4706

8-BIT TELETYPE RECEIVER

The 4706 Teletype Receiver is a serial to parallel converter, self contained on a double length DEC System Module board. This unit includes all of the serial to parallel conversion, buffering, gating and synchronizing necessary to transfer information between incoming serial asynchronous teletype line and a parallel digital device. An 8-bit character consisting of 10.0, 10.5, or 11.0 units is received in serial form. The 8-bit data character is assembled in the shift register. Start and Stop elements accompanying each character are removed. The bit <u>immediately following the Start bit is the least</u> significant bit.

The receiver examines the telegraph line 8 times per unit. When the Start element is recognized the receiver synchronizes with the signal and is placed in the Active state. The shift register is reset, and if the Flag jumper is in the Flag will be cleared (turned off). The line is sampled at 1/2 a unit after the Start signal was received. If the Start signal is not present at this time, the module is placed in the inactive state and awaits a new Start pulse. (This effectively eliminates a hit or noise on the line that is less than 1/2 a unit.) If the line is still in the Start state the Start element is gated into the shift register. From this time on the data elements are gated into the shift register at full unit intervals (sampled in the center of each element). When the last element of data, element 9, (1 Start, 8 data) is gated into the shift register, the Flag is turned on. The Flag indicates to an external device that a data character has been assembled in the shift register. The shift register can now be sampled, and if desired the Flag can be turned off. Bit 1 is the least significant bit.

The time allowed to sample the shift register varies with the length of the Stop element and the speed. The following formula may be used to determine the maximum time permitted to sample the data after the Flag has come on:

$$T \text{ (seconds)} = \frac{\text{Stop Element (units)} + 1/2}{\text{baud (bits per second)}}$$

The following formula applies when the line is open:

$$T \text{ (seconds)} = \frac{\text{Stop Element (units)} + 1/8}{\text{baud (bits per second)}}$$

The receiver is placed in the inactive state at one unit after the Flag comes on (1/2 unit into the Stop element).

The telegraph line is not examined for the next Start element until
3/8 of a unit before the next Start element is expected. (Delay is
determined by jumpers.) The Clock input should be 8 times the baud
or bit frequency. The maximum Clock input is 100 KC, which will
permit baud rates up to 12.5 KC.

The receiver may be connected to devices other than teletype, i.e.
interface between two computer systems, input from measuring device,
etc. The data input requires that ground be present during the mark
(other definitions of this state are idle, one, closed circuit, Stop)
and that -3 volts be present during the space (run, zero, open circuit,
Start). An indicator light mounted on the handle provides a means of
observing the state of the Flag. A switch mounted on the handle opens
(floats) the Flag output circuit.

INPUTS: Clock: DEC Standard 0.4 microsecond negative pulses or
          equivalent. Loading is one unit of 500 KC Pulse Load. Clock
          frequency should be 8 times the element or baud frequency,
          and no greater than 100 KC.

          Enable: DEC Standard Levels or equivalent. Unit is disabled
          when input level is negative, and enabled when level is at
          ground. A disabling level must be true at least 16 micro-
          seconds before data is present. An enabling level must be
          true at least 31 microseconds before data is present. There
          is 1 ma DC load at this input. Transient load for negative
          going signals is and additional 1 ma with a time constant of
          6.6 microseconds. Transient and DC load for signals going
          to ground is zero. A negative level (transmitter active
          output) may be connected to this input to prevent the receiver
          from accepting the transmitted signals (half duplex operation).

          Data Input: DEC Standard Levels or equivalent. DC loading
          is one unit of Base Load. Transient loading is 1 ma for
          signal transitions in either direction.
          Time constant = 30 μsec. Mark = ground.

          Clear Flag: DEC Standard Levels or Standard 0.4 microsecond
          negative pulses or equivalent. Load is one unit of Pulse
          Load or 1/8 of a unit of DC Emitter Load shared by the inputs
          at ground. One leg of the negative AND circuit must be held
          at ground (not floating) when neither input is used.

OUTPUTS: <u>Bits 1, 2, 3, 4, 5, 6, 7, 8</u>: Resistor coupled outputs
           capable of driving 2 units of Base Load when output is
           negative, and 1/4 unit of DC Emitter Load when output is
           at ground. For driving other loads, the DC output may be
           considered as a Thevenin equivalent source of -7.5 volts
           and a series resistance of 2500 ohms, or ground and a
           series resistance of 100 ohms. Assembled character is valid
           from the time the Flag is turned on to the start of the next
           character. Jumperable outputs permit either level to be
           used.

           <u>Active</u>: Resistor coupled output capable of driving 2 units
           of Base Load. This output is not designed to drive fractional
           DC Emitter Loads. Negative (provided Jumper A is in) from
           start time until 1/2 unit into the Stop unit.

           <u>Flag</u>: Output is DEC Standard Level capable of driving 7
           units of Base Load and any number of Pulsed Emitter Loads,
           provided not more than one is pulsed at a time. Output line
           may be opened (floated) by means of a series switch.

           <u>Indicator Lamp</u>: Provides visual indication of the Flag flip-
           flop.   Light on indicates that the Flag flip-flop is set.

POWER REQUIREMENTS: -15 volts/200 ma;   +10 volts (A)/6 ma.

DEC CONVENTION FOR DESIGNATING INTERNAL JUMPERS:

(1)   Bits 1, 2, 3, 4, 5, 6, 7, 8:   1 = -3 volts; 0 = ground when bit
                                         is present.

(2)   Jumper A: Connects <u>Active</u> output to pin M.

(3)   Jumpers B, C, D, E: CE   1 unit Stop code
                            BD   1 1/2 unit Stop code
                            CD   2 unit Stop code

(4)   Jumper F: Flag is cleared when Start pulse is recognized.

Jumpering code following the above sequence:

Example I

      (1)   Bits 1, 2, 3, 4, 5, 6, 7, 8 = 1 (use octal)
      (2)   Jumper A in
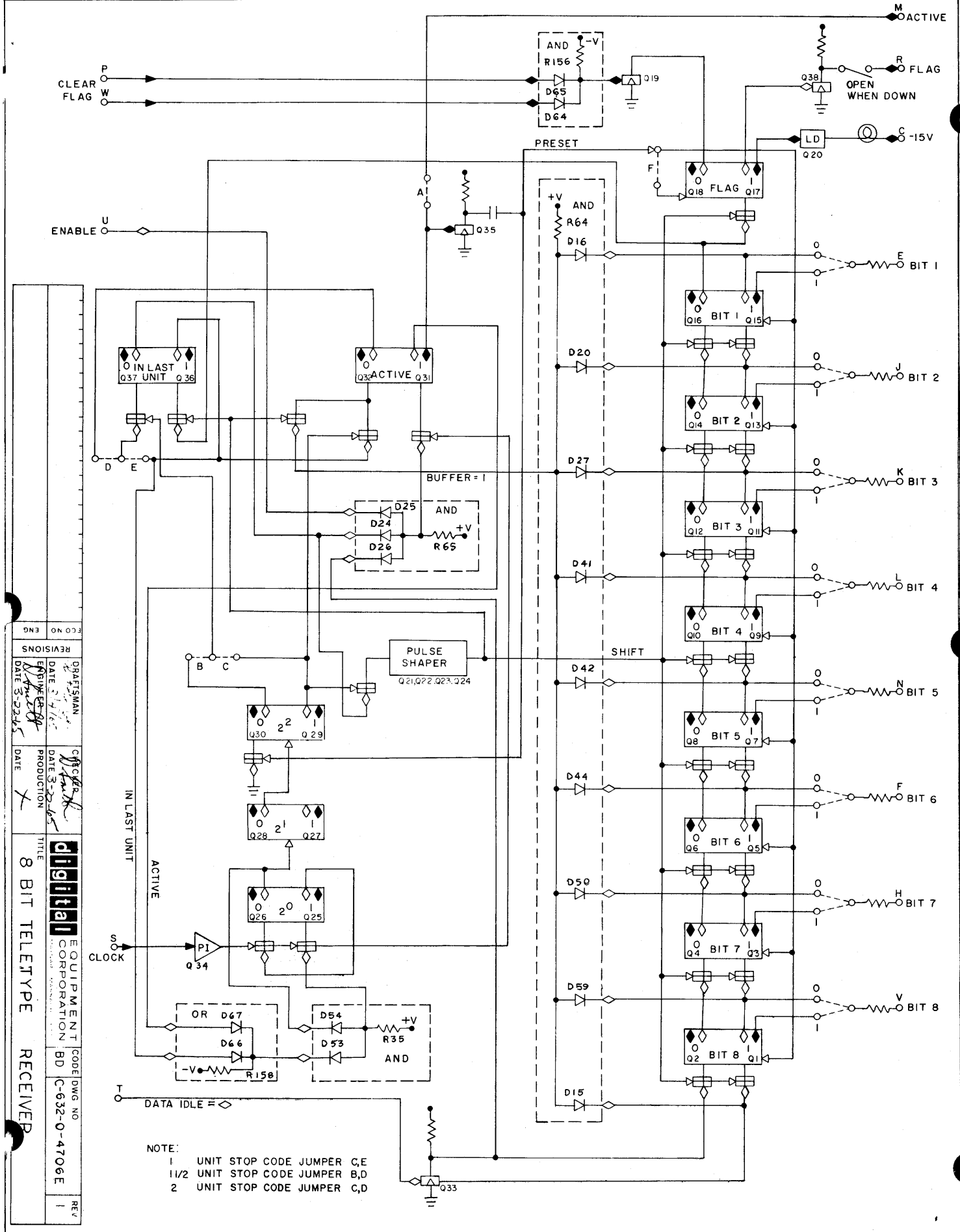   (3)   Jumpers B, D in
      (4)   Jumper F out

becomes 377ABD   3 7 7   A   B D

                     (1)   (2)   (3)   (4) not used

Example II

      (1)   Bits 1, 2, 3, 4, 5, 6, 7, 8 = 0
      (2)   Jumper A out
      (3)   Jumpers C, E in
      (4)   Jumper F in

becomes 000CEF   0 0 0   C E F

                     (1)   (2)   (3)   (4)
                             not
                           used

8 BIT TELETYPE RECEIVER

digital EQUIPMENT CORPORATION

CODE BD | DWG NO C-632-0-4706E | REV 1

NOTE:
1   UNIT STOP CODE JUMPER C,E
1 1/2 UNIT STOP CODE JUMPER B,D
2   UNIT STOP CODE JUMPER C,D