

## Introduction and Parts List

This project will give you the ease and convenience of a full size keyboard, however, you will still have to use the four shift keys.

These four shift keys will also be connected to the full size keyboard. Please refer to the keycap legend on the Jameco ad and you will see what changes have been made. As you can see, there will be two WORDS keys, one at each end of the keyboard (for our convenience).

You will also see that the GREEN, RED, and BLUE, shift keys will be located on the lower left hand corner. Your GO key will be equal to the RETURN key on the full size keyboard. Also, the:

PAUSE = BREAK  
ERASE = DELETE  
HALT = ESCAPE  
SPACE = Space bar

Photo #1 = the units bottom view. This shows the location of the five screws you must remove to open the computer. Please refer to the sheet with the disassembly procedure to take your computer apart. DO NOT GO ANY FURTHER THAN THE FIRST TWO INSTRUCTIONS! These are all you need to do.

### Parts

#### Radio Shack:

16 pin DIP jumper cable RS 276 1976 - use to connect to Bally keypad, just cut off one end OR plain ribbon cable + DIP header.

16 pin wrapping sockets 276-1994 - used to attach to the leads coming from the full sized keyboard

#### Jameco:

Unencoded 63 key keyboard. Check photo of ad for details.

A soldering gun, solder, and a 10 lead flat ribbon cable.  
Plus 10 strips of Five foot long 22 or 20 size insulated wire.

\* You will need a case to put your keyboard into when you finish all the wiring, if you can't build one you will have to buy one.

Total cost of this project app. = \$ 50.00

\*\*If you run into any confusion that you can't figure out call or write, if you call, call in daytime hours 9-2, because I work at night.

Good Luck!  
Ed Larkin

Step one: Disconnect power cord from outlet. Refer to disassembly procedure and photos to open case. After opening, go to step two.

Step two: Refer to picture number one and two and photograph number three. Directly even across from the metal shielding cut ten small holes in the plastic wrapping that covers the ten keypad wires. (If you don't solder these wires as close to the base as you can, you will not be able to close the case later on.) If the cable is also covered with foil, then peel away an area large enough to connect your wiring without it touching the aluminum foil. Upon close examination you will be able to see where each wire is within the covering. Cut away an area large enough to be able to solder a wire onto each of the original keypad wires.

Step three: Use a ten wire flat ribbon cable at least eighteen inches long. Connect one wire from the ribbon cable to each of the keypad wires. When each of the keypad wires have been soldered to each of the ribbon cable leads you should have one wire attached to each of the keypad wires. \*Be careful not to drop any solder into the case when you are soldering the ribbon cable to the keypad wires.

Step four: Punch out the plastic bus cover on the back of the computer case and slip the ribbon cable through this opening and out the back. (Refer to picture number three.)

Step five: Refer to picture number two for labeling the wires from the ribbon cable. It is important that you label each of the wires so that the wires on the outside will be numbered in the same order as the picture shows. This is very important!

Step six: Upon completion of the soldering of the wires to the keypad and the labeling of the wires, put the case back together. You will not need the computer for any other changes. The rest of the wiring will be done to your full size keyboard.

### Keyboard Wiring Directions

No. 1. Cut ten, five foot lengths of No. 22 or 20 gauge wire. Refer to picture #4 to see how you will be connecting the wires to the keyboard.

No. 2. Label each of the ten wires with masking tape. Number them 1 to 10 just as you did with the keypad wires. This must be done because you will be matching these ten wires with the other ten wires.

No. 3. Take the wire that you labeled #2 and connect it to one of the two pins of each of the following keyboard keys:

Letters A, B, C, M, N, O, Y, Z.

No. - 7, 4, 1

Also, the space bar and the return key (Your return key will be = to the Go key on the small keypad.) The last key you need to connect to with this wire is the lower left CTRL key.

No. 4. Next connect the wire you labeled #4 to the following keys.

Letters D, E, F, P, Q, R

No. - 8, 5, 2, 0

Also, the Break key, the Less Than and Greater Than keys and the Blank key in the lower left just below the CTRL key of the last step.

No. 5. Next connect the wire you labeled #6 to the following keys.

Letters G, H, I, S, T, U

No. - 9, 6, 3

Also, the Escape key and Delete key, ( ) key and finally the lower left Shift key.

No. 6. Next connect the wire you labeled #8 to the following keys.

Letters J, K, L, V, W, X

The + key, (-) key, (=) key, the Shift key and the Tab key and finally the lower right Blank key. This Blank key will be our LIST key and the Tab and Shift keys will be our WORDS keys; this way we have two, one at each end of our keyboard, for convenience.

No. 7. Connect the wire you labeled #9 to each of the other pins on the following keys (Starting here you will be connecting these wires to the other pins on the keys you have already wired.). Connect your #9 wire to the other pin on the RETURN key, the ESCAPE key, BREAK key, and the lower right BLANK (LIST) key.

No. 8. Connect the wire you labeled #10 to the following keys.

Letters A, B, C, D, E, F, G, H, I, J, K, L

No. - 7, 8, 9

No. 9. Connect the wire you labeled #7 to the following keys.

Letters M, N, O, P, Q, R, S, T, U, V, W, X

No. - 4, 5, 6

Also, connect this wire to the key directly next to the (+) key (we will use this key for our MINUS key). Refer to the picture of the Jameco keyboard ad for clarification.

No. 10. Connect the wire you labeled #5 to the following keys.

Letters Y, Z

No. - 1, 2, 3

Also, the (+) key

No. 11. Connect the wire you labeled #3 to the following keys.

No. - 0, zero

The Space bar, the Delete key, the (=) key refer to the keycap legend to see = key. Also, the Greater and Less Than keys, and lastly the parenthesis ( ) key

No. 12. Connect the wire you labeled #1 to the following keys.

SHIFT, TAB, LOWER LEFT CTRL, LOWER LEFT BLANK key and lastly, LOWER LEFT SHIFT key.

## -CONCLUSION!

You should now have 10 labeled wires coming from the computer and 10 labeled wires coming from your keyboard. All that you need to do is to match the numbers and solder them together. If you want to be able to connect and disconnect the keyboard solder the ten wires from the computer to a male DIP HEADER- Radio shack-2761980 (page-102 in the new catalog). Then connect the wires from the keyboard to a 276-1994 wire wrapping socket( insulate so the wires dont short against each other at the socket) Then you will be able to connect- and disconnect the keyboard. When soldering the cables from the computer to the male connector and the cables from the keyboard to the female connector , make sure that the female wires match up with the male wires when they get plugged together, or else the keyboard wont work correctly!.

You may wish to label your keyboard keys until you get familiar with them. Just refer to your keypad overlay. You will note that there will be some keys that wont be hooked up to anything.

EXAMPLE OF SOME KEYS: On the top row you have numbers 0-9 now look at the bally keypad overlay you will see that if you just hit the number you will just get the number, but if you hit the words key ( which is now our TAB or lower right bottom SHIFT key) you will get the command words. And so on!

# DISASSEMBLY PROCEDURE FOR REPLACING GAME BOARD

STOP  
HERE

1. Using a magnetized phillips screwdriver remove the five (5) screws on the bottom of the cabinet (figure 1 item 1). Holding the top and bottom sections together, turn the cabinet right-side up.
2. Lift up gently on the top section and it will separate from the bottom section.
3. On the left side of the unit you will see the R. F. Modulator, (figure 2 item 1) and the four (4) wire power connector (figure 2 item 2). Remove the R. F. Modulator by lifting up on the left side of it and pulling outwards to the left. The power connector can be removed by pulling it towards the rear of the unit.
4. Using a magnetized phillips screwdriver remove the four (4) screws in the corners of the board (figure 2 item 3). At this time the game board and keypad/cassette assembly can be removed from the bottom of the cabinet.
5. Remove the silver clips that are attached to the edges of the shielding (figure 2 item 4). After the clips are removed the metal shielding on the bottom of the game board can be removed.
6. Turn the board over and remove the four (4) remaining phillip screws that secure the keypad/cassette assembly to the game board (figure 3 item 1).
7. Holding the two pieces together turn them over and carefully lift the keypad/cassette assembly away from the game board.
8. Holding the keypad/cassette assembly in your right hand, press down gently on the keyboard itself with your left hand and slide the keyboard completely out.
9. Remove the reset button and the remaining plastic shielding by pulling them up and off gently.
10. Reverse the above steps to install a new game board.

**IMPORTANT NOTE:** Insure that all shielding is in place and secure to conform to FCC regulations.

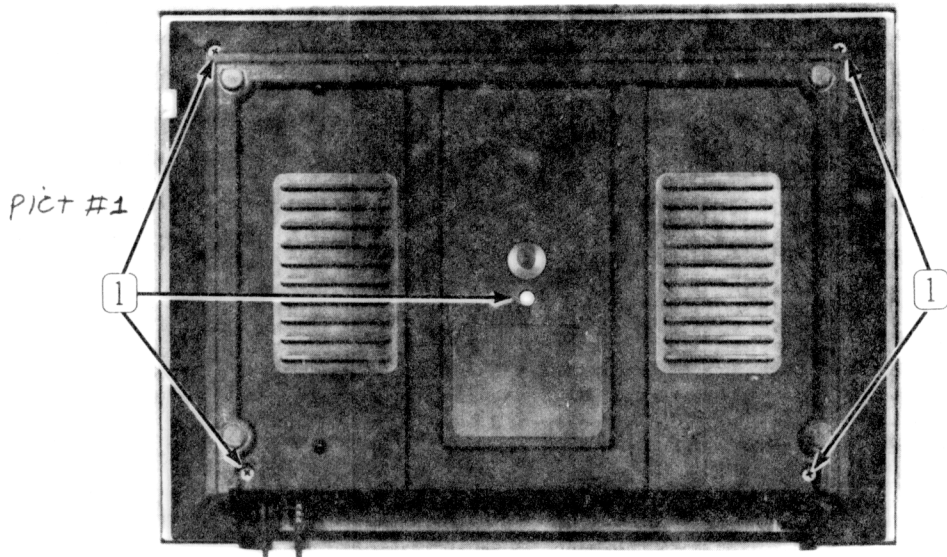


Fig. 1—BOTTOM VIEW

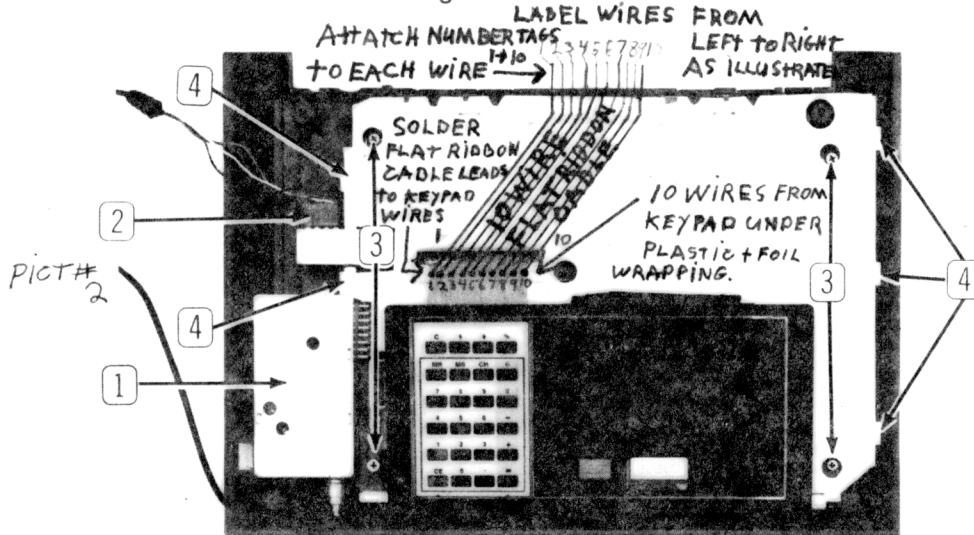


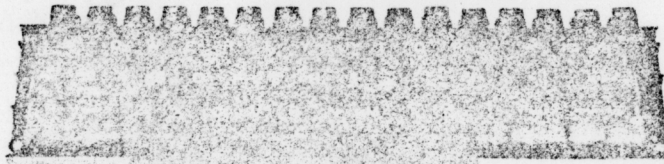
Fig. 2—UNIT WITH TOP REMOVED

- 1--R. F. Modulator
- 2--Power Connector
- 3--Four (4) Philips screws in corners of board
- 4--Silver clips

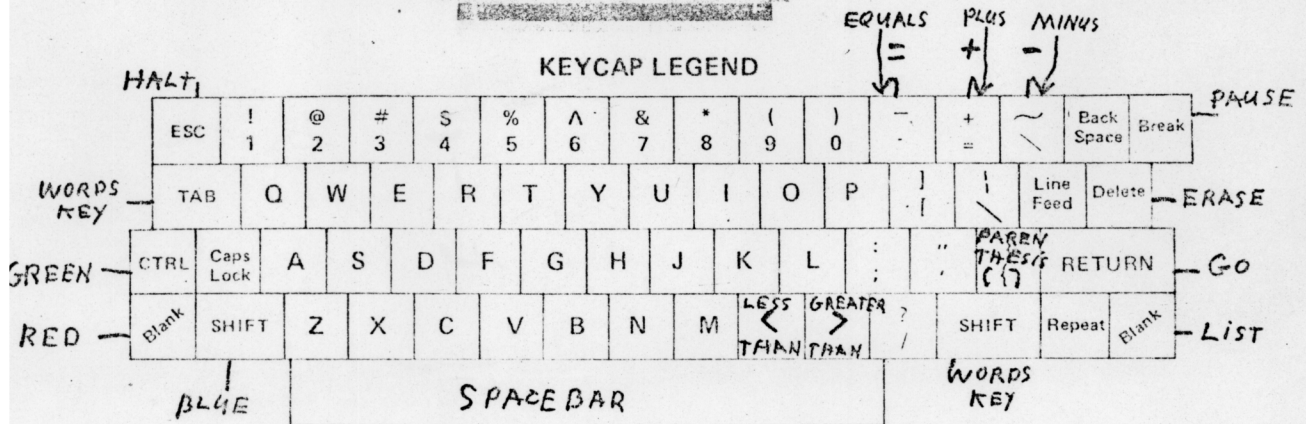
# 63-KEY UNENCODED KEYBOARD

Quality Keyboards for the hobbyist...  
direct from the Manufacturer

UNLIMITED  
QUANTITIES



ALL BOARDS HAVE  
IDENTICAL  
KEYCAP LEGEND



## PERFORMANCE CHARACTERISTICS

### MECHANICAL

KEY TRAVEL . . . . . 0.125 Nominal  
 PRE-TRAVEL . . . . . 0.075 Nominal  
 KEY PRESSURE . . . . . 50 to 100 Grams Typical  
 (Special Available)  
 SWITCH LIFE . . . . . 20 x 10<sup>6</sup> Minimum  
 CONTACT TYPE . . . . . Quadfureated, Form "A"  
 Normally Open  
 KEY SPACING . . . . . 0.750 Centers Standard  
 0.600 Centers Minimum

### ENVIRONMENTAL

HUMIDITY . . . . . 95% R.H.  
 TEMPERATURE . . . . . Operating 0°C to +50°C  
 Storage -40°C to +70°C

### ELECTRICAL

BOUNCE . . . . . Typically less than 2 Milliseconds  
 @5v DC, 10 Milliamps  
 RESISTANCE . . . . . Less than 200 Milliohm Typical  
 DIELECTRIC . . . . . 1000v RMS, 60,Hz, CKT to CKT

### MATERIALS

CONTACT . . . . Phosphor Bronze with Western Electric  
 #1 Gold Alloy Inlay  
 SWITCH BASE . . Self-extinguishing Glass Filled Plastic  
 PLUNGERS . . . . . Self-lubricating Thermo Plastic  
 KEY CAPS . . . . . 2 Shot High Strength ABS Plastic

COMPLETE DATA SHEETS AVAILABLE . . \$ .25 ea.

This is a 63 key, terminal keyboard. It is unencoded and has high reliability type switches.

## 63-Key Unencoded Keyboard . . . . . \$29.95

ALSO AVAILABLE — HD0165 Encoder Chip (encodes 16 keys) \$7.95 each  
 AY-5-2376 Encoder Chip (encodes 88 keys) \$14.95 each