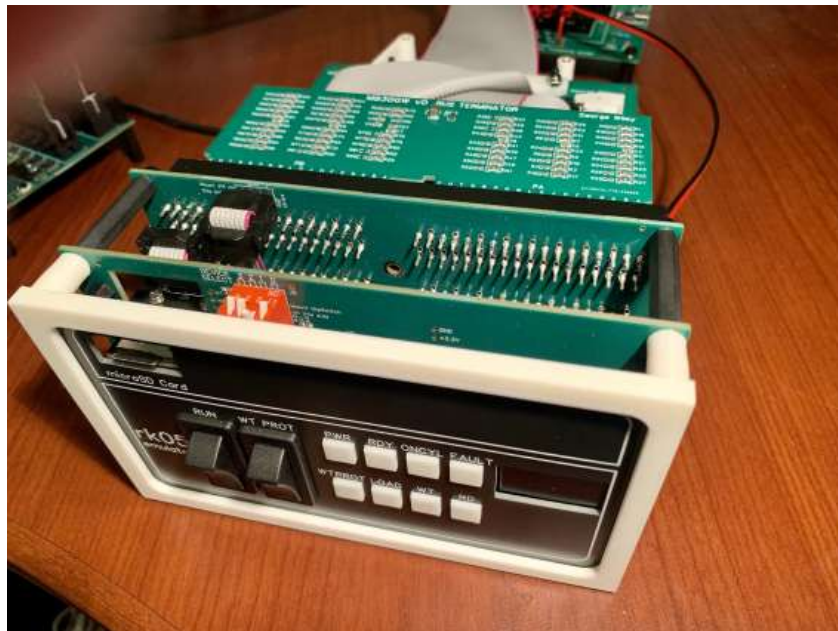


### Connecting the emulator to the Disk Controller:

- The order of the following setup steps isn't important except to turn the power on as the last step.
- Plug in the terminator board and the "A1" or "A2" RK05 bus interface cable. The two RK05 bus slots on the emulator are electrically the same so either board can go in either slot. The component side faces up. It's easier to access the Adapter Board when the terminator board is installed in the top slot.



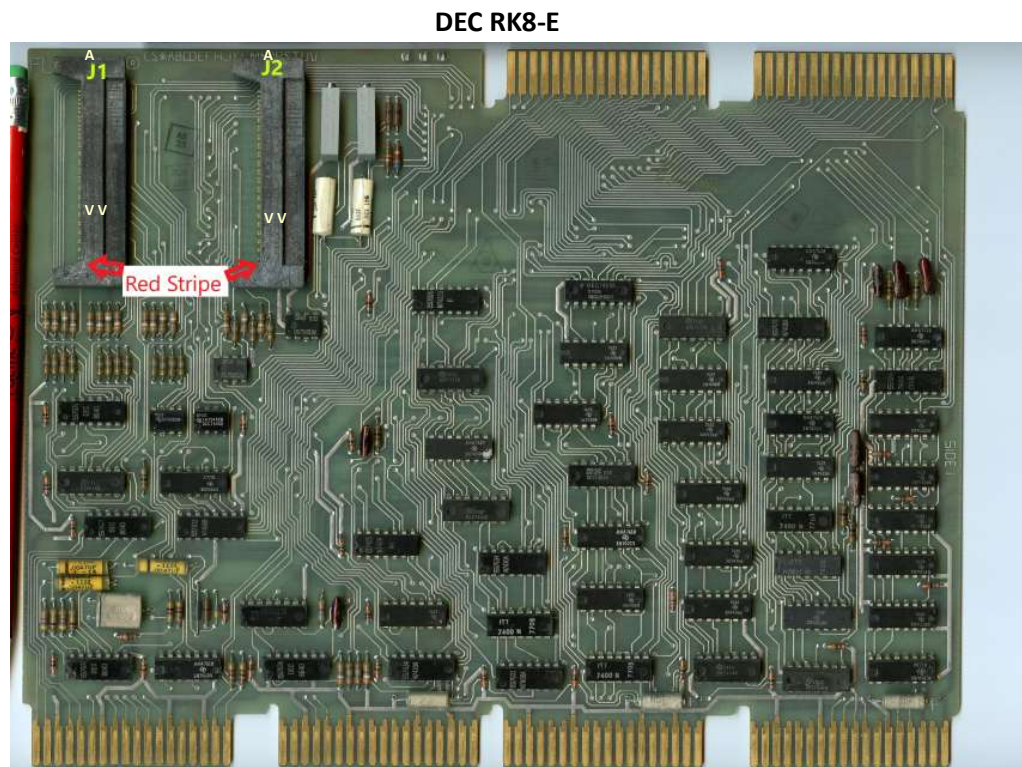
There is a keying slot between the two sets of gold contact fingers on both the terminator board and on the cable. There is a guide on the emulator main board silkscreen that shows the proper orientation of this keying slot.

Silkscreen guide, corresponds to the keying slot

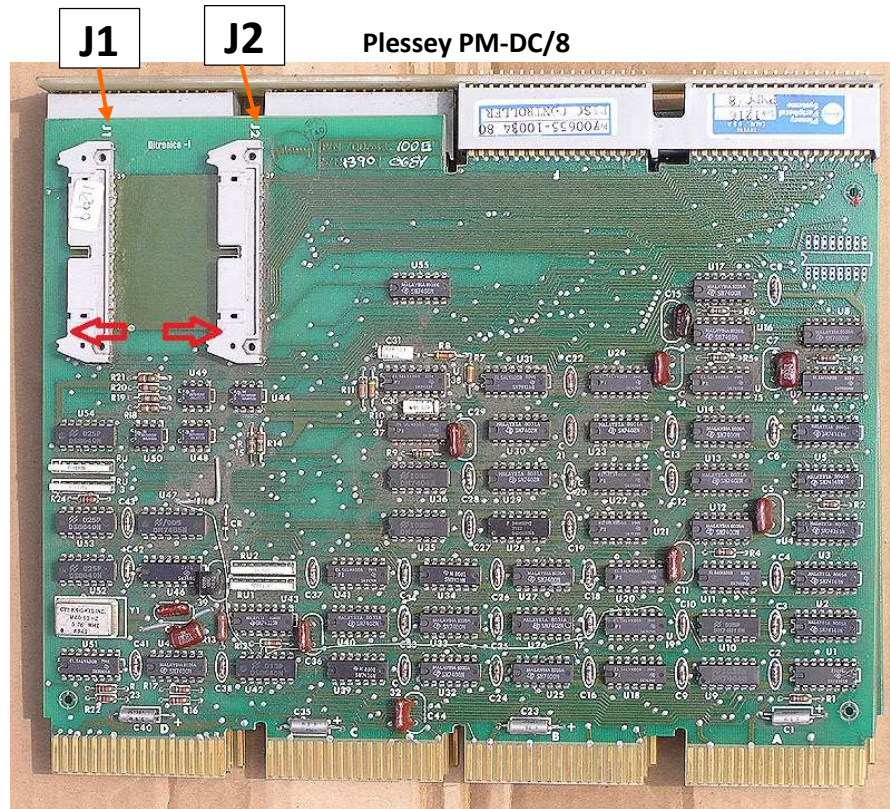


## Connecting to a Disk Controller, PDP-8 Systems

- DEC RK8-E: Connect the unconnected ends of the flat cables from an “A1” RK05-to-RK8-E Cable to the DEC RK8-E M7106 connectors J1 and J2. Connect the flat cable from J1 on the M993GW Adapter Board to J1 on the M7106. Similarly, connect the flat cable from J2 on the M993GW adapter card to J2 on the M7106. It is helpful to use a permanent marker or other means to label the flat cables with “J1” and “J2” so it is clear which cable goes to which connector. If connecting to a DEC RK8-E, then the keying tabs on the flat cable connectors should be sanded off so they will fit into the DEC Berg connectors. A Dremel tool or sharp pair of flush cut diagonal cutters (or both) can also be used to remove the keying tabs. The pin numbering alignment is strange, as shown in the photo: 3M connector pin 1 (red stripe) corresponds to Berg pin VV, and 3M pin 40 corresponds to Berg pin A. If the flat cables are connected to a Plessey PM-DC/8 controller then it is not necessary to sand off the keying tabs on the flat cables because the right-angle headers on the Plessey controller have corresponding keying slots.



- The Plessey PM-DC/8 has J1 and J2 clearly labelled on the silkscreen. Red arrows in the photo show the orientation of the red stripe on the cable. The keying slots on the controller board headers and keying ribs on the cables also ensure that the orientation of the cables and red stripe are correct.





- **OS/8 Bootstrap for RK8-E + RK05**

Load the following two-word program, run from 0030:

Address	Content
0030	6743
0031	5031

**How to:**

1. Copy the file "os8.rke" or another suitable OS/8 image to a microSD card.  
Confirm that no other rke files exist at the root level on the microSD card.
2. Remove the microSD card from your computer and insert the card into the slot on the front of the RK05 emulator.
3. Flip the RUN/LOAD switch on the front of the RK05 emulator to the "RUN" position.
4. Wait for the microSD card image to load. When that's complete, the following lights will be illuminated on the front of the emulator: PWR, RDY, ONCYL
5. Perform the following steps via the front panel of the PDP-8.
6. Set SR = 0030
7. ADDR LOAD
8. Set SR = 6743
9. DEP
10. Set SR = 5031
11. DEP
12. Set SR = 0030
13. ADDR LOAD
14. CONT

- **Conversion to/from emulator rke files and SIMH RK05 PDP-8 images**

<https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/>

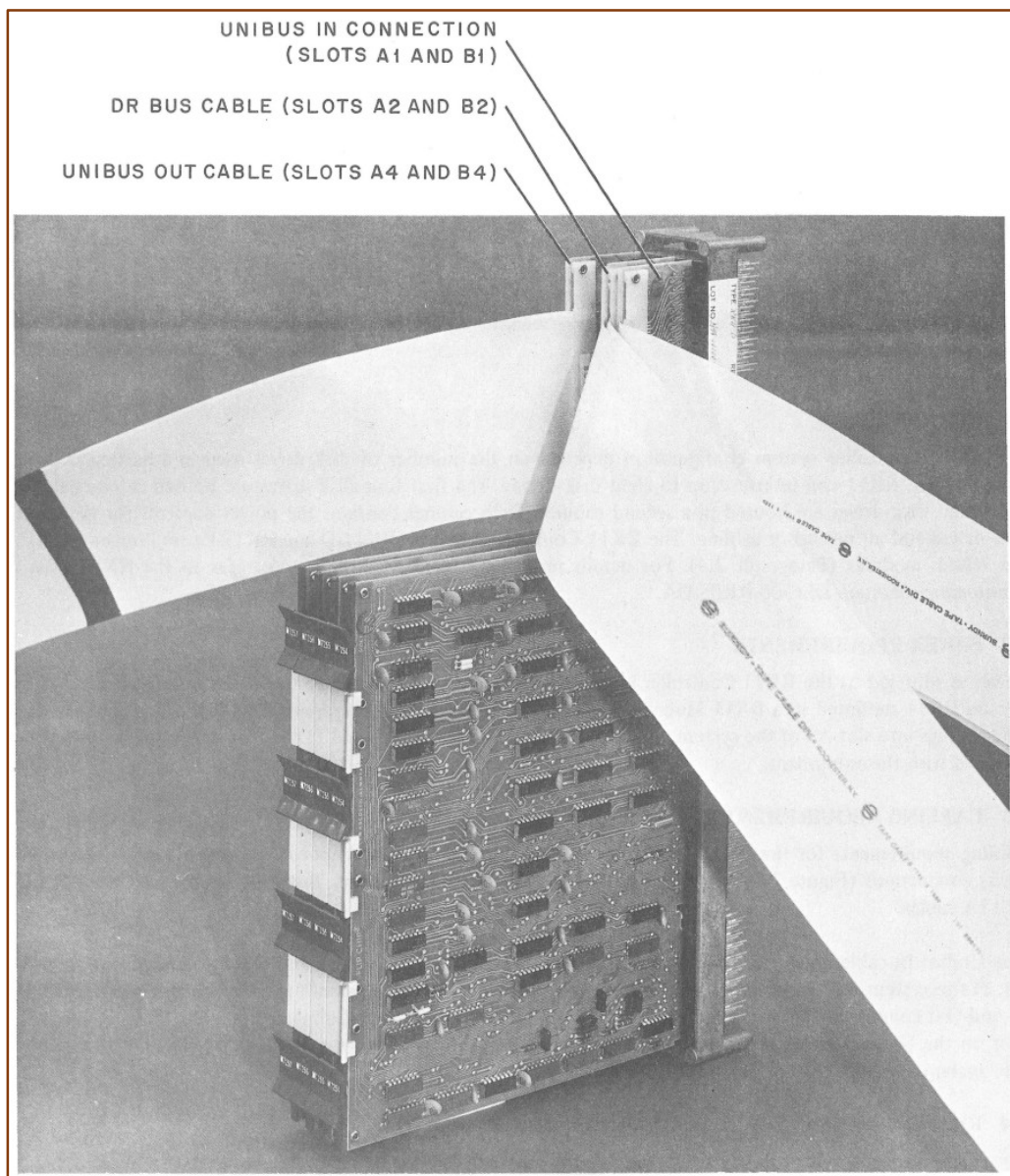
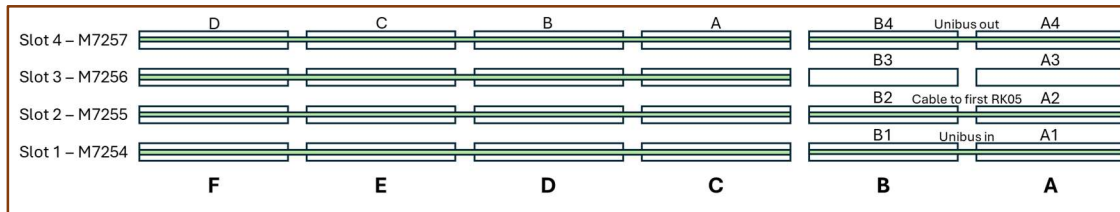
<https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/doc/>

- **dsk2rke** converts .dsk format to RKE (emulator) format  
PERL: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/dsk2rke>  
doc: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/doc/dsk2rke.md>
- **rke2dsk** converts RKE format to .dsk (SIMH) format  
PERL: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/rke2dsk>  
doc: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/doc/rke2dsk.md>
- **rkechk** checks an RKE file and a DSK file for equivalence  
PERL: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/rkechk>  
doc: <https://svn.so-much-stuff.com/svn/trunk/pdp8/8tools/doc/rkechk.md>

## Connecting to a Disk Controller, PDP-11 Systems

A helpful reference: <https://www.pdp-11.nl/peripherals/disk/rk05-info.html#unibus%20ifc>

- **RK11-D:** Connect one end of an “A2” RK05-to-RK05 cable or a DEC BC11A cable to the RK05 Emulator, and connect the other end of the cable to the RK11-D controller Disk Bus which is Slot 2 A-B.



- RKV11-D: Connect one end of an “A1” RK05-to-RK8-E cable into a slot on the RK05 Emulator. Connect the unconnected ends of the flat cables from the “A1” RK05-to-RK8-E Cable to flat cable connectors on the DEC M7268 board that is part of the RKV11-D controller. It is helpful to use a permanent marker or other means to label the flat cables so it is clear which cable goes to which connector. The keying tabs on the flat cable connectors should be sanded off so they will fit into the DEC Berg connectors. A Dremel tool or sharp pair of flush cut diagonal cutters (or both) can also be used to remove the keying tabs. The pin numbering alignment is strange, as shown in the photo: 3M connector pin 1 (red stripe) corresponds to Berg pin VV, and 3M pin 40 corresponds to Berg pin A.

**DEC M7268**

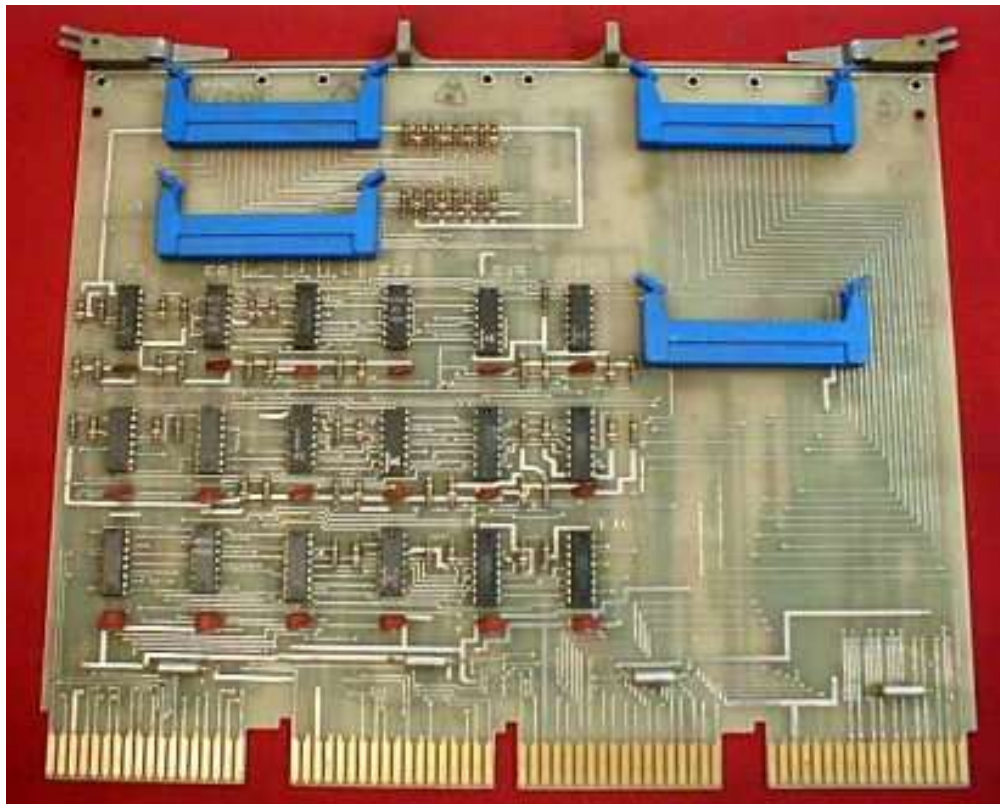


Image source: <https://www.pdp-11.nl/peripherals/disk/rk05-info.html#unibus%20ifc>



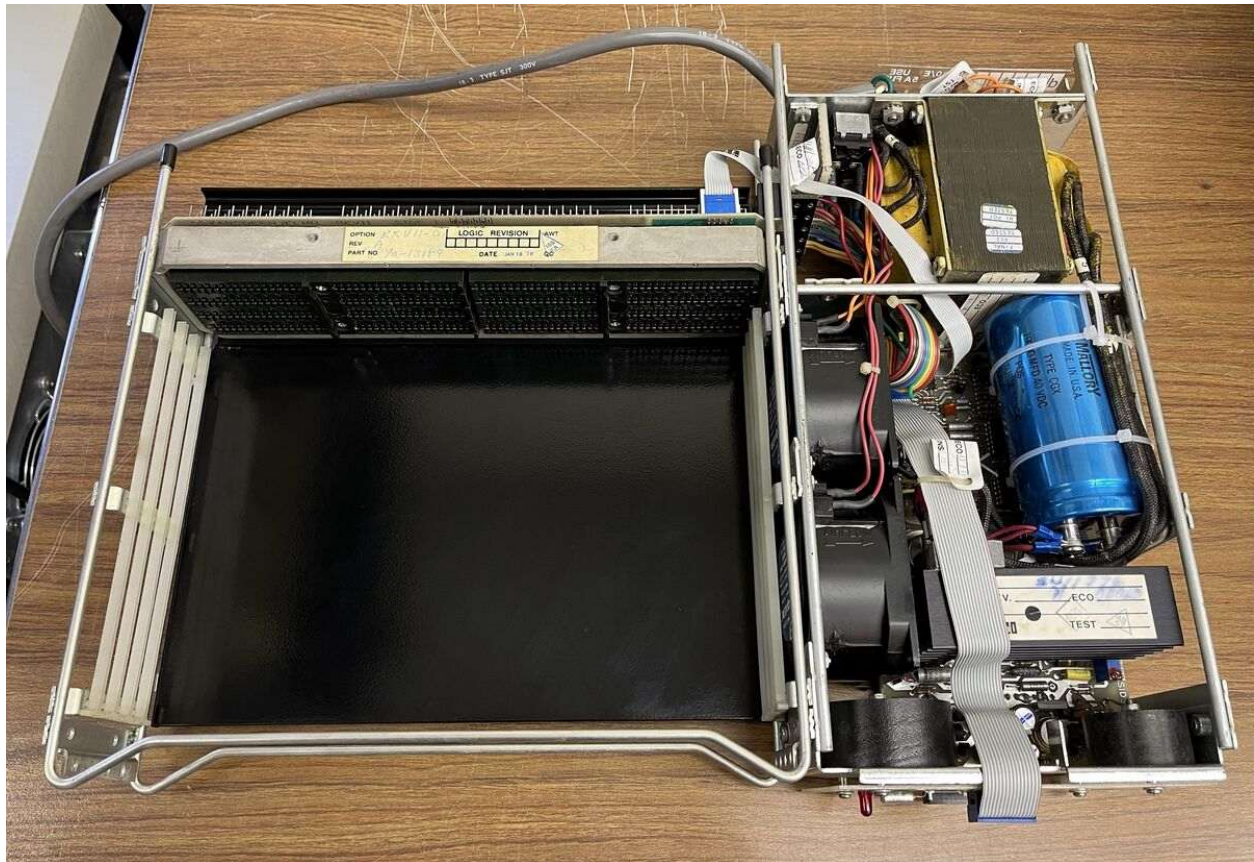
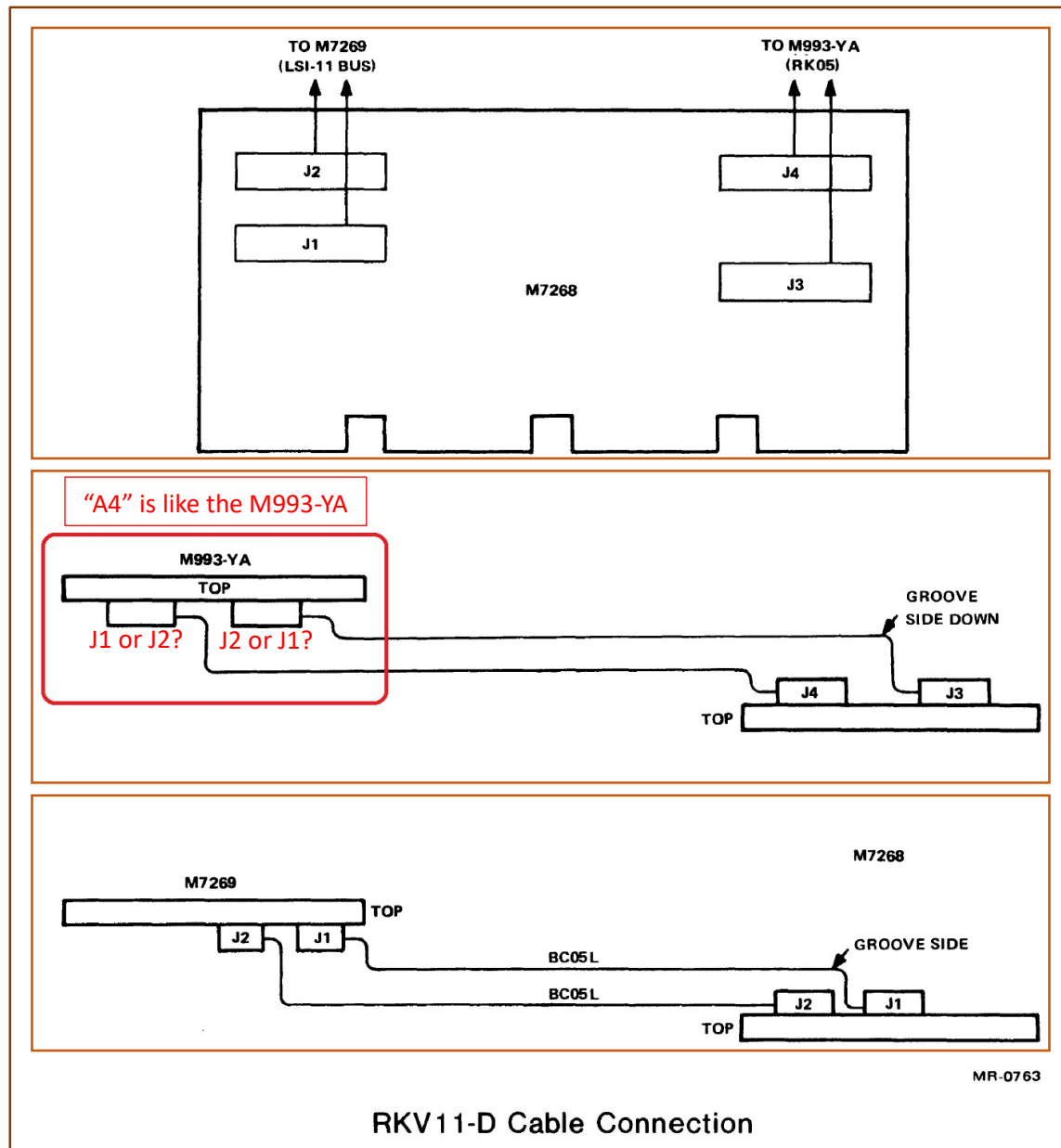


Image source: [https://gunkies.org/wiki/RK11\\_disk\\_controller#RKV11-D](https://gunkies.org/wiki/RK11_disk_controller#RKV11-D)



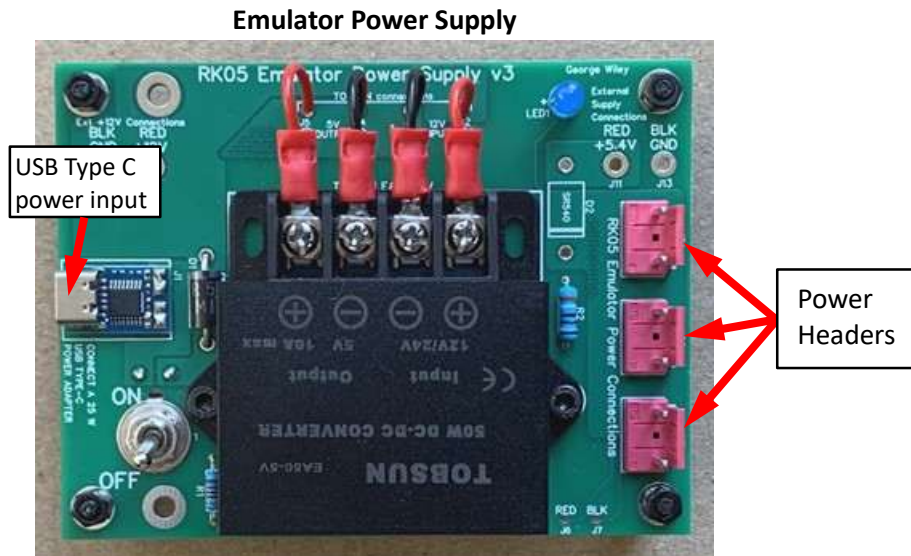
Source: RKV11-D Disk Drive Controller User's Manual, EK-RKV11-OP-001

- **Conversion to/from emulator rke files and SIMH RK05 PDP-11 images**  
[https://github.com/G-Wiley/RK05\\_Emulator\\_Tester\\_System\\_v2/tree/main/\\_rke\\_files/RK05\\_Emulator\\_RK11D\\_UTILITY](https://github.com/G-Wiley/RK05_Emulator_Tester_System_v2/tree/main/_rke_files/RK05_Emulator_RK11D_UTILITY)



## Emulator Power Supply

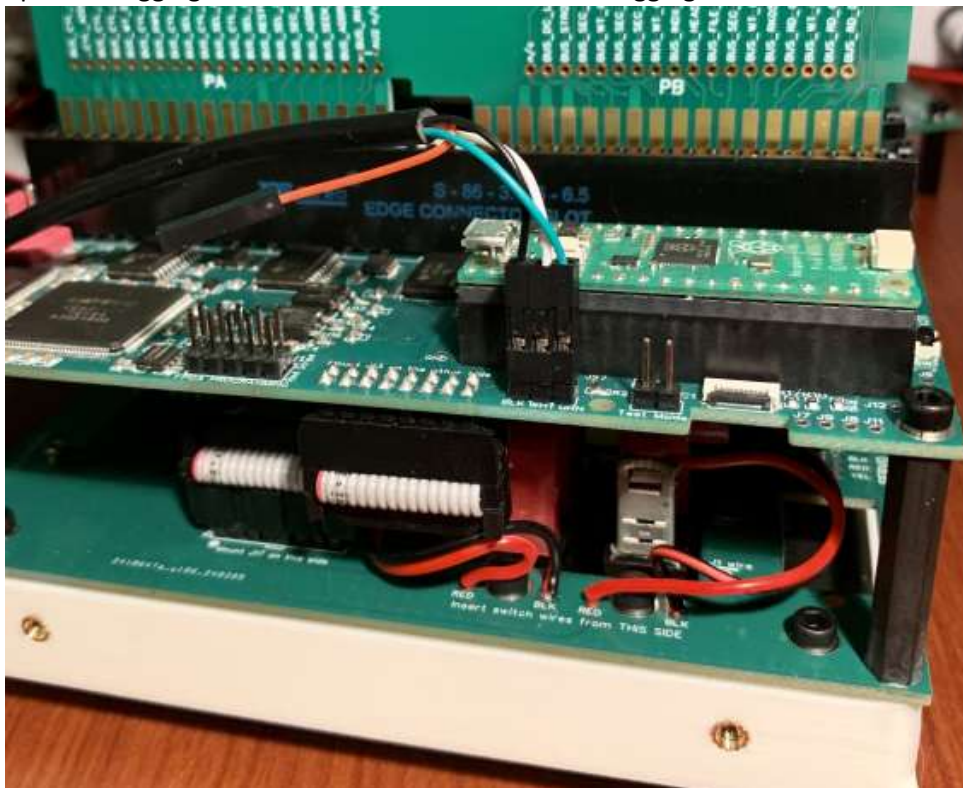
- Connect one end of the red/black power cable to the power header on the emulator. Connect the other end of the power cable to any one of the three power headers on the Emulator Power Supply. Up to three emulators can be connected to a single Emulator Power Supply.



- Connect a 25-watt USB Type C power module to the USB Type C connector on the Emulator Power Supply. This Type C power module is included with the “A7” Emulator Power Supply. For example, this is the type of power module shipped with the “A7” kit:  
<https://www.amazon.com/dp/B097MVXSQ5>  
Emulator Power Supply versions v2 and above have a power input switch located near the USB connector.

## Connecting a serial console

- If it is necessary to observe the emulator event log data, then connect a USB serial cable to the serial “DEBUG” port, as shown. The black wire is “GND”, white is “TX”, green is “RX”. The red wire on the USB serial cable is unconnected. The silkscreen on the main board indicates which wire color should connect to each of the three pins. Either a 5 volt or 3.3 volt USB serial cable can be used; the emulator has 5 volt tolerant drivers and receivers on the TX and RX signals and is compatible with 3.3 volt and 5 volt signal levels. With USB side of the serial cable plugged into in the computer, set your terminal emulator to use whichever COM port is assigned to the cable. Tip: bring up the Windows Device Manager first, then plug the USB cable into the computer to observe which COM port was just assigned when the USB serial cable was inserted. Baud rate is 460,800 bits per second, 8 bits, no parity. The high data rate is used so the serial port can keep up when logging sector reads and writes when the logging mode is selected.



- Set the RUN/LOAD switch on the front panel of the emulator to the “LOAD” position.
- Plug in the USB Type C charger and turn on the on-board power switch.

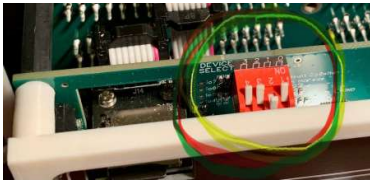
## Using the Emulator:

- Insert a microSD card into the microSD slot accessible through the front panel. The card must have a valid rk05 emulator file with an “rke” file extension at the root level. Example rke files are provided in the emulator repository on github:

[https://github.com/G-Wiley/RK05\\_Emulator\\_Tester\\_System\\_v2/tree/main/\\_rke\\_files](https://github.com/G-Wiley/RK05_Emulator_Tester_System_v2/tree/main/_rke_files)

The emulator will load the first file it finds that has an rke file extension.

- The Drive Address can be set using the 4-position dipswitch located behind the front panel. The dipswitch is identified as “DEVICE SELECT” on the board silkscreen next to the dipswitch. The individual switches are identified as 0 through 3 on the silkscreen. Switches 0 through 2 are a 3-bit binary drive address value. The selected Drive Address immediately appears in the OLED display on the front panel. The Drive Address setting is effective only when the emulator is in the “LOAD” state.
- The following example shows the switches set to address 2. The switch on the right has binary weight of  $2^0$ , the next switch to the left which is in a different state than the other switches is  $2^1$ , the next switch to the left is  $2^2$ , and the switch on the far left selects fixed mode (which is not yet implemented).



Although some drives use one-hot individual select enable signals to select the drive, this address switch is always a binary representation of the drive address. The large digit in the front panel display confirms the address that is selected.

- After the RUN/LOAD switch is turned to the RUN position, the emulator will ignore the state of the dipswitches. Only drive addresses 0 through 3 are valid for PDP-8 RK8-E mode which uses individual select signals on the disk bus. Drive addresses 0-7 can be used in RK11-D/E modes which use a binary-encoded drive address on the disk bus. The disk controller outputs a signal on the disk bus so that drives will use the proper drive-selection mode for the controller. The RK05 emulator and real RK05 drives respond properly to this signal from the controller, but some other drives (such as Diablo series 30) support only individual select signals. The most significant switch, switch 3, (the switch on the left) enables RK05f mode. RK05f mode is not yet supported; the proper double-address will appear in the display, but the FPGA and software do not yet support this mode. This is a planned future upgrade.
- Flip the RUN/LOAD switch to the “RUN” position. The emulator will read the rk05 disk image file from the card and store the data in the emulator’s DRAM. Progress of reading the file will appear in the display. When the entire file has been read, the front panel LEDs will update to indicate RDY and ONCYL.
- To observe a log of RK05 bus events such as Seek, Restore, Read and Write: type “L” on the attached terminal (commands are case insensitive). To stop logging type “S”. There is a bug which may cause the emulator to lock up after receiving 5,000 to 10,000 bus events while logging. This problem does not occur when logging is off.



- To unload and save data from the emulator DRAM back to the microSD card, flip the RUN/LOAD switch back to the LOAD position. Progress of writing the file will appear in the display. When the entire file has been written, the front panel LEDs will update to indicate LOAD.
- If there is an error, then it will show in the emulator front panel display and on the attached terminal and the ERROR indicator on the front panel will flash. The flashing error indicator can be cleared by first holding the WTPROT switch while toggling the state of the RUN/LOAD switch.