes the form of the FINAL MEMORY STORAGE FORMAT in the datalogger. The data is represented as two byte binary encoded data values in the CR21 and as two byte or four byte binary encoded data values (depending upon desired resolution) in the CR7. Appendix B specifies the details of this FINAL MEMORY STORAGE FORMAT. If the C20 FORMAT switches are in the 11, BINARY position, then the C20 will output the direct representation of the data stored on tape without decoding to ASCII. Since the bytes output by the C20 are not ASCII characters, 8 bits without parity are transmitted. Further, the user selected postamble is sent at the end of every 1024 bytes.

The primary feature of leaving the data in the FINAL MEMORY STORAGE FORMAT is the compact mass storage on such devices as floppy discs. Instead of using 10 bytes to represent the data point in ASCII only 2 bytes are required. ASCII representation can be obtained directly by writing a conversion program or by generating a binary tape on the C20, then reading the tape into the computer using the 11, DECODE format selection.

The following two paragraphs deal with reading tapes written by the C20.

TAPE FORMAT 11, ASCII - ASCII files written to tape by the C20 with the FORMAT switches in the 11, ASCII position, should be read with the FORMAT switches in the 11, ASCII position. The C20 outputs the identical ASCII character stored on tape with the exception that all LF's on the source tape are stripped and the user selected postamble replaces any CR's. The eighth bit is the parity bit selected by the PARITY switch.

TAPE FORMAT 11, BINARY - BINARY files written to tape by the C20 with the FORMAT switches in the 11, BINARY position, should be read with the FORMAT switches in the 11, BINARY position. Eight data bits without parity are sent, and all bytes stored on tape are transmitted. The user selected postamble is transmitted at the end of every 1024 bytes.

Table 2-4 summarizes the proper FORMAT switch settings for the various tape sources. The only tape source which allows an option in the output format is CSI datalogger tapes written in FORMAT 11. These tapes can be read and output as binary or decoded to ASCII. The last column of Table 2-4 references the postamble associated with the various output formats. "User selectable" refers to the user selecting either the DEFAULT or USER PROGRAMMABLE postamble.

SECTION 2. FUNCTIONAL OPERATION - SWITCH SETTINGS

TABLE 2-4. SUMMARY OF C20 FORMAT SWITCH SELECTIONS FOR READING TAPES

TAPE SOURCE	TAPE FORMAT	C20 FORMAT SWITCH SELECTION	OUTPUT	POSTAMBLE
CSI dataloggers	CSI I	I, ASCII	ASCII	User selectable, after every 79th character or before the start of a new data output scan
CSI dataloggers	CSI II	II, DECODE	ASCII	User selectable, after every 79th character or before the start of a new data output scan
CSI dataloggers	CSI II	II, BINARY	binary no parity	user selectable, after every 1024 bytes
C20 II, ASCII format write selection	CSI II	II, ASCII	ASCII	Source tape LF's are stripped and the user selectable postamble (DEFAULT or USER PROGRAMMABLE mode) replaces any source tape CR's
C20 II, BINARY format write selection	CSI II	II, BINARY	binary no parity	user selectable, after every 1024 bytes