TECHNICAL FLYER #1

298-100-A-8

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This technical flyer, a joint effort of the Digital Group technical staff, is delivered free of charge on an irregular basis to all D.G. system owners. All related correspondence should be directed to the attention of D.G. Tech. Staff.

The goal of this flyer is to make available to the system user the little hints and tricks which the technical staff has deemed valuable to the trouble-shooting and maintenence of the system.

A NOTE ON EROMS

Z-80 system EROMS are presently supplied in the ZE version. Previous versions included the ZA, ZB, ZC, and ZD code. Those of you who have upgraded to a 64 character display board or have recently purchased a Z-80 system with the 64 character option may soon find a problem in the operating software. You should note that only a ZC, ZD or ZE EROM will completely clear the screen for the 64 character line, as the ZA and ZB version were written before the 64 character line display was created. The ZD version EROM has another inherent difference. This version will print a 6 rather than a . for an incorrect data load. If you are a Z-80 system owner and need to upgrad your ZA, ZB or ZD EROM please return it with a $5.00 reprogramming fee and we will return the ZE version.

THE 64 CHARACTER LINE

The new TVC-64 board deserves a few lines here. If you received one of the first kits and discovered an elusive problem with random characters (especially alpha's) on the display, you should be able to solve the problem by changing R3, R4 to 15K ohms and C4, C5 to 100 picofarads; IC 20 must be a 74L123. These components are available as a kit for no charge. Changing these values will bring the memory write strobe pulses within acceptable limits.

Another point is the video inversion feature. It appears in most cases to be necessary to swamp the video output of the board with a 10 ohm resistor to ground. This should be done on the coax connector (SO-239) mounted on your computer cabinet so as to avoid modifying your TVC board. This should equalize the print quality for black on white characters. Another interesting point is the reduced need for high bandwidth in the monitor or television if the display is inverted. Black characters on the white backround are less demanding of the monitor. This is achieved by grounding the DATA INVERT line (pin T or 16). Also remember that program tapes written for the 32 character board will not work well with the 64 character display and vice-versa. However a software upgrading service is available from DGSS. If the original tape and $2.50 is returned to them, they will recopy the tape with the 64 character software routines. Their address is: Digital Group Software Systems, P.O. Box 1086, Arvada, Colorado 80001.

NOT ALL MEMORY TESTERS ARE CREATED EQUAL

Remember that the memory tester routine included on the OP system tape is not foolproof and is rather limited. The new memory tester routines, now available separately from DGSS, are truly more effective and can catch things the original cannot. It is helpful for finding memory chips which appear good but fail after warmup, or seem to work fine until you load Basic. The cassette including memory test routines and several other programs is $7.50 from DGSS.

PHI-DECK

The Phi-F board also deserves some mention here. If you are getting bit errors and cannot find the cause check the date code on the LM-324. If it is a 650 date code it could be the problem. Also, if you can select a deck before the motor actually stops on the stop command replace IC 49 which is a 7400 with a 74S00. Also note that the 74S188 may be replaced with a 6330.

The Z-80 Phi-Deck demo routine (not applicable to 8080) may have errors in either the listing or the tape, depending on version, which may keep the program from printing error diagnostics (E). The listing in the new documentation is correct, however there may be errors in the tape. (PHI-DECK ROUTINES II). The listing in the old documentation for the Z-80 has wrong object code, but may have correct mnemonics. The errors and corrections are shown below.

	address	code	mnemonic	label
correct	OBE2	05	DEC B	RTD(read test data)
error	OBE2	0B	DEC BC	RTD
correct	OBB6	1602	LD D,2D	RCTD
error	OBB6	1606	LD D,6D	RCTD(record test data)

PADDLE CARD CONNECTOR BLOCK STANDARDS

As you may or may not have gathered, the Digital Group has started to set some interconnect standards. We will adjust these standards as necessary to keep up with additional peripherals. A diagram showing connections to the paddle card connector block has been included. Connection standards for the Phi-Deck follow.

PHI-DECK CONNECTION STANDARDS

In an effort to maintain compatability between Digital Group systems using Phi-Decks, complete wiring diagrams have been included for connecting Phi-Decks to your system. Refer first to the Phi-Deck system block diagram to locate the appropriate wiring diagram. A brief explanation of each wiring diagram is included.

DETAIL 1: This diagram details the motherboard connections between the I/O Port card and the Phi-Deck card using the wire wrap pins on the 36 pin connector of each board. Please note, a labeling change has been made on the pinout of the motherboard wire wrap pins. A conversion chart and explanation appears on a subsequent page.

DETAIL 2: The connections between the backplane of the paddle card connector block and the Phi-Deck card 36 pin connector are detailed on this diagram. Complete the wiring as if your system were using four Phi-Decks, even if you are using less than four decks. There are several wires in the cable for decks 1 and 3 that are common to all the decks. The best approach is to make-up cables with molex connectors on each end that slip over the wire wrap pins. If you should prefer not to use this method, please refer to your Phi-Deck documentation for the actual Phi-Deck card pinout.

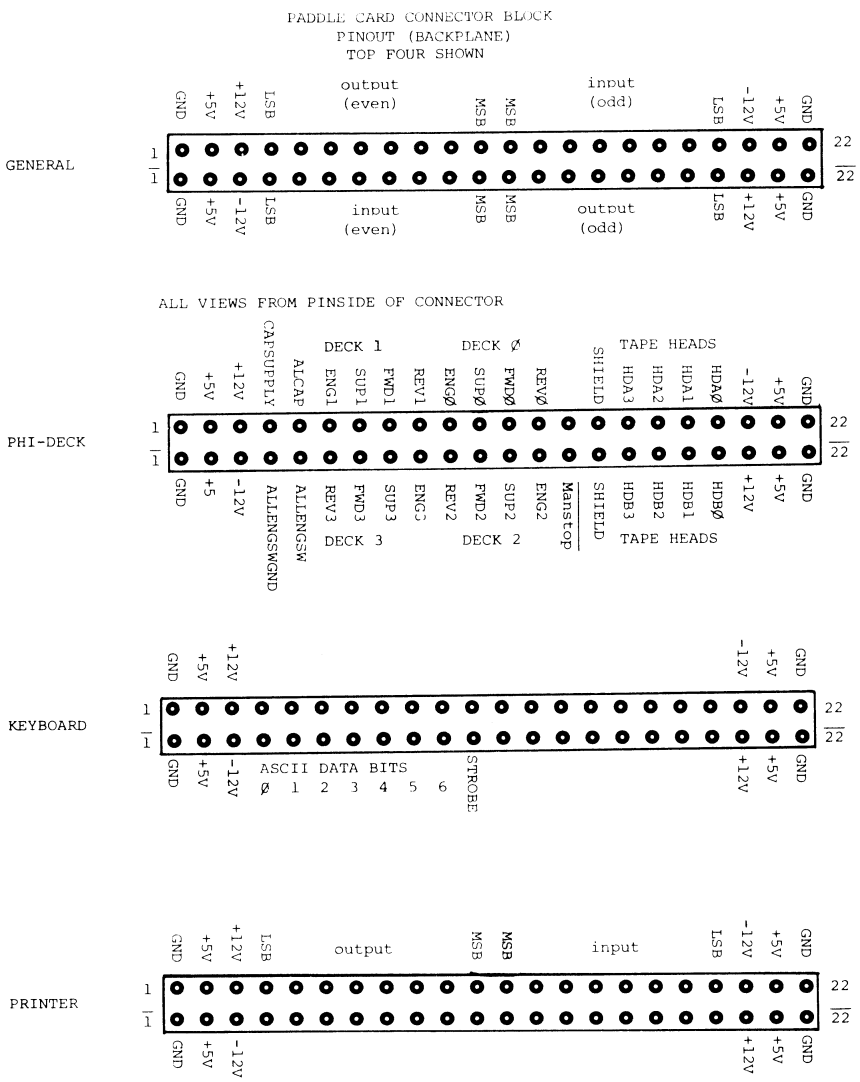
DETAIL 3: This detail shows the cabling between the paddle card going to the CPU cabinet (22 pin) and the paddle card going to the Phi-Deck cabinet (36 pin). There are two groups of wires on this diagram. Shielded cables should be used for the group on the left, since this cable contains the tape head signals. Also note that the shield from the shielded cable doesn't go to chassis ground, but is strictly ground for the tape heads to help avoid noise on the head ground. Ribbon cable (20 conductor) works best for the group on the right.

DETAIL 4: Phi-Deck cabinet wiring is detailed in this diagram. Your wiring needs will depend on the number of Phi-Decks in your system. The Phi-Decks are numbered Ø thru 3, so if you are using only one Phi-Deck, connect the cables labeled for deck Ø.

The Digital Group strongly recommends you follow the interconnect standards. This will greatly facilitate repair of your system, should you find it necessary to return it for service. If you send us your system please detail the connections on the paddle card connector block, etc. or state that you are following the Digital Group standard.

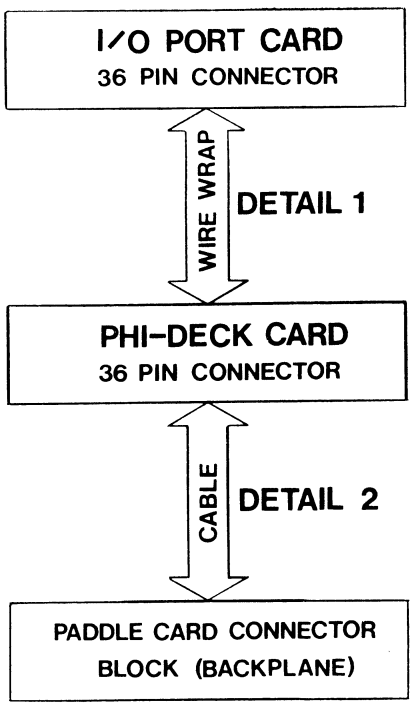
MOTHERBOARD PINOUT LABELING CHANGE

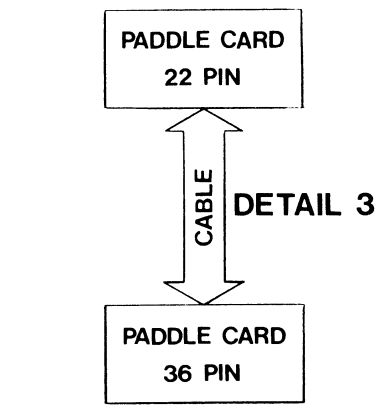
The wire wrap pins on the backplane of the motherboard, previously labeled with letters (A thru Z, etc.) are now being labeled with numbers and an overhead bar, i.e. $\overline{1}$,$\overline{2}$,...$\overline{36}$, etc. (Read: one not, two not, ... thirty-six not). This should make locating specific wire wrap pins easier. The conversion chart below shows the new labeling system and the labels currently in use on the CPU card and the rest of the Digital Group boards.



OLD CONNECTOR LABEL		NEW
CPU	GENERAL	LABEL
A	A	1
B	B	2
C	C	3
D	D	4
E	E	5
F	F	6
H	H	7
J	J	8
K	K	9
L	L	10
M	M	11
N	N	12
P	P	13
R	R	14
S	S	15
T	T	16
U	U	17
V	V	18
W	W	19
X	X	20
Y	Y	21
Z	Z	22
AA	A	23
AB	B	24
AC	C	25
AD	D	26
AE	E	27
AF	F	28
AH	H	29
AJ	J	30
AK	K	31
AL	L	32
AM	M	33
AN	N	34
AP	P	35
AR	R	36
AS		37
AT		38
AU		39
AV		40
AW		41
AX		42
AY		43
AZ		44
BA		45
BB		46
BC		47
BD		48
BE		49
BF		50

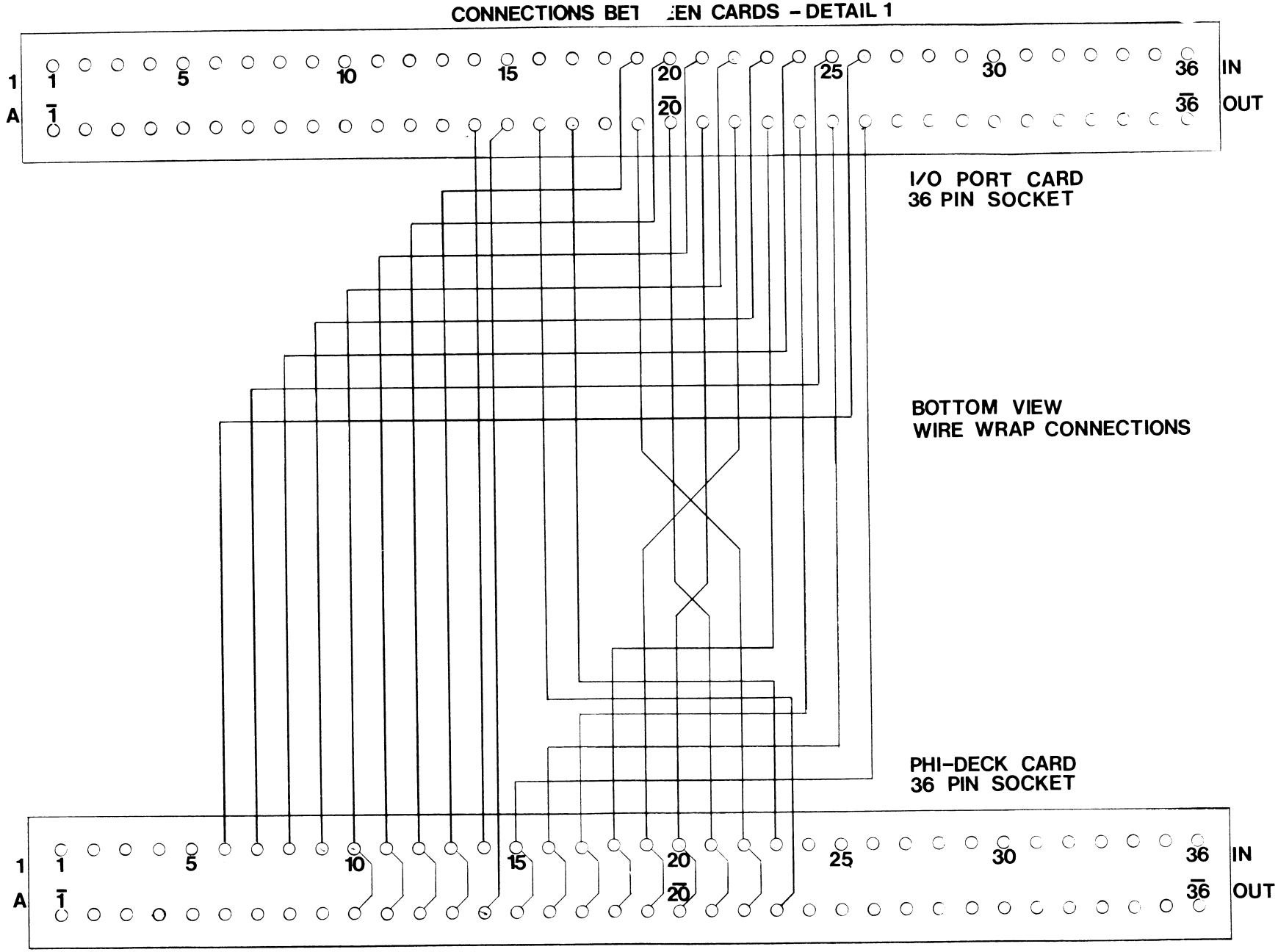
PHI-DECK SYSTEM BLOCK DIAGRAM



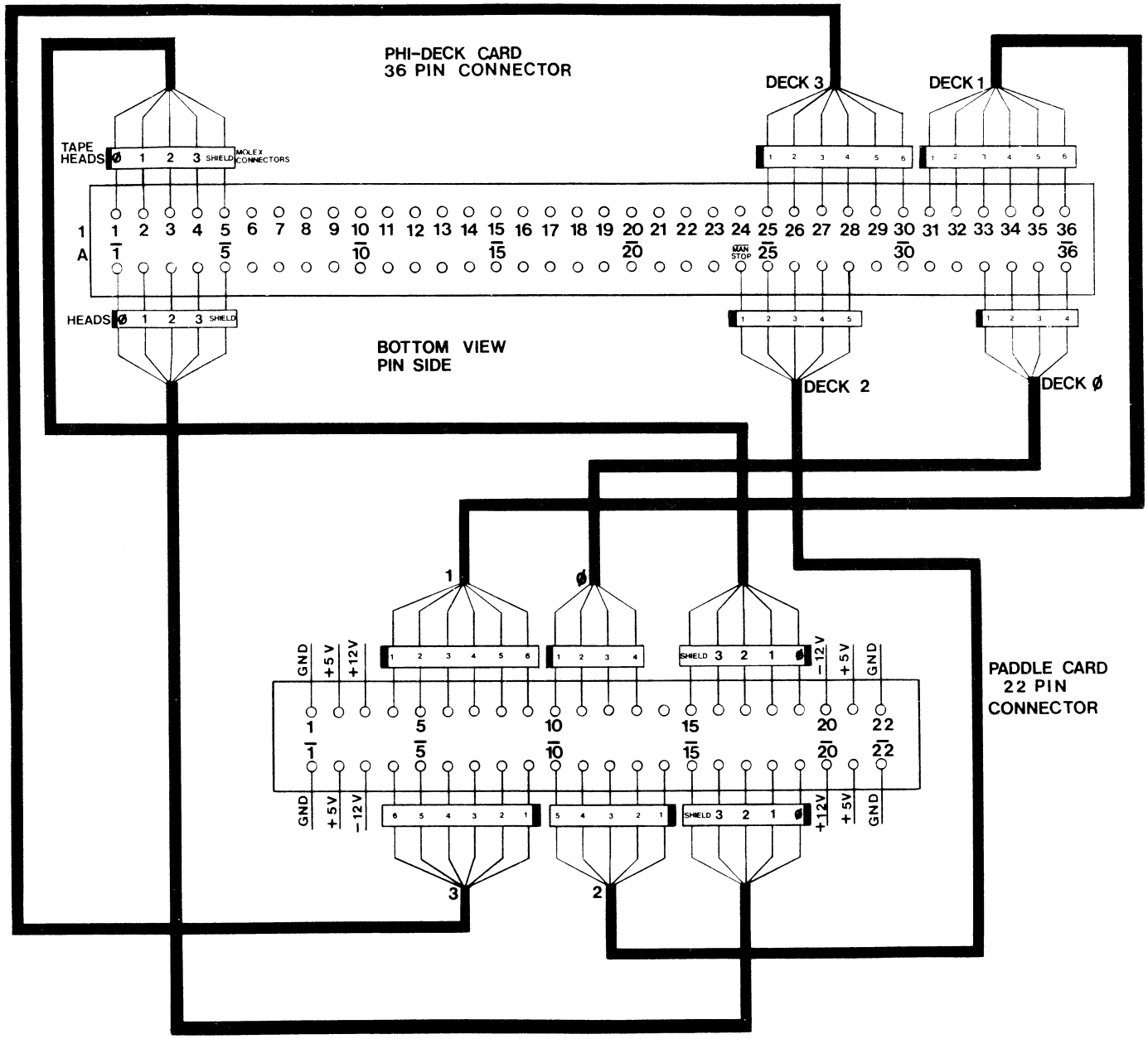


PHI-DECK CABINET WIRING

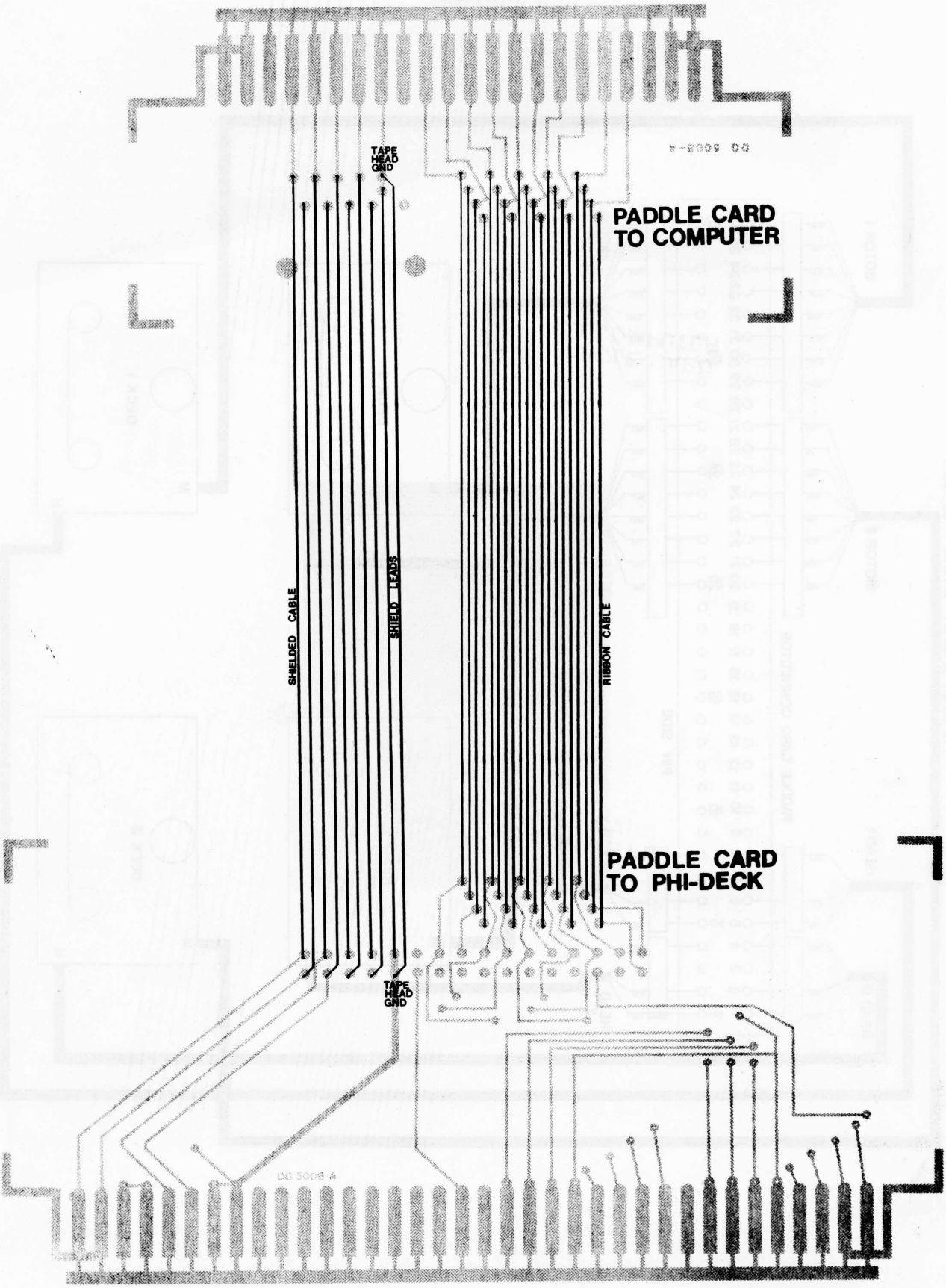
DETAIL 4


CONNECTIONS BET EN CARDS - DETAIL 1
1
A
1
5
10
15
20
25
30
36
1
20
36
IN
OUT
I/O PORT CARD
36 PIN SOCKET
BOTTOM VIEW
WIRE WRAP CONNECTIONS
PHI-DECK CARD
36 PIN SOCKET

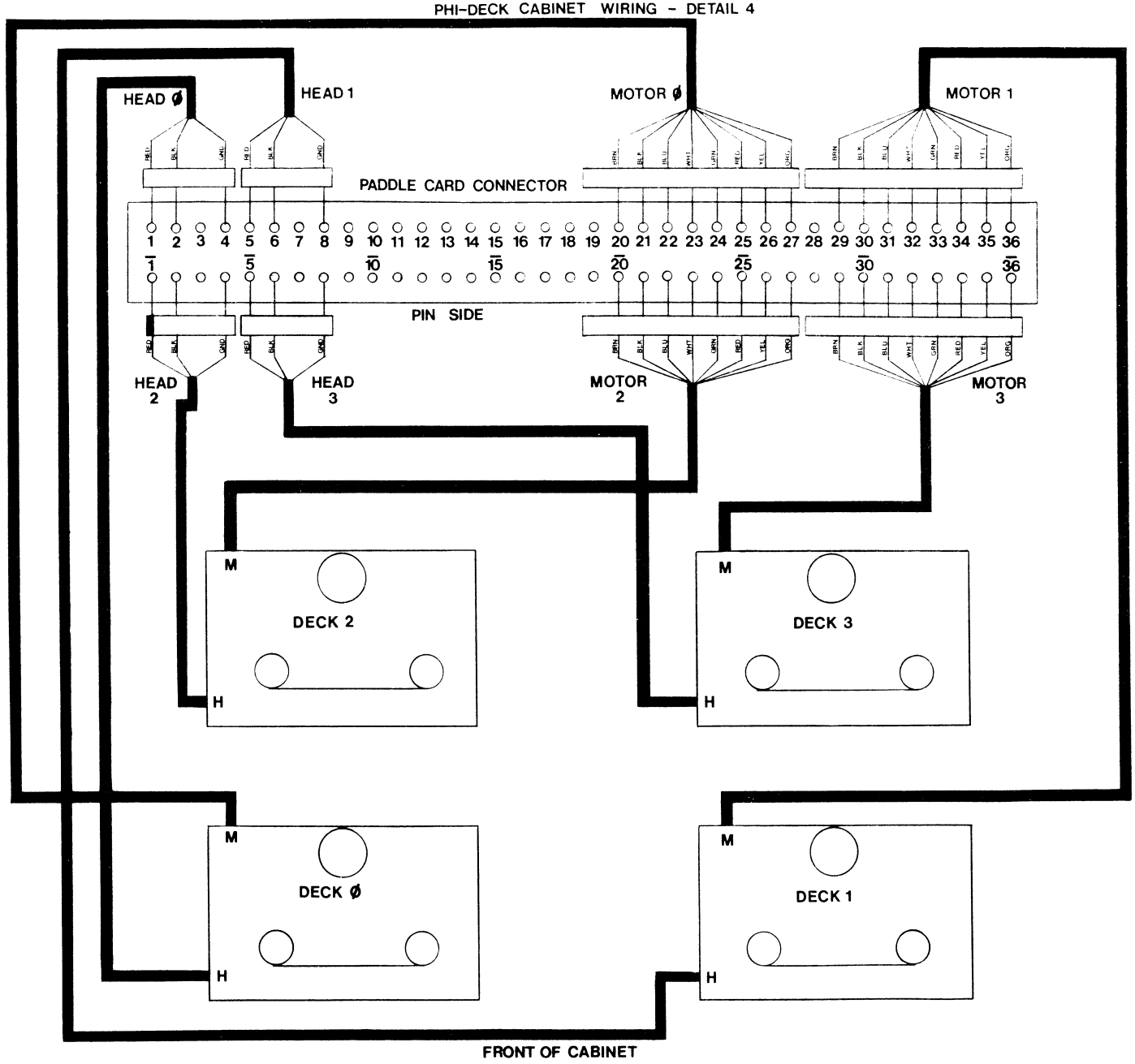
PHI-DECK CARD CONNF ONS TO
PADDLE CARD BACKPLAI DETAIL 2



DETAIL 3


TAPE HEAD GND
PADDLE CARD TO COMPUTER
SHIELDED CABLE
SHIELD LEADS
RIBBON CABLE
PADDLE CARD TO PHI-DECK
TAPE HEAD GND
DG 5008-A

PHI-DECK CABINET WIRING - DETAIL 4



APPENDIX A

New DG OP SYS Format

A new format of TV Storage Dump and keyboard program is included on the front end of this software system. You will notice the new wording of options 3 and 4, and that 5 and 6 are missing.

Pressing option 3 (octal program) will initially result in the familiar register display. However, subsequent operations are somewhat different.

Press the Space Bar. You will notice the page of octal bytes is one line shorter. The major difference is an arrow at the top left pointing to byte 000000 presently. This pointer indicates the byte where programming might take place if desired (since 000000 is in read only memory, no change is possible.) This pointer may be preset by entering the page (H) and byte (L) similar the H&L presetting operation of the older DG OP System's keyboard programming system. Try entering H070 and then L123. Notice where the pointer has now moved to. Since this is RAM area in a 16K or greater system, the observed byte may be changed by entering the desired data. e.g. 321 could be entered from the keyboard. Notice the bottom line "scratchpad effect." The actual data is not entered at the indicated address until after the final entry. Emergency abort may be done by pressing the "reset key" on the system prior to the final entry, with no affect on memory.

The cursor may be incrementally moved around the screen. The Digital Group keyboard with cursor control keys allows the user to move the pointer in the direction indicated by the cursor keys. Keyboards different from this one can move the pointer about if a control H, control J, control K, or control L is entered.

The system will return to the Op Sys by pressing an R or r on the keyboard. Option 4 (Hex Program) is similar to Option 3 except that the display is in Hex.

Command Summary

Space - New memory display page
H 000 (HH) - Preset page (octal or hex)
L 000 (HH) - Preset byte (octal of hex)
R - Return to Op Sys
H CTRL - Move pointer backward
J CTRL - Move pointer down
K CTRL - Move pointer up
L CTRL - Move pointer forward
000 (HH) - Insert (octal or hex)code at indicated byte

APPENDIX B

Hardcopy Routines

Several different hardcopy machines have been interfaced to the Z-80 TV scrolling system. The driving routines have been located within the 256 bytes of page 6. Two routines have been identified within the page 6 hardcopy routine requirements.

The first routine is the hardcopy machine initializing routine. This can vary from a special character sent to place a hardcopy machine in the "receive mode", to a routine which will carriage return and give several line feeds. This routine is entered when "Option 8" (hardcopy) is selected.

The other routine is the generalized routine as required to print the desired character on the hardcopy machine. The desired character is placed in the accumulator (A register) and Restart 4 called (347 octal). All registers must be returned in their original condition (pushed when entering, popped when leaving this routine).

The sample hardcopy routines included in this software package include drivers for a Baudot machine, an ASR 33 Teletype and an Itel 1051 Selectric.

The Baudot routine converts the ASCII 8 level code to the 5 level code of the Baudot system, keeping track of the Upper and Lower case shift requirements. A software UART system serializes the Baudot and sends the output to port 2 LSB at 60 WPM.

The ASR 33 Teletype routine serializes the ASCII and sends the data to port 2 LSB at 110 baud.

A Selectric routine converts the ASCII to the Correspondence Code for a "Scribe" typeball. This parallel code is then serialized and sent to port 2 LSB at 135 baud. The Selectric routine will have to be customized for the particular machine being used, since many different Selectric electronic driver systems, some serial, some parallel; and typeballs are utilized.

Modifying the DGSS tape for Different Hardcopy Devices

The software tape included with this documentation has three separate tone bursts. The first, and longest, tone burst is the main software system with the Teletype 33 110 Baud Printer routines in page 6 of memory. If this is your hardcopy device, then no further modification is necessary.

The second, and shorter, burst is 1¼K bytes of data which makes up the 5 level 60 WPM Baudot routine. The third burst is the sample Selectric routine.

The second or third burst hardcopy routine may replace the Teletype 33 routine by performing the following steps.

1. Load the first program. The screen should then display the Op Sys Display.
2. Select either the Baudot (2nd) or Selectric (3rd) routines. Position the cassette so that the recorder is ready to read the data.
3. Start the recorder, then select Option "1".
4. When the data burst is finished on the screen, the modification is done.
5. Put a fresh cassette on your recorder and start the recorder in "record mode".
6. Select Option "2". When finished, select Option "2" again for a "backup copy". You now have a customized cassette.

Building your own hardcopy routines

The hardcopy initializing routine's address is 006000.
This subroutine is called by "Option 8". End the hardcopy initializing subroutine with a return instruction (311). If not required, a simple 311 (return) instruction may be placed at 006000.

The general hardcopy routine's address is 006030. Be sure to restore all registers in this page 6 subroutine. End this subroutine with a return instruction (311) also.

Save your customized system by pressing "Option 2", which will make a new master.

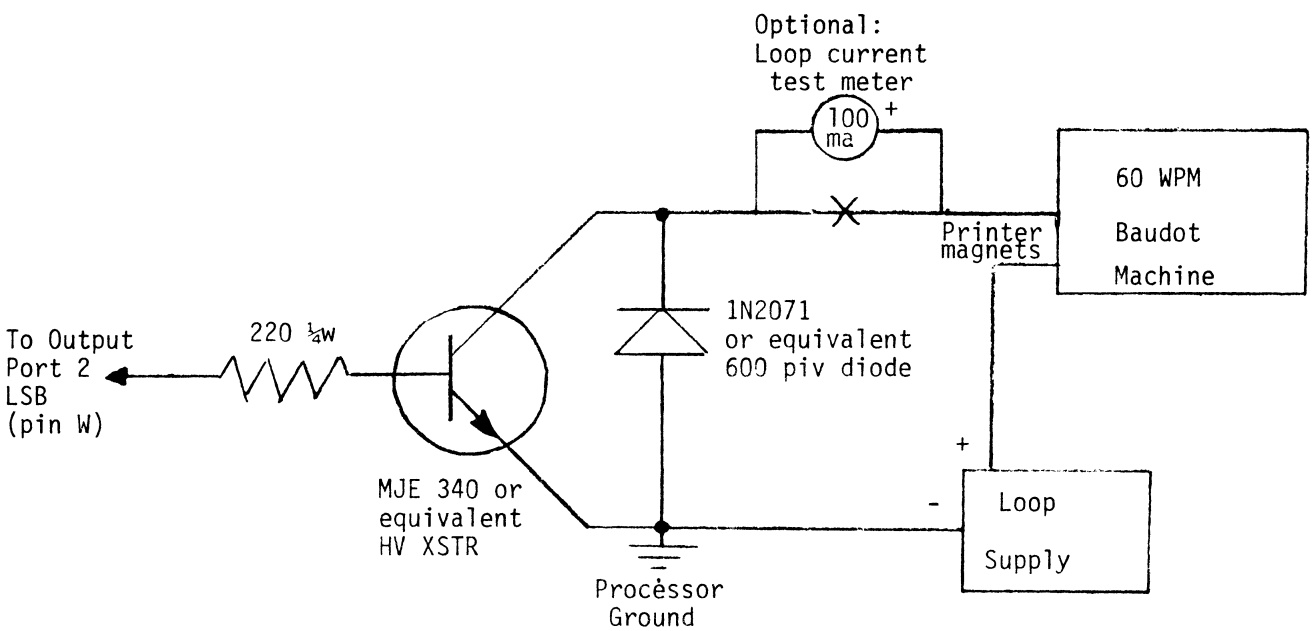
Since so many different potential hardcopy machines are available, The Digital Group is unable to provide specific assistance for all of these devices.

Hardcopy interfaces for "The Digital Group" System

The Teletype machines, 5 level or 8 level, may be easily interfaced to The Digital Group System for less than $5. The 5 level (Baudot) machines generally utilize a high voltage (≃ 150 volts) loop which is opened or closed at 45 Baud to generate the required code. The 8 level (ASCII) machines use lower voltage and lower current loops. There are many Selectric interface systems, ranging from RS232 to TTL, etc.

Baudot

The Baudot machine is driven through the LSB of Port 2 output. This is pin W of the 36 pin connector of the I/O board located between the CPU board and the TVC board. Since these hardcopy machines are typically driven by a high voltage loop supply, some means of interface between this loop and the output ports TTL level must be utilized. Several schemes have been used and yield similar results. The simple high voltage transistor scheme shown below certainly represents a low cost method:



The TTL to loop interface shown on the preceding page is simply an electronic open/closed switch to the 60 WPM Baudot machine.

The output ports voltage causes the emitter-collector connection to be "closed" when the TTL input is high (≃+3 volts and "open" when the TTL input is low (≃ 0 volts). The diode prevents reverse voltage spikes from destroying the transistor or noise problems in the processor. The loop voltage is generally in the range of 100 - 150 volts and the loop current is adjusted to be around 60ma. Several excellent books are available which explain the basics about these machines and the loop supplies. Two books are as follows:

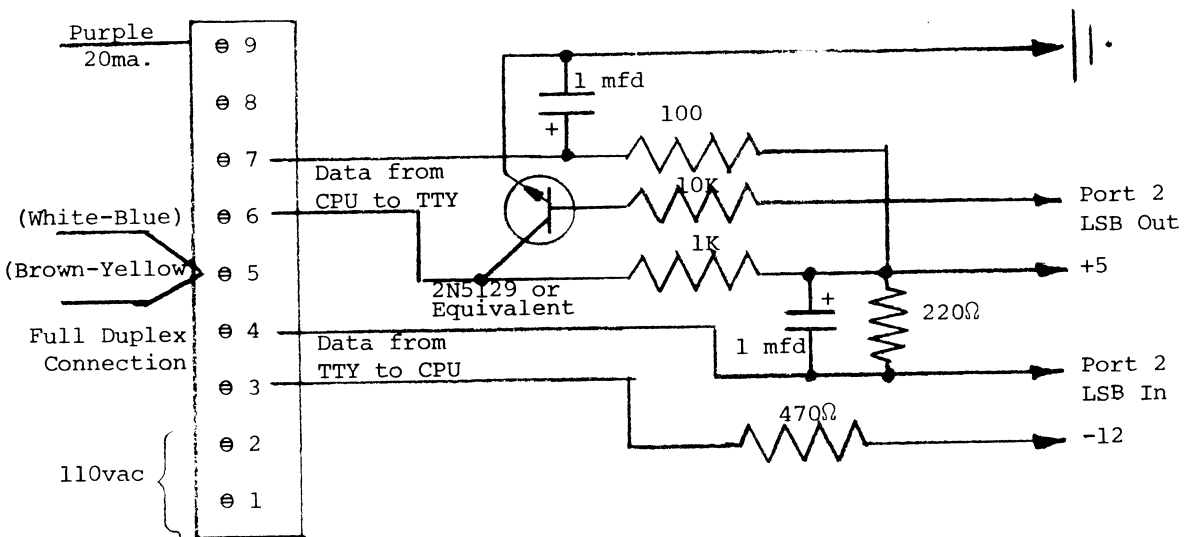
1. RTTY HANDBOOK published by TAB, Edited by Wayne Green; and
2. NEW RTTY HANDBOOK published by Cowan, Edited by Byron Kretzman.

These books are generally available at most "Ham Radio" supply stores. The loop supply must be transformer isolated from the incoming 110 volts household AC.

After assembling this little interface, connect it to the processor, machine, and loop supply with correct polarities and with all voltages off. Be very certain that the ground return on the processor is connected. Turn on the loop supplies and the machine. The machine should "run open". If not, the line to the diode/xstr is probably reversed and the diode is forward biased and closes the loop. Removing the I/O board (and others of convenience) should permit placing a temporary +5 volt lead in series with another ≃ 220 ohm resistor. The printer should latch up (quiet down) when the voltage to the xstr's input is applied and run open (noisy) when the xstr's input voltage source is removed. If all tests OK, turn off everything and reassemble the processor. Be sure the interface input goes to Output Port 2, LSB. Remove any I/O devices and interfaces also connected to I/O Port 2 to avoid undesired commands to these devices.

ASCII

The ASCII machine is driven through the LSB of Port 2 output. This is pin W of the 36 pin connector of the I/O board located between the CPU board and the TVC board. The Teletype model 33 machine may be simply interfaced by using the following circuit. A few extra lines and parts are used to enable data entry from the model 33 if appropriate software were written to sample and deserialized the incoming data.



(Line Terminal Strip (located at Right Rear of a TTY 33)

Digital Group System Interface to TTY 33 20ma. loop

The Teletype 33 should be set up for Full Duplex operation, with a 20ma. loop as per the manuals or the included circuit of the color coded leads.

Selectric

No single circuit will interface the different Selectrics seen. If your Selectric uses RS232, a 1488 and 1489 IC by AMD or Motorola can serve as a level converter from RS232 to TTL and viceversa, as I (Dr. Suding) did on my Itel 1051 Selectric. Those in hopelessly desperate need for Selectric information might try chasing down the rumored existance of a book on interfacing Selectrics called "Interfacing Selectrics to the 8080" from The Center for the Study of the Future, 4110 N.E. Alameda, Portland, OR 97212. The book costs $12.00. I've never seen one yet.

Possible modifications to the Hardcopy Routines

If there is one thing D.G. has learned in the past year, it's that everybody has to do it their way. Since the Selectrics are a so different, the Assembler copy has been included for your education as needed.

Two areas of modification are anticipated; using a different port, and different speed machines.

The Teletype 33 Port assignment is located at 006131. You will find an 002 at this location presently. Change to your desired port number. Address 006157 contains the software UART's time constant (presently an 034 for 110 Baud for Z-80). Ascii machines with a higher Baud rate may be utilized by decreasing the value at 006157.

The Baudot subroutine has Port assignments at 006221 and 006240. Address 006250 has the 60 WPM Baudot constant of 111. Lowering this octal constant proportionately will permit using the routine at 66, 75, or 100 WPM speeds.

After completing the desired modifications and testing, always load the original as supplied, make the modifications, then write the new master cassette before running. You will then have a clear original.

ASSEMBLY LISTING OF SELECTRIC INTERFACE ROUTINE:

```
ASSM 006000 100000

006000                          0100 * SELECTRIC PRINTING ROUTINES.
006000                          0110 * CORRESPONDENCE CODES FOR ITEL 1051
006000                          0120 *
006000                          0130 * INITIALIZE THE PRINTER WITH AN EOA
006000                          0140 *
006000 076 055                  0150 EOA    LD   A,055
006002 315 171 006              0160        CALL BYTESL
006005 311                      0170        RET
006006                          0180 *
006006                          0190 * SKIP TO 006030
006006                          0200 EXTRA  DS   022
006030                          0210 * PRINT THE CHARACTER IN ACCUM.
006030                          0220 *
006030 365                      0230 SELTRC PUSH AF
006031 305                      0240        PUSH BC
006032 325                      0250        PUSH DE
006033 345                      0260        PUSH HL
006034 366 200                  0270        OR   200
006036                          0280 * SPECIAL HANDLING FOR CR/LF
006036 376 212                  0290        CP   212
006040 312 164 006              0300        JP   Z,ENDSEL
006043 376 215                  0310        CP   215
006045 302 065 006              0320        JP   NZ,SPACE
006050 076 267                  0330 CR     LD   A,267  * CODE FOR CR/LF
006052 315 171 006              0340        CALL BYTESL
006055                          0350 * WAIT .7 SEC FOR CR/LF
006055 076 007                  0360        LD   A,007
006057 315 173 001              0370        CALL 001173 * 100 MS DELAY
006062 303 164 006              0380        JP   ENDSEL
006065                          0390 * CONVERT ILLEGAL CHAR TO SPACES
006065 376 241                  0400 SPACE  CP   241
006067 322 077 006              0410        JP   NC,CONTIN
006072 076 003                  0420        LD   A,003  *"SPACE CHAR"
006074                          0430 * FORGET ABOUT SHIFT WHEN SPACING.
006074 303 161 006              0440        JP   OUTCAR
006077                          0450 * UPPER/LOWER CASE SHIFT REQUIRED?
006077 041 225 006              0460 CONTIN LD   HL,TABLE
006102 326 240                  0470        SUB  240
006104 205                      0480        ADD  L
006105 157                      0490        LD   L,A
```

```
006106 345                0500         PUSH HL
006107 176                0510         LD   A,(HL)
006110 346 001            0520         AND  1       CHECK SELECTRIC SHIFT
006112 041 224 006        0530         LD   HL,SHIFT SHIFT CONSTANT ADDR
006115 312 140 006        0540         JP   Z,DSHIFT
006120 176                0550 USHIFT  LD   A,(HL) IN UPPER SHIFT?
006121 346 200            0560         AND  200
006123 312 155 006        0570         JP   Z,SHFTOK
006126 076 071            0580         LD   A,071  * "UP SHIFT"
006130 315 171 006        0590         CALL BYTESL
006133 066 071            0600         LD   (HL),071
006135 303 155 006        0610         JP   SHFTOK
006140 176                0620 DSHIFT  LD   A,(HL) IN LOWER SHIFT?
006141 346 200            0630         AND  200
006143 302 155 006        0640         JP   NZ,SHFTOK
006146 076 371            0650         LD   A,371  * "DOWN SHIFT"
006150 315 171 006        0660         CALL BYTESL
006153 066 371            0670         LD   (HL),371
006155                    0680 * OUTPUT THE DESIRED CHARACTER
006155 341                0690 SHFTOK  POP  HL
006156 176                0700         LD   A,M
006157 366 001            0710         OR   001    *ELIMINATE U/L BIT
006161 315 171 006        0720 OUTCAR  CALL BYTESL
006164 341                0730 ENDSEL  POP  HL
006165 321                0740         POP  DE
006166 301                0750         POP  BC
006167 361                0760         POP  AF
006170 311                0770         RET
006171                    0780 *
006171                    0790 * SUBROUTINE TO OUTPUT TO SELECTRIC
006171                    0800 *
006171 026 011            0810 BYTESL  LD   D,011
006173 247                0820         AND  A      *CLEAR CARRY
006174 027                0830 ROTBIT  RLA         *SERIALIZE BITS
006175 365                0840         PUSH AF
006176 346 001            0850         AND  001
006200 323 002            0860         OUT  2
006202 361                0870         POP  AF
006203                    0880 * BIT DELAY ROUTINE
006203 006 352            0890         LD   B,352
006205 016 004            0900 LOADC   LD   C,004
006207 015                0910 DECRC   DEC  C
006210 302 207 006        0920         JP   NZ,DECRC
006213 005                0930         DEC  B
006214 302 205 006        0940         JP   NZ,LOADC
006217 025                0950 NXTBIT  DEC  D
006220 302 174 006        0960         JP   NZ,ROTBIT
006223 311                0970         RET
006224                    0980 * CONSTANT TO INDICATE UPPER/LOWER.
006224 071                0990 SHIFT   DB   071
006225                    1000 * LOOKUP TABLE AREA
006225 002                1010 TABLE   DB   002    SPACE
006226 200                1020         DB   200    !
006227 223                1030         DB   223    "
006230 017                1040         DB   017    #
006231 041                1050         DB   041    $
006232 021                1060         DB   021    %
```

```
006233 027          1070        DB    027     &
006234 222          1080        DB    222     '
006235 055          1090        DB    055     (
006236 047          1100        DB    047     )
006237 035          1110        DB    035     *
006240 311          1120        DB    311     +
006241 334          1130        DB    334     ,
006242 354          1140        DB    354     -
006243 212          1150        DB    212     .
006244 340          1160        DB    340     /
006245 046          1170        DB    046     0
006246 142          1180        DB    142     1
006247 010          1190        DB    010     2
006250 016          1200        DB    016     3
006251 040          1210        DB    040     4
006252 020          1220        DB    020     5
006253 032          1230        DB    032     6
006254 026          1240        DB    026     7
006255 034          1250        DB    034     8
006256 054          1260        DB    054     9
006257 327          1270        DB    327     :
006260 326          1280        DB    326     ;
006261 055          1290        DB    055     ( (<)
006262 310          1300        DB    310     =
006263 047          1310        DB    047     ) (>)
006264 341          1320        DB    341     ?
006265 011          1330        DB    011     @
006266 237          1340        DB    237     A
006267 157          1350        DB    157     B
006270 137          1360        DB    137     C
006271 125          1370        DB    125     D
006272 123          1380        DB    123     E
006273 317          1390        DB    317     F
006274 305          1400        DB    305     G
006275 145          1410        DB    145     H
006276 231          1420        DB    231     I
006277 303          1430        DB    303     J
006300 131          1440        DB    131     K
006301 143          1450        DB    143     L
006302 207          1460        DB    207     M
006303 113          1470        DB    113     N
006304 243          1480        DB    243     O
006305 321          1490        DB    321     P
006306 333          1500        DB    333     Q
006307 225          1510        DB    225     R
006310 245          1520        DB    245     S
006311 101          1530        DB    101     T
006312 115          1540        DB    115     U
006313 215          1550        DB    215     V
006314 257          1560        DB    257     W
006315 107          1570        DB    107     X
006316 347          1580        DB    347     Y
006317 053          1590        DB    053     Z
006320 005          1600        DB    005     (
006321 002          1610        DB    002     NOP
006322 004          1620        DB    004     )
006323 002          1630        DB    002     NOP
```

```
006324 355          1640          DB    355     UNDERLINE
006325 002          1650          DB    002     NOP
006326 236          1660          DB    236     A (LOWER CASE)
006327 156          1670          DB    156     B
006330 136          1680          DB    136     C
006331 124          1690          DB    124     D
006332 122          1700          DB    122     E
006333 316          1710          DB    316     F
006334 304          1720          DB    304     G
006335 144          1730          DB    144     H
006336 230          1740          DB    230     I
006337 302          1750          DB    302     J
006340 130          1760          DB    130     K
006341 142          1770          DB    142     L
006342 206          1780          DB    206     M
006343 112          1790          DB    112     N
006344 242          1800          DB    242     O
006345 320          1810          DB    320     P
006346 332          1820          DB    332     Q
006347 224          1830          DB    224     R
006350 244          1840          DB    244     S
006351 100          1850          DB    100     T
006352 114          1860          DB    114     U
006353 214          1870          DB    214     V
006354 256          1880          DB    256     W
006355 106          1890          DB    106     X
006356 346          1900          DB    346     Y
006357 052          1910          DB    052     Z
006360 002          1920          DB    002     NOP
006361 002          1930          DB    002     NOP
006362 002          1940          DB    002     NOP
006363 002          1950          DB    002     NOP
006364 002          1960          DB    002     NOP
                                  *
```

* END OF ASSEMBLY LISTING OF
SELECTRIC INTERFACE ROUTINE