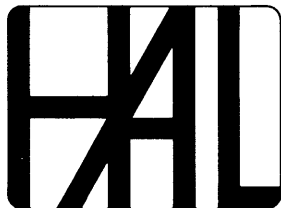


**EXTENDED
MEMORY
OPTION**
FOR THE
**DKB-2010
KEYBOARD**

**INSTRUCTION
MANUAL**



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QUALITY COMMUNICATIONS EQUIPMENT

**EXTENDED
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**DKB - 2010
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HAL DKB-2010 EXTENDED MEMORY OPTION

1. Introduction

The HAL 64/128 Key Buffer option extends the memory capacity of the DKB-2010 Dual Mode Keyboard to 64 or 128 keystrokes, depending on the model chosen. With the buffer installed, the operator is free to type for an extended period at a rate greater than the keyboard transmission speed without losing characters.

Buffer operation is controlled by the shifted CQ, AUX, and HERE IS keys. Typing a shifted HERE IS clears the buffer memory. A shifted AUX turns the memory output off, allowing characters to accumulate in the buffer for later transmission. Typing a shifted CQ turns the memory output on; the stored keystrokes are then passed to the keyboard logic circuitry. Complete operating instructions are given in Section 3.

A feature of special importance is that the buffer stores keystrokes rather than individual characters. As a result, the QBF (quick brown fox), identifier, CQ, and AUX messages occupy only a single location in the memory. It is possible, for example, to press the QBF key as many as 64 (or 128) times. Each keystroke will be stored, and the keyboard will repeat the entire quick brown fox test message as many times as the key was pressed.

Installation of the buffer requires no wiring changes in the keyboard. The buffer circuit board is fitted with card-edge connectors and simply plugs in between the keyswitch board and the wiring harness connector. Complete installation instructions are given in Section 2.

2. Installation

You will find it very easy to install the buffer in your keyboard by following the steps listed below.

TO PREVENT DANGEROUS ELECTRICAL SHOCK, UNPLUG THE KEYBOARD FROM THE AC OUTLET BEFORE PROCEEDING. 115 volts AC is exposed at several points within the cabinet.

1. Stand the keyboard on its right end. Remove the three screws from the lip of the bottom cover at the rear of the unit. Remove the screw from the center of the front edge of the bottom plate. Slide the bottom plate back to free it from the front lip of the cabinet and lay it flat on the table. The logic board remains attached to the bottom panel.

2. The large circuit board remaining inside the cabinet is the keyswitch board. It is held into the cabinet with five slotted-head screws--two at the upper end, two at the lower end, and one in the center toward the rear of the cabinet. Remove these five screws, starting with the bottom ones. As you remove the upper screws, hold the circuit board to prevent it from falling from the cabinet.

3. Swing the upper end of the circuit board away from the cabinet. As you do so, reach behind the board and pull the BUFFER FULL lamp from its plastic lens. Cut the lamp leads off as close as possible to the circuit board. The lamp may be discarded, as it will be replaced by the new lamp connected to the buffer circuit board.

4. Carefully detach the circuit board connector from the contact fingers at the rear edge of the board.

5. Plug the keyswitch board into the card edge connector mounted on the buffer circuit card. Note that the buffer board will be beneath the keyswitch board when the keyboard is in its normal operating position. Then plug the buffer board into the card edge connector previously removed from the keyswitch board. Make certain that the connector has not been reversed--the yellow and red leads should be closest to the power transformer when the keyswitch board is reinstalled.

6. Return the keyswitch board (with the buffer circuit card attached) to its original position in the cabinet. As you do, reach beneath the board and insert the lamp connected to the buffer board into the lens from which the old BUFFER FULL lamp was removed. Then secure the keyswitch board to the cabinet with the five screws removed during disassembly.

7. Reinstall the bottom plate, sliding the front edge beneath the front lip of the cabinet. Fasten it in place with the original screws.

The keyboard and buffer are now ready to operate. Refer to Section 3 for instructions on the use of the buffer.

3. Operating Instructions

Three keys (CQ, AUX, and HERE IS) in conjunction with the SHIFT keys control the operation of the buffer.

The shifted HERE IS key clears the buffer of its contents. A shifted AUX stops the flow of characters out of the buffer. The shifted CQ key turns the buffer output on so that the stored characters pass from the keyboard to the logic circuitry and are transmitted.

It is important to observe the proper sequence of operations when using these keys to control the buffer. The SHIFT key must be pressed and held down while one of the control keys is struck. The SHIFT key should not be released until after the control key is released. Otherwise, the character sequence produced by the control key in its normal (unshifted) mode will be entered in the memory unintentionally.

When the keyboard is first switched on, it is not possible to predict the states that the buffer memory stages will assume. It is therefore best to type a shifted HERE IS to clear the buffer and prepare it for incoming keystrokes.

If you wish to use the buffer as an extension of the keyboard's internal three-character memory, type a shifted CQ. The buffer output will be turned on, and the characters you type will pass through the buffer to the keyboard logic for transmission. If you type faster than the rate at which the keyboard is transmitting, the additional characters will "stack up" in the buffer and will be passed on to the keyboard logic when it is ready to receive them.

When the buffer is completely filled, the BUFFER FULL lamp will light. In that case, stop typing until the keyboard has had a chance to transmit some of the stored characters. As soon as memory space is available for another keystroke, the BUFFER FULL lamp will go out.

Transmission of the stored keys may be stopped at any time by typing a shifted AUX. The keyboard will transmit the two characters stored in its internal memory, but will not draw any more characters from the buffer. To restart transmission, type a shifted CQ. The contents of the buffer may be erased at any time by typing a shifted HERE IS.

It is possible to use the buffer to store a complete message or character string by typing a shifted AUX prior to typing the first character of the message. The buffer output will be turned off, and any keystrokes will be recorded in the memory, but will not be passed to the logic circuits for transmission. When ready to send the message, type a shifted CQ. Any pauses or gaps which occur when the message is originally typed will be closed up, as the keystrokes are stacked up sequentially in the buffer. If you wish to erase the memory, simply type a shifted HERE IS. The memory contents do not recirculate; once the message has been transmitted, it is no longer present in the memory. If you wish to repeat the message, it must be typed into the buffer again.

Since the buffer, in effect, stores keystrokes rather than individual characters, the QBF (quick brown fox message), HERE IS (identifier message), CQ, and AUX keystrokes occupy only a single memory location. It is therefore possible, for example, to store the QBF message and 63 (or 127) other keystrokes in the memory. Note that the repeat feature of the HERE IS, CQ, and AUX keys no longer functions when the buffer is installed.

The only keystroke which does not enter the buffer is the "break" (BRK) key function. The break key operates as usual unless the buffer output has been turned off, in which case it is deactivated and has no effect.

4. Theory of Operation

The buffer memory is installed in the DKB-2010 keyboard between the output of the keyencoder and the input of the logic circuit board. In the standard keyboard, keystrokes are translated into a seven-bit ASCII code by the keyencoder. These codes are fed directly to the ROM, where they are converted to the correct bit pattern for either Morse or RTTY transmission, depending on the mode selected.¹

¹Consult the DKB-2010 instruction manual for a complete discussion of the keyboard logic circuitry.

The heart of the buffer is an eight-bit parallel first-in, first-out (FIFO) buffer. Characters from the keyencoder are clocked into the buffer on data lines A_0 through A_6 each time a keystroke occurs. The character code bits ripple through the buffer stages toward the output end. They are clocked out of the buffer, one eight-bit code at a time, into the keyboard logic circuits when the ENABLE signal from the logic circuit indicates that the keyboard is ready to receive them. If the buffer input rate exceeds the output rate, the character codes ripple through the buffer and stack up at the output end, awaiting transfer to the logic circuit.

Each eight-bit buffer consists of two four-bit FIFO buffer IC's operating in parallel (IC's 7 and 8 in the schematic diagram). The buffers are capable of storing up to 64 eight-bit character codes. In the 128-key model, two additional buffers (IC's 10 and 11), in the same parallel configuration, are connected in series with the first two buffers to provide a storage capacity of 128 eight-bit codes.

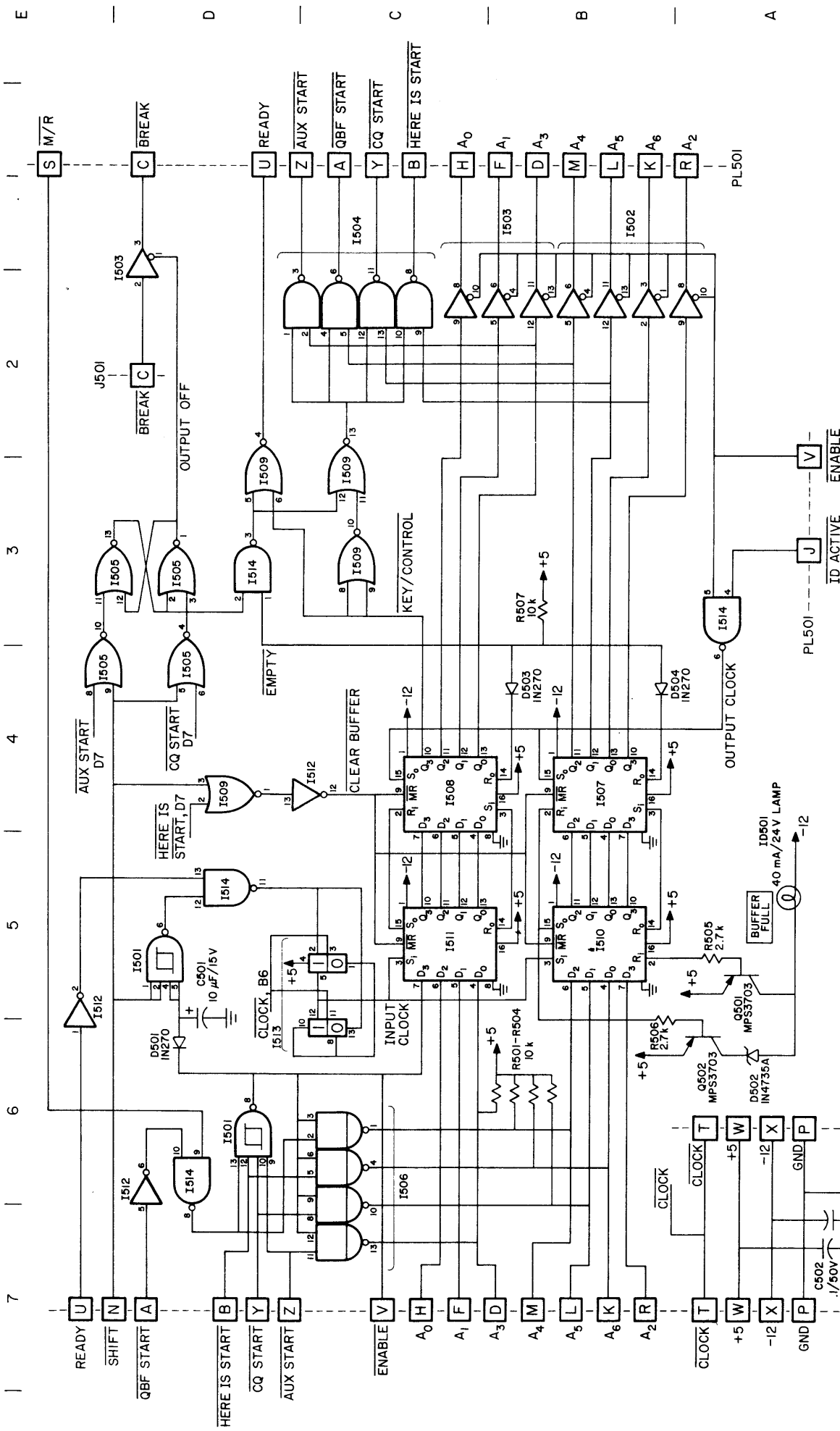
Additional control logic senses closure of one of the automatic character sequence keys (QBF, HERE IS, CQ, and AUX) and enters a special code into the FIFO buffers. When this code reaches the buffer output, it is sensed by one of a series of logic gates which actuates the appropriate character sequencer in the keyboard.

Characters (or keystrokes) from the keyswitch board enter the buffer whenever the READY line from the keyencoder goes high. The stored characters are clocked out of the buffer by a transition of the ENABLE line, which occurs whenever the keyboard logic circuits are ready to receive a new character code. When the buffer is full, the R_1 (input ready) terminal of the buffer goes low, driving a switching transistor (Q501) into conduction. The BUFFER FULL lamp, which serves as the transistor's collector load, then lights.

The output of the buffer memory is controlled by IC-5, which forms a flip-flop driven by two control gates. When the AUX key is pressed along with one of the SHIFT keys, the flip-flop is set. An output from the flip-flop controls the READY line, which when high normally indicates that one or more characters have been stored in the buffer awaiting transfer to the keyboard logic. If the flip-flop is set, the READY line is held low, and the keyboard logic is not notified that characters are stored in the buffer. Hence, no clock pulses return via the ENABLE line. Incoming characters are stored in the buffer, but are not transmitted.

When the SHIFT and CQ keys are pressed simultaneously, the flip-flop is reset, and the READY line is allowed to go high. The keyboard logic then generates a transition on the ENABLE line, clocking the first character out of the buffer. The process repeats until all stored characters have been transmitted.

The buffers may be cleared of all contents by pressing the SHIFT and HERE IS keys simultaneously. A NOR gate senses this combination of key closures and drives the CLEAR BUFFER line low, resetting all stages of the shift registers.



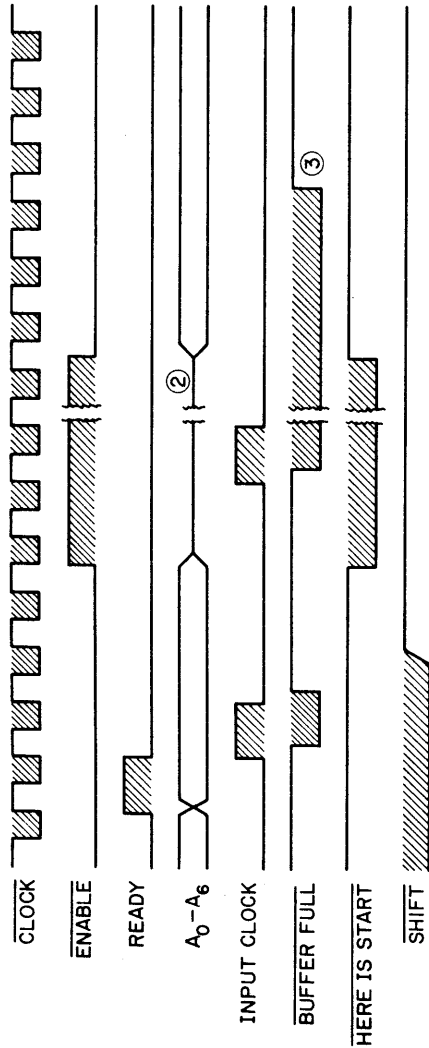
NOTE: 1. CIRCUITRY SHOWN IS FOR 128 KEY BUFFER. FOR THE 64 KEY VERSION, I510 AND I511 ARE REPLACED BY APPROPRIATE JUMPER SETS AND R505, D502, AND Q502 ARE OMITTED.

2. ACCEPTABLE SUBSTITUTES ARE: FOR Q501 AND Q502 - MPS3702 OR MPS6518

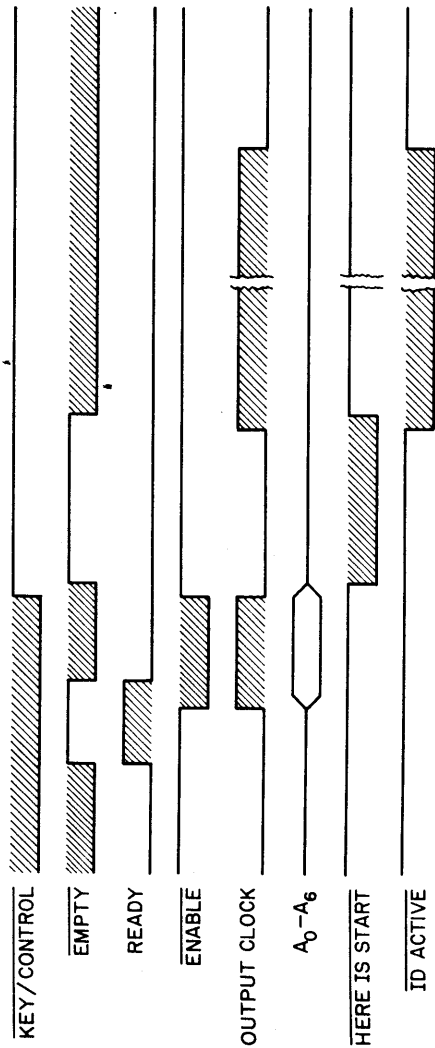
3. ALL RESISTERS ARE $\frac{1}{4}$ W $\pm 10\%$

DKB-2010
64/128 KEY BUFFER
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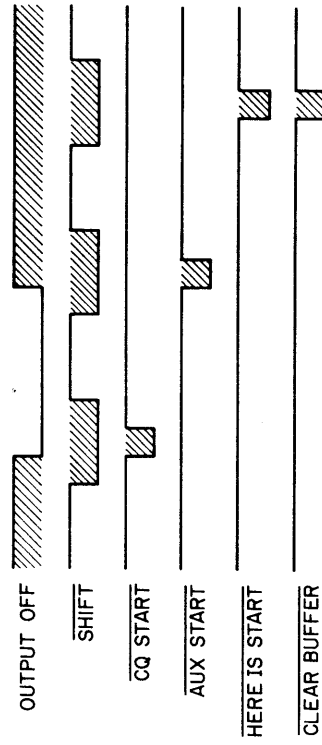
INPUT TIMING ①



OUTPUT TIMING ④



CONTROL TIMING ⑤



- NOTE: 1. INPUT TIMING IS GENERALLY SYNCHRONOUS EXCEPT WHEN BUFFER IS FULL
2. A_x LINES NOT OTHERWISE DRIVEN GO TO A HIGH-IMPEDANCE STATE WHEN DISABLED (TRI-STATE)
3. THE BUFFER FULL SIGNAL REMAINS LOW (ACTIVE) WHEN NO BUFFER LOCATIONS ARE EMPTY IGNITING THE BUFFER FULL INDICATOR
4. OUTPUT TIMING IS ASYNCHRONOUS AND VARYING DELAYS ARE ENCOUNTERED BETWEEN CONTROL LINES
5. A CONTROL CONDITION EXISTS WHEN "CQ", "AUX", OR "HERE IS" IS PRESSED AFTER THE SHIFT KEY AND RELEASED BEFORE THE SHIFT KEY IS RELEASED. THE FUNCTIONS ARE:

SHIFT - CQ: TURN BUFFER OUTPUT ON
 SHIFT - AUX: TURN BUFFER OUTPUT OFF
 SHIFT - HERE IS: PURGE BUFFER CONTENTS