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TRS 80 Model 1 and SYSTEM 80
Double Density Adapter PCB

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1. INTRODUCTION

I have owned a Model 1 TRS 80 for a number of years and have designed and built a few hardware add-ons to improve my system. The hardware construction project I am about to describe will enable Model 1 and SYSTEM 80 single density disk systems to be upgraded to double density for less than half the cost of an imported American double density adapter. (Unless you can purchase a discarded M1 or S 80 equipped with DD cheaply). An American adapter currently (June 1986) costs about $180 Australian. The adapter described here uses the WD2791 or WD2793 floppy disk controller (FDC), the latest and third generation, Western Digital SD/DD disk drive controller. The WD2791 or WD2793 includes within the IC, data separation and write precompensation for SD/DD, as required, and the ability to interwork with both 5 1/4" and 8" disk drives. Other doublers use the second generation Western Digital FDC WD1791. The Model 3 uses the WD1793 which is the same as the WD1791 with the exception of a true data bus.

The adapter PCB plugs into the existing single density controller socket and may require a flying lead or two depending upon the users requirements. The adapter PCB provides a number of switch selectable options to the user or these options can be strapped permanently when this flexibility is not required. LED's can be provided on the front panel of the expansion interface to indicate to the user if SD or DD has been selected or if a 5 1/4 or an 8" drive has been selected.

The adapter PCB uses two disk controller IC's, the original WD1771 for SD and a WD2791 or WD2793 for DD and optionally SD. Another eight common inexpensive IC's are used to provide the decoding and switching between densities and type of drive. Circuitry is also required to enable the two controller IC's to be connected in parallel. The IC count is less than other DD adapter PCB's, while providing extra facilities. The American adapters use the WD1771 and WD1791 disk controllers with additional circuitry to provide data separation and write precompensation.

This Doubler can be built for approximately $45 (Aust) excluding the FDC chip. The chip can be purchased from Danever Australia P/L by mail order using your credit card for approximately 30 to 40 dollars. The price depends on the chip type (WD2791 or WD2793) and the quantity required. The WD2793 can also be imported directly from B.G MICRO, P.O. Box 280298, Dallas, Texas, United States of America, Phone (214)271-5546 to use your credit card, for about 15 - 20 dollars (Aust,June 1986) including duty, in one off quantities.

At the time of writing, the Doubler has been installed with complete success in the later version Tandy expansion interface, both types of SYSTEM 80 (Video Genie) expansion interface and the LNW expansion interface for the Model 1 . The doubler has also been used successfully with both 40 and 80

track drives and with the CPU clock frequency increased by two.

2. ADDRESS DECODING.

The decoding used to select density and type of drive is compatible with that used in the LNW 5/8 adapter. As far as I'm aware the AEROCOMP and PERCOM doublers use the same decoding for density selection. The adapter has been used with NEWDOS80 V2, LDOS 5.1.4 and MULTIDOS with satisfactory results. The wait state facility provided by the LNW 5/8 Doubler has not been provided in this 5/8 Doubler.

Selection of single density :
Write F8 or FA or FC or FE into 37EC.
FDC command Register address.

Selection of double density :
Write F9 or FB or FD or FF into 37EC.
FDC command Register address.

Selection of 5 1/4" drive :
Write C0 into 37EE. Bits 0-5 don't care.
FDC Sector Register address.

Selection of 8" drive :
Write 80 into 37EE. Bits 0-5 don't care.
FDC Sector Register address.

When booting the system, SD or DD and 5 1/4" or 8" drive type are selected by either user accessible switches or by permanent straps. Hardware hackers may prefer to have control of all functions while other users may prefer permanent straps.

The TANDY double density adapter uses different decoding (naturally) to select SD or DD and most DOS's provide a driver to handle the TANDY doubler.

3. DATA ADDRESS MARKS.

The FDC provided in the TRS 80 is designed for use with soft-sector formatted floppy disks. In this type of disk operation, the location of the space occupied by a sector is denoted by special data patterns and identification fields written on the disk during the formatting process. The soft sectored format was defined by IBM with the introduction of eight inch disk drives. A variation of this format is used in the TRS 80. The special data pattern consists of an index mark, track and sector identification, a data address mark (DAM), a sector of data and checksum fields (CRC's). There is a gap between each sector to enable the FDC to separate the end of one sector from the identification field of the next sector.

The data address mark was defined by IBM to be one of two

values, FB to indicate that the sector contains data , or F8 to indicate the data in the sector has been deleted. While designing the WD1771 FDC, Western Digital allocated an extra two DAM's (F9 and FA) by using a spare bit in the write sector command. When the WD179X was designed (second generation), this bit was reclaimed to provide additional facilities. Therefore the WD179X/WD279X can only generate the FB and F8 DAM's.

Tandy used DAM's FA and FB to define the directory sectors and non directory sectors respectively when Model 1 TRSDOS was designed. This could have been an unintentional deviation due to an error in the WD1771 data sheet that reversed the two bits identifying the DAM read from the disk.

Data address marks have caused compatibility problems since doublers were introduced into the Model 1. The incompatibility problems can occur when attempting to interchange Model 1 SD disks with a Model 3 due to the Model 3 using a WD1793 FDC (DAM's FB and F8) and the Model 1 a WD1771 FDC (DAM's FB and FA).

The latest versions of MULTIDOS, DOSPLUS and LDOS use DAM's FB and F8 in both Model 1 and Model 3 and therefore the problem described above has been overcome. Model 1 NEWDOS80 V2 will use DAM's F8 and FB if the SYSTEM command parameter BN = Y, this should be the normal value used for BN. Note: BN = Y must be set to enable the WRDIRP command to change the directory DAM to the correct value. TRSDOS 2.3 uses DAM's FA and FB,and therefore a WD1771 must be used with this DOS unless the DOS has been modified (nobody uses it anyhow).

The American magazine 80 MICRO published a hardware article in the December 1982 issue describing construction of a Model 1 expansion interface. The expansion interface disk controller PCB consisted of a large board with a smaller extension PCB containing the two FDC's and some associated logic. It appears that the designer originally produced the board with only a WD1791 and no extension PCB. It is my guess that upon firing up the original version, the designer was very surprised to find difficulty in reading (TRSDOS) SD disks due to the previously discussed DAM incompatibility problems. Because the PCB was produced using a taped layout and no space was available for the additional FDC, the mezzanine extension board was introduced. Only a small section of the PCB layout needed to be rearranged to connect to the extension PCB with the additional circuitry. The preceding ramble is my own opinion because no valid reason was given in the article for the extension PCB.

Since I have been using the Doubler I have found that Super Utility + insists that two FDC'S must be accessible before it will configure for DD. SU+ appears to write and read toward both FDC's in SD and DD to check the type of Doubler, if any, installed. Therefore, if only the WD279X was provided for both SD and DD, SU+ would not operate in DD without modification.

I have not seen an article on how to build a Doubler for the Model 1 in any computer magazine or newsletter, so even after all these years, this article might still be a first.

4. CIRCUIT DESCRIPTION.

The Doubler uses a WD1771 (IC1) for SD operation connected in parallel with a WD2791 or WD2793 (IC2) for DD and/or SD and the associated address decoding to control two flipflops (IC4) for selection of density and type of drive. By inverting the read and write data for the WD2793, bus transceiver IC10 enables a WD2793 to be used in lieu of a WD2791. The WD2793 with a true data bus is the commonly used FDC and is therefore sometimes about half the cost of a WD2791 with an inverted data bus. If the WD2793 can be purchased significantly cheaper than the WD2791, provide IC10 to invert the bus for the WD2793. If not, replace IC10 with straps and use a WD2791, this is the preferred option. The WD1771 uses an inverted bus and hence the existing TRS 80 bus circuitry that the Doubler must interface to, expects the FDC data I/O to be inverted.

The chip select I/P to each FDC is used to enable the FDC by connecting or disconnecting the FDC data leads to and from the bus. The STEP, DIRC, WG and WD outputs from the FDC to the disk drive bus are not controlled by the FDC chip select I/P and are therefore always active. To enable these signals to be switched from the selected FDC to the disk drive bus, a quad 2 I/P noninverting multiplexer, IC3, is used. The switching function of IC3 (pin 1) is controlled by the density selection flipflop IC4a or optionally by a front panel switch during SD operation via NOR gates IC8c and IC8d. The WD2791 or WD2793 is always selected for DD operation by IC4a. During SD operation the WD1771 is selected by 0 volts applied at point "B" on the circuit diagram. The WD2791 or WD2793 is selected for SD if point "B" is open circuit.

When the reset switch is operated, density and type of drive are selected by IC4a and IC4b being preset by MR* via the boot selection switches or permanent straps. It is possible to boot in SD or DD using a 5 1/4" or an 8" drive. NEWDOS80 V2 enables use of a system disk that is completely DD format. i.e the first track does not need to be SD. (PDRIVE parameter TI=K).

The DOS manipulates IC4 to switch density and type of drive by writing to the FDC as described in the section on address decoding. A number of inverters (IC7) and open collector inverters (IC5, IC6), arranged in a "wired or" configuration, are used to decode the various data and address conditions to set and reset the flipflops in IC4.

The WD2791 or WD2793 simplifies the design of a FDC by including data separation and write precompensation within the

chip. C11 is used to adjust the centre frequency, R14 the write precompensation and R15 the read pulse width. The PUMP circuit consisting of R13, C10 and D1 is used to inhibit over-responsiveness to jitter and to prevent an extremely wide lock-up response by the internal phase-detector. C10 should be 0.1uF for 8" drives or 0.22uF for 5 1/4" drives or a compromise of 0.15uf if both types of drive are being used.

The INTRQ O/P from each FDC cannot be connected directly together because the WD2791 or WD2793 uses active high and low O/P whereas the WD1771 requires a pull-up resistor. This is not spelt out clearly in the WD2791 or WD2793 data sheet as a variation from the WD1771 and WD1791 FDC's. Inverters IC9e and IC9f overcome this incompatibility.

Visual indication of SD or DD and 5 1/4" or 8" selection is available via LED's D3 and D2 driven by OR gates IC8b and IC9c. D3 'on' indicates DD while 'off' indicates SD . D2 'on' indicates 8" while 'off' indicates 5 1/4".

The type of drive is normally selected via IC4b, however, it is possible to perform this selection from the drive select signal from the disk drive bus. An I/P via point "C" and IC7a can be used to select the type of drive. A low (0 volts) applied to point "C" selects 8" drive mode.

A disk inhibit switch option is provided to enable the keyboard reset switch to act as in LEVEL II rather than initiating a boot up. This will only work correctly when a WD2793 is used, and if the WD2793 is also selected when the reset switch is operated. This facility is not available when the WD2791 is used.

The TG43* O/P at point "D" has been provided for drives requiring an indication when the track number is greater than 42. A spare wire in the disk drive bus must be utilised if this facility is required. NOR gate IC8a generates the TG43* signal at point "D" when DD is selected or if the track number is greater than 42.

The WD2791 or WD2793 can accept either a 1 or 2 M Hz clock, however, if operation with eight inch drives is required, a 2 M Hz clock must be used in lieu of the existing 1 M Hz clock. The WD279X has an internal divide by two controlled by the ENMF* FDC I/P. If a 2 M Hz clock is required the divide by two option must be used when accessing a 5 1/4" drive.

Single density data separation for the WD1771 has not been provided on the adapter PCB. Most TRS 80 users will be using a plug-in SD data separator, this separator can be used with the DD adapter. The DD adapter is plugged into the exiting FDC socket, the SD data separator is plugged into the adapter WD1771 socket and the WD1771 is plugged into the SD data separator. The SYSTEM 80 has an in-built single density data separator for use with the WD1771. This data separator can be utilised in

conjunction with the adapter PCB via strap h-i and a flying lead from point "E" to a RAW DATA connection on the SYSTEM 80 expansion interface board. The connections associated with SD data separation (pins 25, 26 and 27) are connected directly to the WD1771 on the adapter PCB, therefore SD operation is unchanged with the Doubler installed. The WD279X provides SD data separation internally and can be utilised where a Model 1 data separator is not available.

Testpoints 1, 2 and 3 (TP1, TP2, TP3) have been provided to enable easy access to connection points used during the initial adjustment of the adapter in conjunction with the test link. Refer to the adjustment section for details.

5. CONSTRUCTION.

The double density adapter is built using a 6" x 4" single sided PCB. The PCB was designed with the aid of a CAD software package. Updating of the PCB during development of the adapter was made easy by the editing facilities of the CAD package. The use of a single sided PCB results in a larger sized board than if a double sided board had been designed. However, a single sided board is cheaper to manufacture and is easier for the home constructor to handle. The PCB requires the drilling of 393 1/32" holes before construction can start. Reasonable care must be taken when handling the PCB due to the small track width used to enable some of the tracks to pass between IC pads. A PCB for the Doubler is available from the author.

Before commencing construction of the Doubler it is worth having a look at the insides of your expansion interface to determine the most suitable connection and mounting method for the Doubler in your particular box. The board was originally designed for my 1978 TRS 80 Model 1 but will also fit into both versions of the SYSTEM 80 expansion interface and the LNW expansion I/F. There is a lot of space above the TRS 80 expansion I/F board allowing the Doubler to be plugged directly into the existing FDC socket. A SD data separator can also be plugged into the Doubler providing that clearance between boards is adjusted accordingly during construction.

The main board in both SYSTEM 80 expansion I/F's is mounted with only about 20 mm clearance between the top side of the board and the case. This makes plugging the Doubler into the the FDC socket difficult because of the height of the crystal and some 0.1 uF disc ceramic bypass capacitors mounted on the main board. If the crystal is removed and placed on the other side of the main board and the existing bypass capacitors are replaced with modern monolithic 0.1 uF ceramic capacitors, the Doubler can be plugged into the existing FDC socket. If you do not wish to touch your SYSTEM 80 expansion I/F main board, the doubler can be connected to the main board using a 40 wire ribbon cable and a 40 pin DIL insulation displacement connector. The ribbon cable is soldered directly to pads on the

under side of the Doubler PCB. Multicolour ribbon cable with a very thin clear plastic covering is the best type for this application as it allows the wires to be easily separated for soldering. Rod Irving, Melbourne, stocks this type of cable. The cable should be as short as possible. The doubler has been installed OK in a system with a X2 speed up modification.

The SYSTEM 80 FDC socket can also pose a problem due to some sockets being the type that come up the side of the FDC chip. Normal 40 pin IDC or solder type headers will not plug into this type of socket because the pins are too short. Where the Doubler plugs directly into the FDC socket, this socket problem can be overcome by using long square pins cut from a wire wrap socket to provide the Doubler to FDC connection. Where the ribbon cable connection option is to be used, a 40 pin wire wrap socket with square pins can be pruned to provide a interface between the 40 pin IDC DIL header and the main board FDC socket. ie. insert the wire wrap socket into the FDC socket of the main board and then insert the IDC header into wire wrap socket. The wire wrap socket pins must be long enough to provide a good connection but short enough to ensure adequate clearance between the IDC header and the expansion I/F case.

Once you have selected the way the Doubler is to be connected to the main board, commence construction of the Doubler by inserting all straps. The straps can be bare wire where there is no likelihood of short circuits. Component pigtail offcuts are good for this purpose. Where the straps are close together, insulated fine stiff single conductor wire should be used. Insert all IC sockets, except the WD1771 socket, (good quality only) and check for correct orientation before soldering. Mount and solder resistors, capacitors and diodes, noting that polarities are correct where applicable. Insert the trimmer capacitor (C11) and trimpots (R14, R15) and set according to Appendix 3.

Install the terminal posts on the upper side of the Doubler. I suggest that all terminal posts be provided so that if you change your mind later, eg. due to acquiring an 8" drive at a bargain price, it can be pressed into service by a simple strapping change. I have found that some stiff component pigtail offcuts make very good strapping terminal posts. The posts can be installed using 1/32 holes (same as for IC's) if pigtail offcuts are used. This is an advantage due to the fine tracks used on the Doubler PCB.

The remaining part of the PCB construction will vary depending upon the type of computer and the selected connection method.

i. TRS 80 Model 1

Install the terminal posts on the lower side of the PCB used to connect the 40 pin header for plugging into the existing SD FDC. The under side posts must be long enough to ensure the

adapter PCB clears components on the main expansion interface PCB. Install the WD1771 socket and solder the 40 pin solder connection header to pins. Insert the header into a 40 pin socket during soldering to prevent misalignment of pins due to the application heat. Ensure that alignment is accurate before soldering the header to the posts. The PCB holes might require enlargement to accommodate the posts you are using, however, minimum sized holes must be used.

ii. SYSTEM 80 Direct. Socket up side of FDC chip.

Drill PCB to take posts of wire wrap socket, insert into PCB until required length of post protrudes on the lower side of the PCB. Solder posts and then cut posts on the upper side of the PCB as close as possible to the surface of the PCB. Insert the WD1771 FDC socket into the PCB and solder. Take care to ensure that the posts protruding on the lower side of the PCB are not bent. Refer to an earlier section of this document for changes to the main board component size when using this method.

iii SYSTEM 80 Extension cable.

Insert the WD1771 FDC socket and solder in place. Decide where the Doubler is to be mounted (at the back is ok), determine the length of 40 wire cable required and cut a piece to length. Install the 40 pin IDC header on one end of the length of cable. Strip back the thin plastic sheath on the other end of the cable about 50 mm. Strip and tin the individual wires to enable the correct wires to be soldered to the PCB pads. After double checking the header orientation and wire to pad connections complete the remaining soldering.

iv. SYSTEM80 (Direct). Normal FDC socket.

Insert the WD1771 FDC socket into the PCB and solder. A 40 pin solder connection header is used to connect the PCB to the main board. The header connection tags must be tapered to reduce the likelihood of track short circuits occurring. If the solder tag has two points, break one off to taper the tag. Insert the header into a 40 pin socket during soldering to prevent misalignment of pins due to the application of heat. The space between the header and the PCB must be kept to a minimum.

All Methods.

Depending upon the options selected and the flexibility required (refer to strapping option section), insert straps and/or prepare sections of rainbow cable to provide switch and LED options. Check track side of PCB for cracks and short

circuits. Mask off the component side of the PCB and apply a coat of lacquer to the track side of the board.

6. INSTALLATION.

Disconnect the power before inserting or removing IC's or the adapter PCB and handle the FDC IC's with care. Check your work and then plug the adapter into the expansion I/F. Connect switches and LED's as required. If the Doubler is being installed in a SYSTEM 80 connect the RAW DATA input to the point designated in the terminal post section. Connect the 2 MHz lead if 8" drives are to be used. Verify power potentials on each IC socket before inserting any IC's. Insert all IC's except the FDC's and check that the LED's indicate the correct response when the reset button is operated. Insert the single density FDC into the correct FDC socket of the adapter, power up, and check that a single density system disk will boot using the WD1771 FDC. Note:- The DOS will probably "hang" if it attempts to change density while the DD FDC is not installed. Single density NEWDOS is OK for this test, SD MULTIDOS is not.

The WD2791 or WD2793 can now be inserted in the adapter and if the necessary CRO and frequency counter are available, the adapter can be adjusted as per the relevant section in this document. If a double density system disk is available, attempt to boot using this disk. Adjust C11 to obtain boot-up if it is not achieved initially. Proper adjustment will need to be performed when the test equipment is available.

When the adapter has been adjusted, verify all facilities provided and check operation with your software. GOOD LUCK !!

7. PARTS LIST

IC's

IC1	WD1771	Single density disk controller. (Existing SD FDC in expansion I/F).
IC2	WD2791 or 2793	Single/double density disk controller.
IC3	74LS157	Quad 2 input multiplexer,noninverting.
IC4	74LS74	Dual D flip flop.
IC5	74LS05	Hex inverter,open collector.
IC6	74LS05	Hex inverter,open collector.
IC7	74LS04	Hex inverter.
IC8	74LS02	Quad two input NOR gate.
IC9	74LS05	Hex inverter, open collector.
IC10	74LS640	Octal transceiver,3 state, inverting. Only required if WD2793 used.

Danever Australia P/L 03 5985622 for WD2791 or WD2793.
Sometimes offer a discount for quantities of 2793's.

Resistors

R1, R2, R3, R4, R5,	4.7 K ohm, 5%, 1/4 W
R6, R7, R8, R9, R10.	4.7 K ohm, 5%, 1/4 W
R11, R12	470 ohm, 5%, 1/4 W
R13	1 k ohm, 5%, 1/4 W.
R14	10 K Trimpot, horizontal PCB ,Cermet
R15	50 K Trimpot, horizontal PCB ,Cermet
R16	330 ohm, 5%, 1/4 W

Capacitors

C1, C2, C3, C4, C5, C6	0.1 uF Monolithic bypass.
C7, C8	100 pF ceramic disk.
C9	47 uF 10 volt electrolytic.
C10	0.22 uF ceramic disk or Greencap.
C11	4.5-60 pF trimmer. (Phillips) or Murata 9.8-60 pF to provide a lower profile when installing the doubler in a SYSTEM 80.

Diodes

D1	IN914
D2, D3 (Optional)	Red LED. SD/DD & 5/8" indicators

Sockets

14 pin DIL	6 off	
16 pin DIL	1 off	
20 pin DIL	1 off.	Required if WD2793 used.
40 pin DIL	2 off	

Headers

40 pin DIL, solder connections 1 off

The System 80 interface may require a 40 wire extension cable if the adapter card will not plug directly into the existing 1771 socket due to lack of space.

Depending on the type of socket used for the existing FDC a 40 pin wire wrap socket with square pins might also be required. If this is the case, the extension cable method of connection will be used. Refer to construction section.

Miscellaneous

Terminal posts Quantity

Printed Circuit Board 1 off.
PCB available from the author.
See front cover for address.

Wire for straps (wire wrap)

Rainbow ribbon cable for switches and LED's

40 wire ribbon cable. Might be required for SYSTEM 80.

Switches. (Optional)

Disk inhibit- SPST
Boot SD/DD - SPDT
Boot 5"/8" - SPDT
SD 1771/279X- SPST

8. ADJUSTMENTS

Write precompensation.

(a) Set up for Double Density 5" drive, disconnect the test link and power up the system. ie set boot switch to DD and 5/8" switch to 5".

(b) Insert the test link and observe the pulse width on TP1 using a CRO.

(c) Adjust the write precompensation trimpot R14 for a pulse width of 125-150 (or as specified for your drives) nanoseconds at TP1. Remove the test link.

Data Separator.

(a) Set up for Double Density 5" drive, disconnect the test link and power up the system. ie set boot switch to DD and 5/8" switch to 5".

(b) Insert test link and observe pulse width on TP2 using a CRO.

(c) Adjust read pulse width trimpot R15 to obtain a pulse width of 500 nanoseconds at TP2.

(d) Connect a frequency counter to TP3 and adjust trimmer C11 to obtain a frequency of 250 K Hz.

(e) Remove test link and set switches normally.

9. DESCRIPTION OF TERMINAL POSTS.

Testpoints

TP1 WD pin 31 of 279X, write precompensation.

TP2 TG43 pin 29 of 279X, data separator.

TP3 DIRC pin 16 of 279X, centre frequency.

Posts.

A. 2 M Hz clock input for 8" drive applications.

B. WD1771 or WD279X selection for single density.

C. Selection of 5" or 8" via drive select.

D. TG43* to 8" drive via disk drive bus cable.

E. Input for RAW DATA when installed in a SYSTEM 80.

F. SD/DD LED indicator.

G. 5"/8" LED indicator.

10. STRAPPING OPTIONS.

Selection of 1 or 2 M Hz clock.

1 M Hz	Insert a-b, remove c-d.
2 M Hz	Insert c-d, remove a-b.

Selection of 5" or 5" and 8" drive operation.

DOS	Insert e-f, remove e-g.
Drive select	Insert e-g, remove e-f.

Use this option if only 5¼" drives are to be used. This prevents some copy programs from falsly changing the 5/8 F/F.

SYSTEM 80 or TRS 80 option.

TRS 80	Insert h-i.
SYSTEM 80	remove h-i.

Boot Density Selection. Can be a switch.

Double Density	Insert x-y, remove y-z.
Single Density	insert y-z, remove x-y.

Boot Drive Type Selection. Can be a switch.

5 1/4" Insert v-w, remove u-v.
8" Insert u-v, remove v-w.

If 8" drives are not used, connect 0 volt to post w. This will prevent selection of 8" during any unusual writing to the sector register. (Some copy programs) straps u-v-w are not required if straps e-g inserted.

Disk Disable.

Insert j-k if a WD2791 FDC is used or if the facility is not required when a WD2793 is used.

11. NOTES (Refer to circuit diagram).

Note 1.
A 2 MHz clock must be obtained via a flying lead from the main expansion interface PCB when 8" drives are to be used.

Connect Adapter PCB point "A" to :

(i) TRS 80 early interface (Buffered cable)
Z28 pin 3

(ii) TRS 80 later interface
Z25 pin 3

(iii) SYSTEM 80 early interface, X-4010
Z8 pin 3

(iv) SYSTEM 80 later interface, X-4020
Z54 pin 8 or J2 pin 2

Where only 5" drives are to be used the flying lead from point "A" is not required . A 1 M Hz clock is used by inserting strap a-b and removing strap c-d.

Note 2.
Selection of 5" or 8" drive at power up is determined by the boot switch position. By inserting strap e-g and removing e-f 5" or 8" can be selected by a flying lead from "C" to the drive select signals. The 5/8 switch and/or the 5/8 flipflop manipulated by the DOS are not used with the above straps. Normally Type of drive is selected via the DOS if both types of drive are being used.

Note 3.
TG43 is provided for use with 8" drives if required. A spare wire in the disk drive bus cable is used to connect this

signal to the 8" drive(s).

Note 4.

S1 closed selects the WD1771 for SD operation and the WD279X for DD. S1 open selects the WD279X for both SD and DD operation. A strap can be substituted to always select the WD1771 for SD.

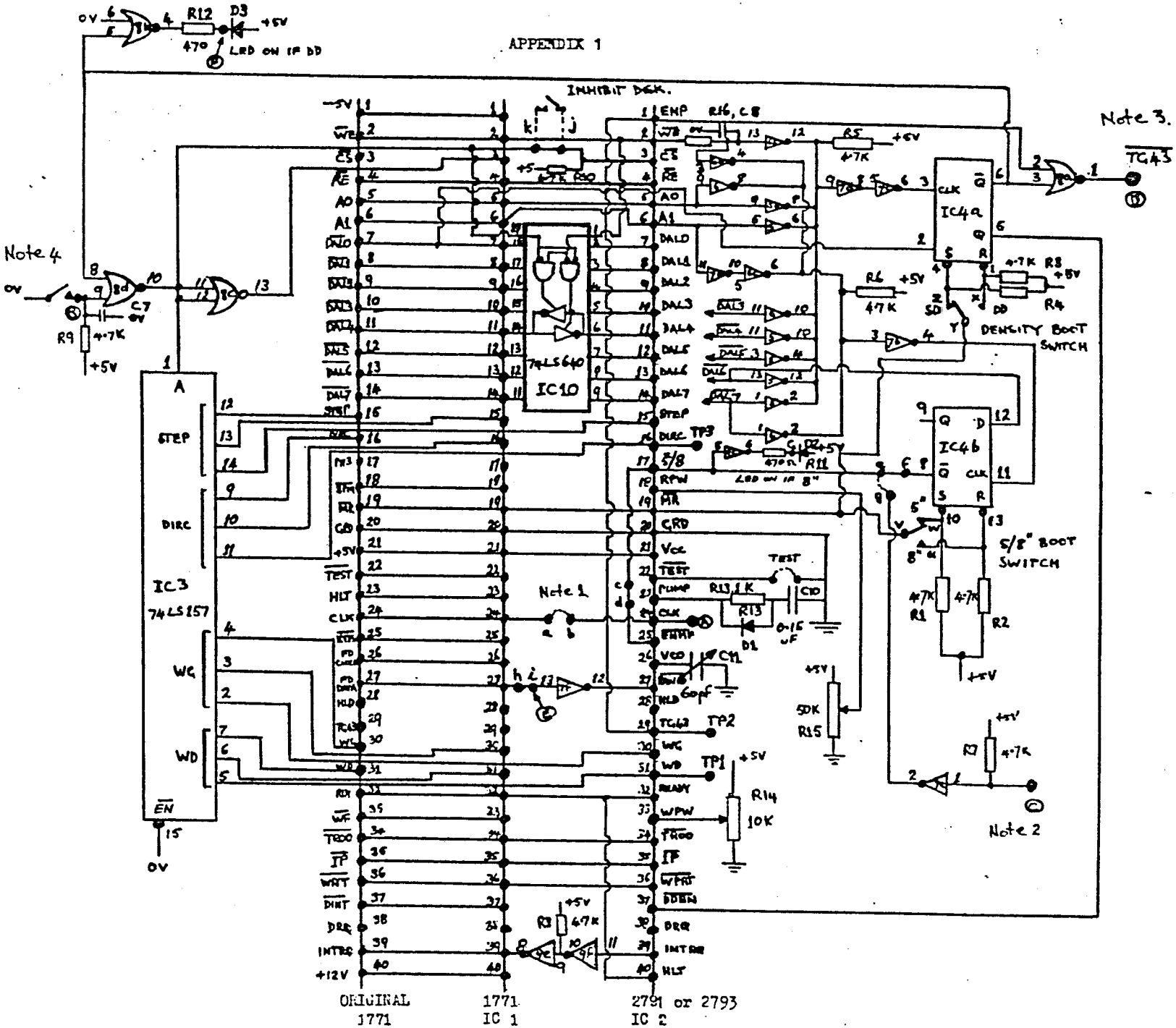
Note 5.

A single density external data separator for the TRS 80 WD1771 is provided ,if required, by plugging the existing SD data separator into the conversion card WD1771 socket. The WD1771 would be required when reading a single density disk of another user and the data address marks cannot be read by the WD2791 or WD2793.

The SYSTEM 80 has a built in S data separator and this can be utilised by removing strap h-i on the adapter PCB and connecting a flying lead from "E" to Z11 pin 13 (X-4010) or Z58 pin 2 / J1 pin 2 (X-4020) of the expansion interface. This connection provides an alternative path for RAW DATA to the WD279X, bypassing the SYSTEM 80 SD data separator.

The WD279X contains built-in data separators and write precompensation for both SD and DD operation. It may therefore be possible to get by without a data separator for the WD1771 in the TRS 80.

THE END

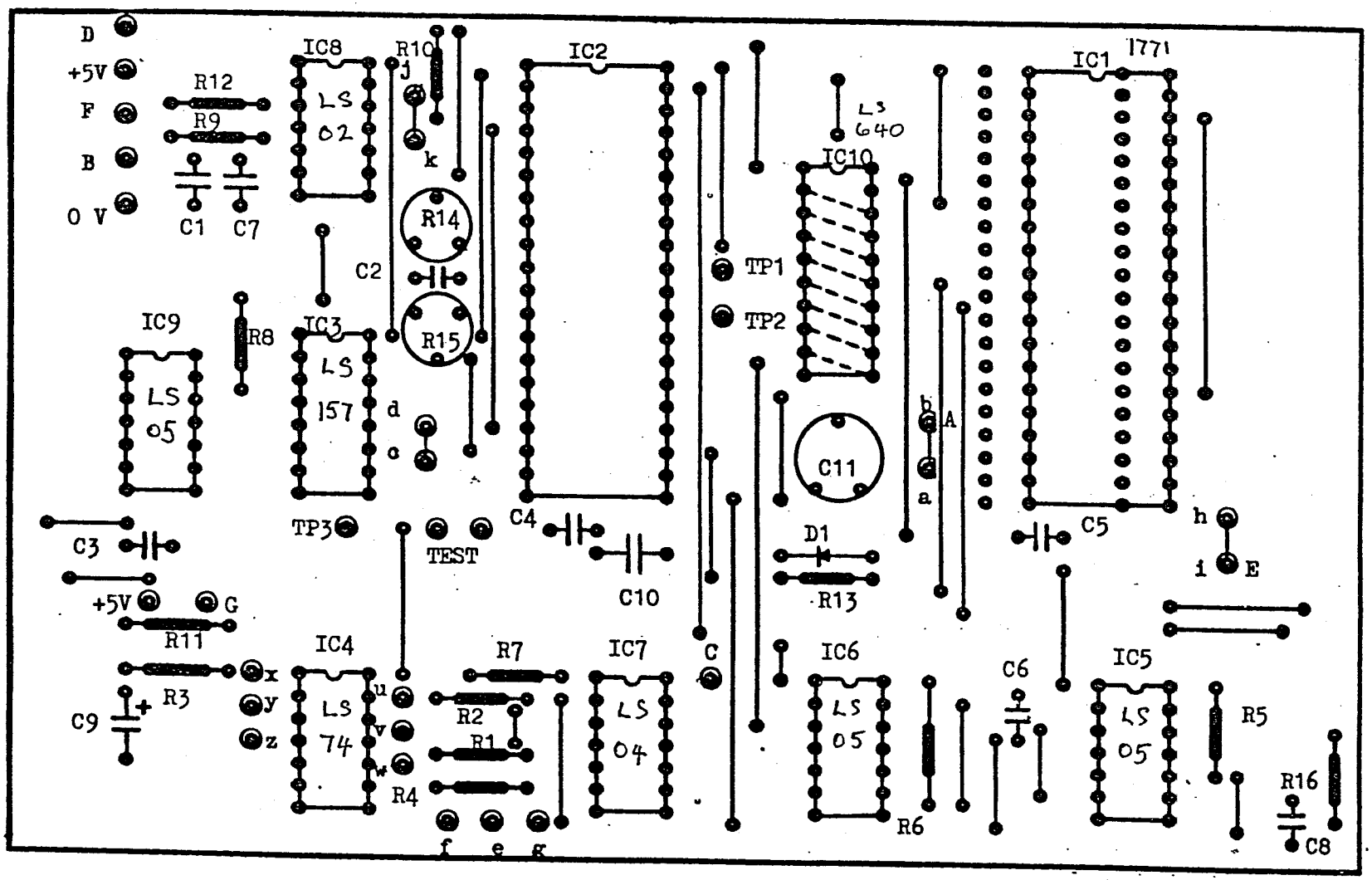


TRS Model 1 SD/DD PLUG IN CONVERSION CARD.

Adjustment - Trial

R14 C11 Post

R15



DOUBLE DENSITY ADAPTER - TOP VIEW (COMPONENT SIDE)

APPENDIX 3