

## DATATRON PAPER TAPE PUNCH

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The Datatron Paper Tape Punch is based on the Epson 6110 Tape Punch. Inside the cabinet are three subassemblies: the Epson 6110 Tape Punch mounted on a vibration-damping mount, a 24-volt power supply with switch and fuse, and a Datatron Punch Interface Board.

### AS BUILT

The Punch Interface board requires an external +5V supply. It interfaced to a computer with a 26-pin ribbon cable connector, with the following pinout:

Pin(s)	Name	Dir	Function
1-3	+5V	In	+5 Volts input
Odd pins from 5 to 23	GND	-	5V Ground reference
4	CLOCK	In	Free-running clock
6	D7	In	Data bit 7
8	D6	In	Data bit 6
10	D5	In	Data bit 5
12	D4	In	Data bit 4
14	D3	In	Data bit 3
16	D2	In	Data bit 2
18	D1	In	Data bit 1
20	D0	In	Data bit 0
22	-READY	Out	Ready for data when low
24	-NULL	In	Overrides D0-D7
25	N/C	-	N/C (has been cut)
26	ENABLE	In	Enables punching

CLOCK requires a free-running clock whose period is no longer than the test loop time for the CPU communicating with this punch.

-READY goes low to indicate that writing to the punch is allowed. Writing to D0 -D7 and ENABLE must occur "soon" after this signal goes low, for continuous punching. There is no way to insure that the first character punched is timed correctly.

D0-D7 are the data bits.

-NULL overrides the the data on D0-D7, causing nulls to be punched.

The ENABLE signal enables punching.

The Epson 6110 Tape Punch connects to the Datatron Punch Interface Board via wires soldered to the 'E' pads on the Punch Interface Board:

<b>E Pad</b>	<b>Name</b>	<b>Dir</b>	<b>Function</b>
1-3	N/C		No Connection
4	-Bit 6	Out	Low while -Sync is low punches bit 6
5	-Bit 2	Out	Low while -Sync is low punches bit 2
6	-Bit 1	Out	Low while -Sync is low punches bit 1
7	-Bit 7	Out	Low while -Sync is low punches bit 7
8	-Sprocket	Out	Low while -Sync is low punches a sprocket hole
9	-Bit 3	Out	Low while -Sync is low punches bit 3
10	-Bit 4	Out	Low while -Sync is low punches bit 4
11	-Advance	Out	Low while -Sync is high causes the tape to advance
12	N/C		No Connection
13	-Bit 0	Out	Low while -Sync is low punches bit 0
14	N/C		No Connection
15	-Bit 5	Out	Low while -Sync is low punches bit 5
16	-Sync	In	50 Hz square-wave Synchronization signal
17	GND	-	Ground
18-22	N/C		No Connection
23-24	GND	Out	Ground to Epson 6110
25-26	GND	In	Ground from 24V power supply

The 9 punch signals from the Punch Interface Board (8 data bit punches, plus one sprocket punch) are sampled mechanically by the Epson Tape Punch, after the falling edge of the -Sync signal. A low signal causes a hole to be punched. These signals should be stable the entire time that -Sync is low.

-Advance is sampled mechanically after the rising edge of -Sync, and should remain stable the entire time that -Sync is high. A low signal causes the tape to advance one position.

The schematic for the Datatron Punch Interface Board is at the end of this document.

MODIFICATION

The Datatron punch was modified to make it compatible with normal parallel interfaces:

1. A 5-volt power supply was added inside the cabinet, to power the Punch Interface Board. This power supply is powered from the output of the Datatron's 24-volt power supply. It connects to the Punch Interface Board via pins 1-3 of the 26-pin connector.
2. The interface board was modified as follows. (See the modified Punch Interface Board schematic at the end of this document.)

Operation	Location	Note
Cut	Trace to A4-11	Solder side, near A4-11
Cut	Trace to A4-8	Solder side, below via near A4-7
Cut	Trace to A4-5	Solder side, near A4-5
Cut	Trace to A4-13	Solder side, near A4-13
Jumper	A4-12 to A4-10	
Jumper	A1-6 to A4-13	
Jumper	C2-11 to J1-4	Use via near R1 for J1-4
Jumper	C3-9 to C3-12	
Jumper	C3-12 to A4-8	
Jumper	C3-11 to C4-2	
Jumper	C3-13 to C4-12	
Jumper	C2-4 to C3-10	
Jumper	C3-8 to J1-22	Use via near J1-22
Jumper	C2-10 to A4-11	
1K Resistor	C4-12 to C4-14	Solder side

3. A normally-open pushbutton switch was added from the new -FEED signal (pin 24 of the 26-pin connector) to ground (pin 23 of the 26-pin connector). This switch allows the user to feed the paper tape, causing it to punch a stream of nulls.

The new 26-pin connector pinout is as follows. The right two columns show the pinouts for a DB25P cable connection to a MITS 88-4PIO and to a standard PC parallel port:

Datatron Pin(s)	Name	Dir	Function	88-4PIO DB25 Pin	PC Parallel Port DB25 Pin
1-3	+5V	In	+5 Volts	N/C	N/C
5	GND	-	Ground	6	18
Odd pins 7 to 17	GND	-	Ground	N/C	19-24
19,21,23	GND	-	Ground	N/C	N/C
4	-STROBE	In	Data Strobe	12	1
6	D7	In	Data bit 7	10	9
8	D6	In	Data bit 6	9	8
10	D5	In	Data bit 5	23	7
12	D4	In	Data bit 4	22	6
14	D3	In	Data bit 3	21	5
16	D2	In	Data bit 2	20	4
18	D1	In	Data bit 1	19	3
20	D0	In	Data bit 0	18	2
22	-READY	Out	Punch ready	11	11
24	-FEED	In	Punches nulls	Button	Button
25			N/C	N/C	N/C
26	TEST	Out	Connection test	N/C	N/C

-STROBE is an active-low data strobe to the punch. The data signals should be stable at the falling edge of -STROBE, and remain stable until the next falling edge of -READY.

-READY is an active-low handshake signal from the punch. -READY will go high at the falling edge of -STROBE, and also at every falling edge of the Epson Tape Punch's -Sync signal. -READY will go low at the rising edge of this -Sync signal.

Data bits D0-D7 should be written no more than 8 mS after the high-to-low transition of -READY.

Pulling -FEED low will punch 50 nulls per second until the signal is released. This is intended to be connected to a normally-open 'Feed' button on the Punch.

TEST can be used to test cable connectivity, but generally can be ignored (not connected).

Pin 25 was originally connected to ground, but was cut in a previous modification to the Punch Interface Board.

## EXAMPLE 8080 ASSEMBLY LANGUAGE DRIVER

```
*****
; Punch Subroutine
; On Entry: de = number of data bytes to punch
;           hl = starting RAM address for punch data
*****
PUNCH:      mov    b,m          ;get a data byte from memory
            call   PBYTE
            inc    h            ;bump memory pointer
            dcx    d            ;bump byte counter
            mov    a,d          ;test for completion
            ora    e
            jnz    PUNCH        ;loop until complete
            ret

;*****
; Subroutine to punch one byte. This subroutine assumes
; that the status port is a general-purpose input port.
; On Entry: b = character to punch
;*****
PBYTE:
; Wait for -READY to go inactive

PSYNC:      in     PSTAT        ;read port status
            ani    PRMASK       ;test output port-READY bit
            jz     PSYNC        ;wait for port to be not ready

; Synchronize to the leading edge of -READY

PWAIT:      in     PSTAT        ;read port status
            ani    PRMASK       ;test output port-READY bit
            jnz    PWAIT        ;wait for port to be ready

; Immediately punch the data

            mov    a,b          ;get character to punch
            out    PDATA        ;write it to parallel port
            ret

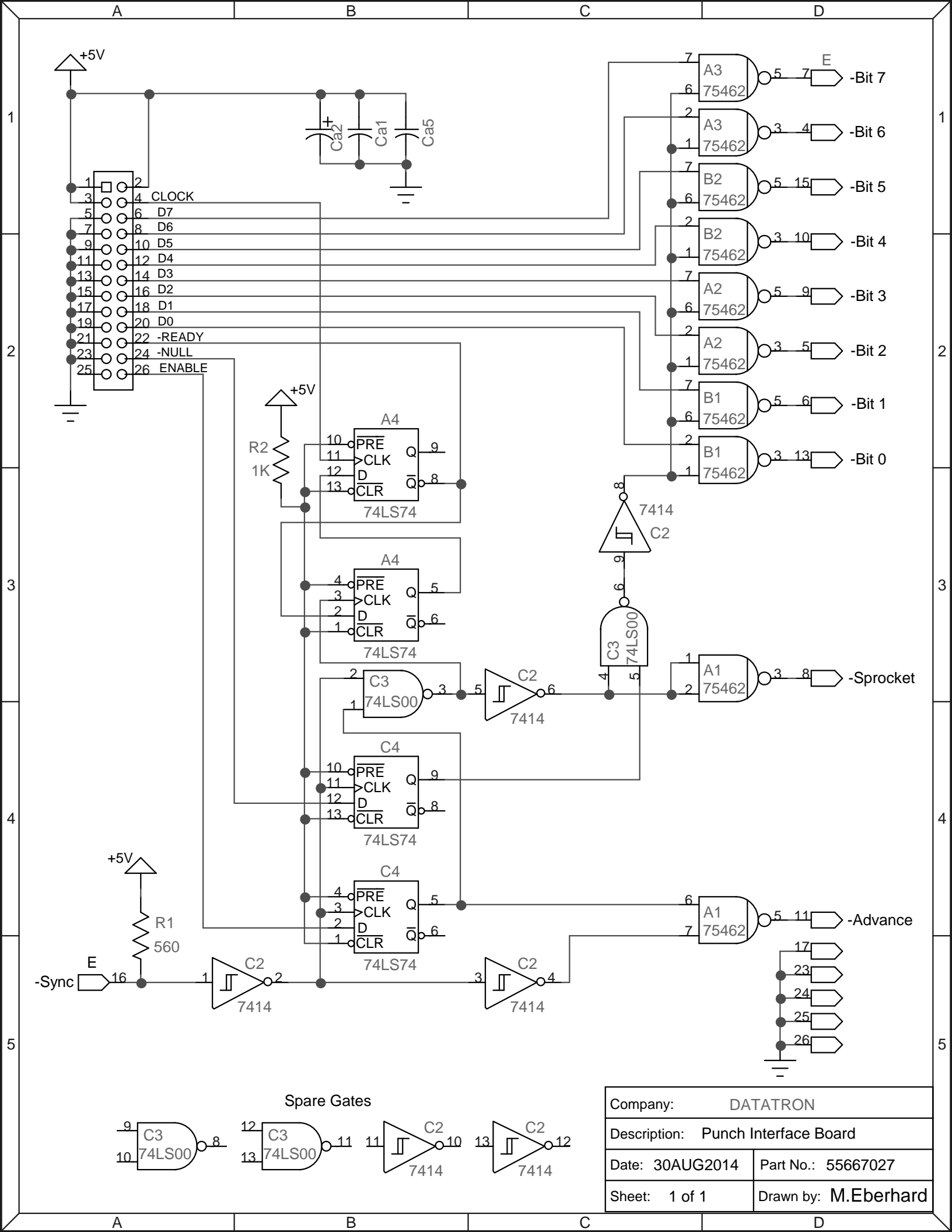
;*****
; Subroutine to punch one byte, for an 88-4PIO port
; On Entry: b = character to punch
;*****
PBYTE:      in     PDATA        ;Clear the 88-4PIO status port

; Synchronize to the leading edge of -READY

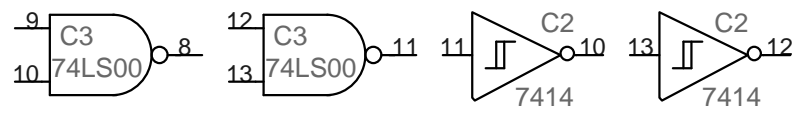
PWAIT:      in     PSTAT        ;read port status
            ani    PRMASK       ;test output port-READY bit
            jnz    PWAIT        ;wait for port to be ready

; Immediately punch the data

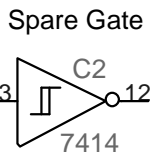
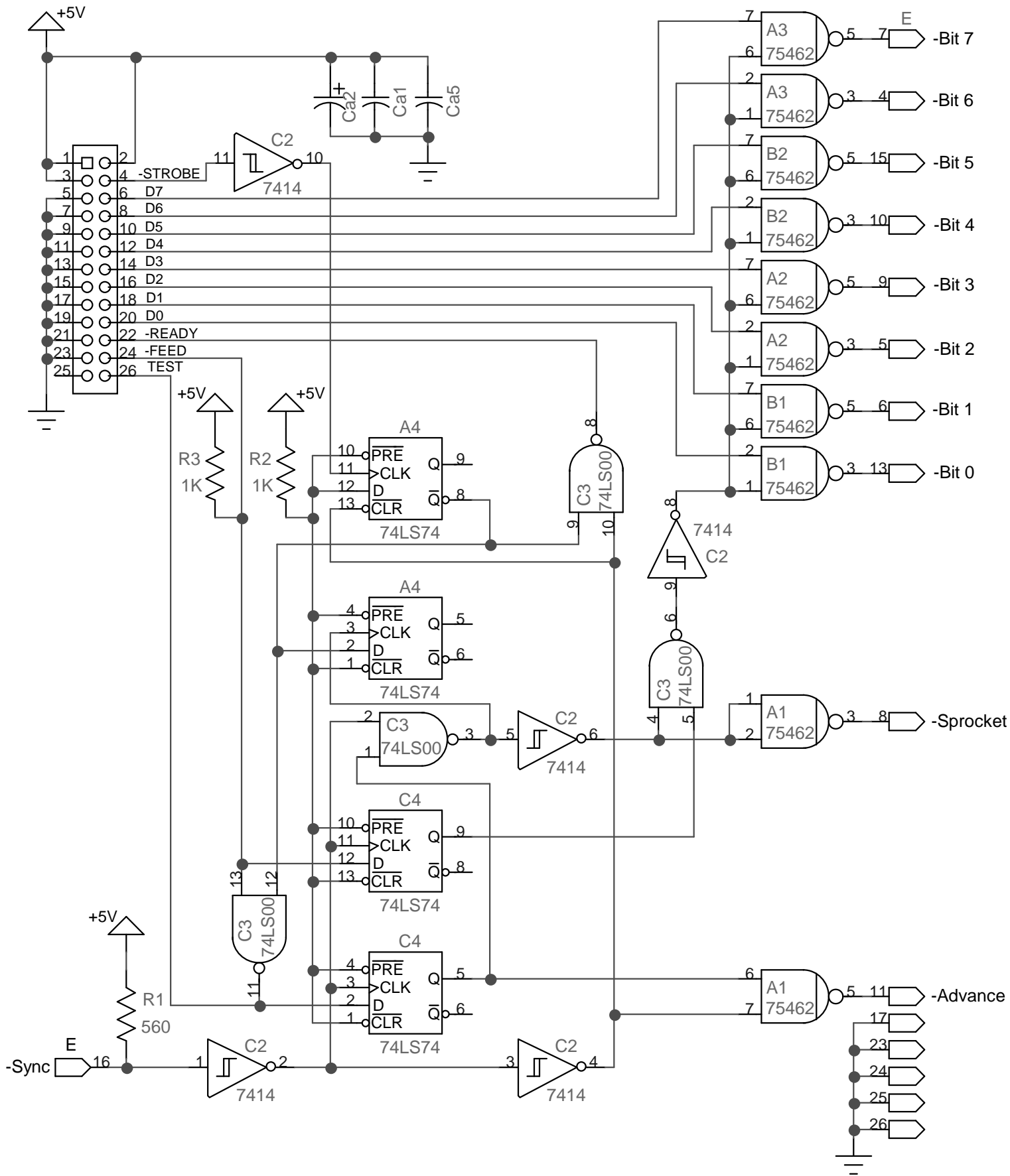
            mov    a,b          ;get character to punch
            out    PDATA        ;write it to parallel port
            ret
```



Spare Gates



Company: DATATRON	
Description: Punch Interface Board	
Date: 30AUG2014	Part No.: 55667027
Sheet: 1 of 1	Drawn by: M.Eberhard



Company: DATATRON	
Description: Modified Punch Interface Board	
Date: 30AUG2014	Part No.: 55667027-ME
Sheet: 1 of 1	Drawn by: M.Eberhard