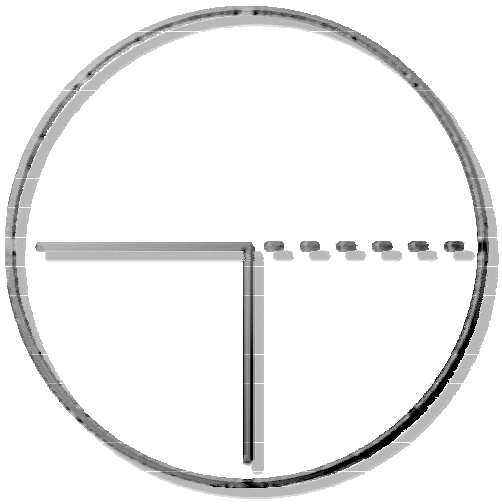


TORPEY TIME

CPU-7B/DSP-17

CLOCK DISPLAY/TIMER/TIMER DISPLAY

TECHNICAL INSTRUCTION MANUAL

First issue: Jan. 2003

Torpey Controls & Engineering Limited
98-2220 Midland Ave.
Scarborough, ON, Canada M1P 3E6
Tel. (416) 298-7788 Fax: (416) 298-7789
Toll-Free: 1-800-387-6141
E-mail: sales@torpeytime.com
Internet: www.torpeytime.com

CONTENTS

This Technical manual contains:

INTRODUCTION

The CPU-7B/DSP-17 TIME DISPLAY is a versatile unit that is designed to be mounted in a control console.

It can be used as 'slave' display of clock data as delivered from a central Master Clock system, as a self-contained UP Timer, or as a remote display of timer information sent by an external Master Timer.

On-board jumpers allow selection of these various functions.

It consists of a compact electronic board, which mounts an LED display board on one edge. The digits of the display are 0.56 in. high.

Power is derived from an external 9 volt power adapter, or optionally, from the console's 5 volt power supply. Both power and serial code input arrive on a 5-pin locking connector.

SPECIFICATIONS

When used as a Clock Display,
input Codes Accepted ……

SMPTE	as used by Leitch
EBU	European time code
ESE	TC 76 code
ESE	TC 89 code
ESE	TC 90 code
DQS	from Torpey and Dynaquip.
NPR	used by National Public Radio (U.S.)
NMEA	from Torpey GPS Master Clock
IRIG-B	TTL data code

Input Level ……..RS422 balanced, data line. (Minimum of 3 volts p-p).

Display Type ……. LED (light emitting diode) seven segments.

Display Size …… 0.56 in (14.2 mm.).

AM and PM Indicators ……. The AM indicator is at the top left corner of the display.
The PM indicator is at the bottom right corner.
(These will light only when jumper J7 is in place. See Section 4.)

Dimensions ……. Main board: 2.2 in deep x 3.3 in. wide.
Display board: 1.1 in x 4.4 in.

Power requirement ……..9V DC from external power adapter, or
optionally: 5V DC at 300mA.

INSTALLATION

Referring to the enclosed mechanical drawing, mounting holes are provided to allow easy installation in your console. A red acrylic bezel is recommended for the viewing window.

OPERATION AS A CLOCK DISPLAY

CODE SELECTION

Since the CPU-7B is designed to operate from many clock time codes, it is necessary to tell the processor which one to expect. Jumpers J9, J10, J11, and J12 are used. The following table defines these jumper positions.

CODE	J9	J10	J11	J12	USE
ESE **TC76**	OUT	**IN**	**IN**	OUT	For ESE master clocks
ESE **TC89**	**IN**	OUT	OUT	OUT	For ESE master clocks
ESE **TC90**	**IN**	OUT	OUT	**IN**	For ESE master clocks
DQS	OUT	OUT	**IN**	OUT	Torpey CLK-50 or Dynaquip master clocks
SMPTE	OUT	**IN**	OUT	OUT	For Leitch or Evertz master clocks
EBU	**IN**	**IN**	OUT	**IN**	European Time Code
IRIG-B	OUT	**IN**	OUT	**IN**	DC Level IRIG-B code
NPR	**IN**	**IN**	OUT	OUT	For the National Public Radio SOSS, or Torpey GPS-1 Master Clock System
NMEA	OUT	OUT	OUT	**IN**	For use with other GPS receivers

Your unit will normally come with the code selector jumpers set for the code as specified on the label attached to the packing material.

CODE CONNECTION

To check that the module is working, apply power to it without connecting the input code: the unit will start with its display at 00:00:00 (or at 12:00:00 depending on jumper J7), and run by itself, with its decimal points flashing.

DQS and SMPTE: For use with SMPTE or DQS code, the display will automatically adjust to the incoming polarity of the signal. Therefore, the polarity of the DQS or SMPTE signals is not a concern.

ESE: In the case of ESE codes, the code polarity must be respected because this code is normally distributed on unbalanced coaxial cable. THE CENTER CONDUCTOR OF THE COAXIAL BNC CONNECTOR GOES TO PIN 5 OF THE CONNECTOR, AND THE OUTSIDE COAXIAL SHIELD GOES TO PIN 4. If the ESE code is connected backwards, the display may show 'HELP 4' on its LEDs, or simply stop running.

NPR and NMEA: These codes are connected via telephone-style modular plugs, and will normally be supplied with the proper connection polarity for this system. When using the NPR code, see the addendum to this manual for set-up of your SOSS system to deliver time packets.

Once the serial code is correctly connected, the clock will display the decoded time, and the decimal points will stop flashing. If after running, the code is then interrupted for any reason, the decimal points will flash again, and the clock will continue to run on its own crystal.

WARNING: Flashing decimal points are an indication that the code has been disconnected.

CLOCK DISPLAY MODES

You can decide what time value will appear on the display. You have a choice of **time zone offsets**, including 30 minutes. 12-hour or 24-hour formats are also available.

The style and offset values are set by selectively installing jumpers (or closing a switch contact) at positions J1 to J8 on the circuit board. These jumpers are normally set at the factory (on certain products switches or external connections are provided so the customer may change the display).

When all jumpers are absent, the product will operate in the 24-hour mode, i.e. no offset from incoming code.

Jumper #8 acts as a leading zero blanking enable. When these pins are connected, hours values from 00 to 09 will appear as 0 to 9.

Jumper #7 converts the incoming code to 12-hour base, with AM and PM indicators lighting.

#6 adds 16 hours to the incoming code
#5 " 8 " " "
#4 " 4 " " "
#3 " 2 " " "
#2 " 1 " " "
#1 " 30 minutes " "

TIME OFFSETS

JUMPER 7654321	DISPLAY #1	COMMENTS
0000000	TIME 24 HR	NO CONVERSION
1000000	TIME 12 HR	
X000001	ADD 30 MINUTES	
X000010	ADD 1 HOUR	
X000100	ADD 2 HOURS	
X001000	ADD 4 HOURS	
X010000	ADD 8 HOURS	
X100000	ADD 16 HOURS	

For example:

The desired time display is in the 24-hour mode with zero blanking, but with a time offset (addition) of 5 hours:

Install: jumper #8 for leading zero blanking.
jumper #4 for an offset of 4 hours.
jumper #2 for an offset of 1 hour.

RESULT: 4 hours + 1 hour = 5 hours.

If a negative time offset is required, imagine that you are advancing the time display to the next day, so that, for example, if an offset of -3 hours is required, then advance the display by 21 hours (24-3). This case would call for J6 (16 hours), J4 (4 hours), and J1 (1 hour).
Result: 16+4+1=21.

OPERATION AS A TIMER

You can use the CPU-7B as an UP Timer, by placing jumpers at positions J9, J10, and J11.

External controls of START, STOP, and RESET are provided.

When the display is powered, the display will show *00.00.00* and allow the user to start, stop and reset a timer. (If J8 is inserted, the display will blank its leading zeroes. to show *.....0* instead.)

J1 is the Reset
J2 is the Start
J3 is the Stop

These functions simply require a momentary contact to circuit ground.

Operationally, if pushbuttons are wired to these three jumper positions, the following functions are available:

START (J2)	starts the timer running
STOP (J3)	stops the timer, and holds the count.
RESET (J1)	puts the count to zero. (00.00.00).
	If the timer is running, reset to zero and continue running.
	If the timer is stopped, reset to zero and wait for the start signal.

'SLAVE' TIMER DISPLAY

You can also use this unit as a **'slave' display from a Master Timer**, such as the Model STW-5.

With jumpers at positions J11 and J12 only, the unit will read the Timer code from the STW-5 timer, and display the value without the tenths-of-seconds. (The DSP-17 display board is made only for hours:minutes:seconds).

The only option offered to this mode is J8, which allows for leading zero blanking.

CIRCUIT DESCRIPTION

The CPU-7B/DSP-17 is made up of two circuit boards: a CPU-7B controller board and a DSP-17 display board. Each type of board is described separately in the following pages.

2.0 CPU-7B CONTROLLER

Please refer to drawing CPU-7B/2-1 Schematic for the following discussion.

2.1 CENTRAL PROCESSING UNIT

The Central Processing unit is the heart of the time display. The MCU (Micro Controller Unit, U1) executes a program stored as a series of instructions in its internal ROM. This program controls all aspects of the CPU-7B's function.

2.1.2 OSCILLATOR

C1, C2, and X1 are used in the oscillator circuit of the MCU (U1). The oscillator controls all the timing of the MCU.

2.1.3 POWER ON RESET AND WATCHDOG.

When power is first applied to the CPU-7B, U3 resets the MCU (U1), by putting a momentary HI on U1-9.

It also acts as a 'watchdog' circuit. Pin U3-7 needs to be continuously triggered by the processor from U1-39 (DS1), or else its output U3-5 will go HI and reset the processor at U1-9.

2.2 SERIAL DATA RECEIVER

The serial data receiver takes a balanced signal and converts it to a level suitable for the MCU (U1). The received input code is then available to the processor at U1-10 and at U1-12.

R10, R11, C7, and U4 form a serial data receiver.

2.3 DIGIT SELECTS

The MCU (U1) activates P0.0 (pin 39) through P0.5 (pin34) when a digit is to be activated. U2 inverts and buffers this signal to the display board connector. R9 is a pull-up resistor network for these signals.

2.4 DISPLAY SEGMENT DRIVERS

Parallel segment data is presented by the MCU on port 2, pins 21 to 28. The parallel data is delivered through R1 to R8, to Q1 to Q8 respectively, which invert this signal and drive the segments of the LED's via the display board connector.

3.0 CODE SELECTION

Since the CPU-7B is designed to operate from many input codes, it is necessary to tell the processor which one to expect.

Jumpers J9, J10 are wired to the MCU port P0.6 (pin 33) and P0.7 (pin 32) while J11 and J12 go to P3.6 (pin 16) and P3.7 (pin 17). They are used to tell the processor which area of ROM memory to address, and thus which input code is expected.

DSP-17 DISPLAY BOARD

INTRODUCTION

The DSP-17 is a remote timer display board intended for use with the CPU-7 controller board. The display features 0.56 ins. LEDs for hours, minutes and seconds display.

Please refer to the schematic labeled DSP-17 for connection of the displays to the CPU-7B board.

TECHNICAL SUPPORT

If you require technical advice concerning the installation, setup, or repair of this unit, we may be reached during normal business hours (Eastern Time) at 1-800-387-6141.

* * * * *

ADDENDUM

SET-UP OF SOSS SYSTEM FOR NPR CODE

In order for any Torpey Clock to operate on the National Public Radio system, it must receive Time Packets from the SOSS system, which is communicating with NPR headquarters, and receiving this data (among others).

It is necessary to ensure that the Time Packets are sent on the Control Bus, by running the SETUP program of your SOSS system.

To do this:

1. Double-click on the SOSS icon of your OS2 computer's screen.
   (The picture of the satellite dish)

2. Double-click on SETUP as a choice on the screen.

3. Log on using your security code (if applicable).

4. Click on 'Edit' in the Setup menu. (or use ALT-E).

5. Select 'General Parameters' from this menu.

6. The resulting screen offers a list of options. The second line of this screen is:

   ☐ Send Time Sync Packet Out Control Bus.

   Click on this box to select this option.

   Click on OK to save this, and return to the Setup Editor.

7. Double-click on the top left corner box of this screen to exit.

As a result of this action, your system is operating exactly as it was before, but with Time Packets sent approx. every ten seconds, interspersed with the control data.

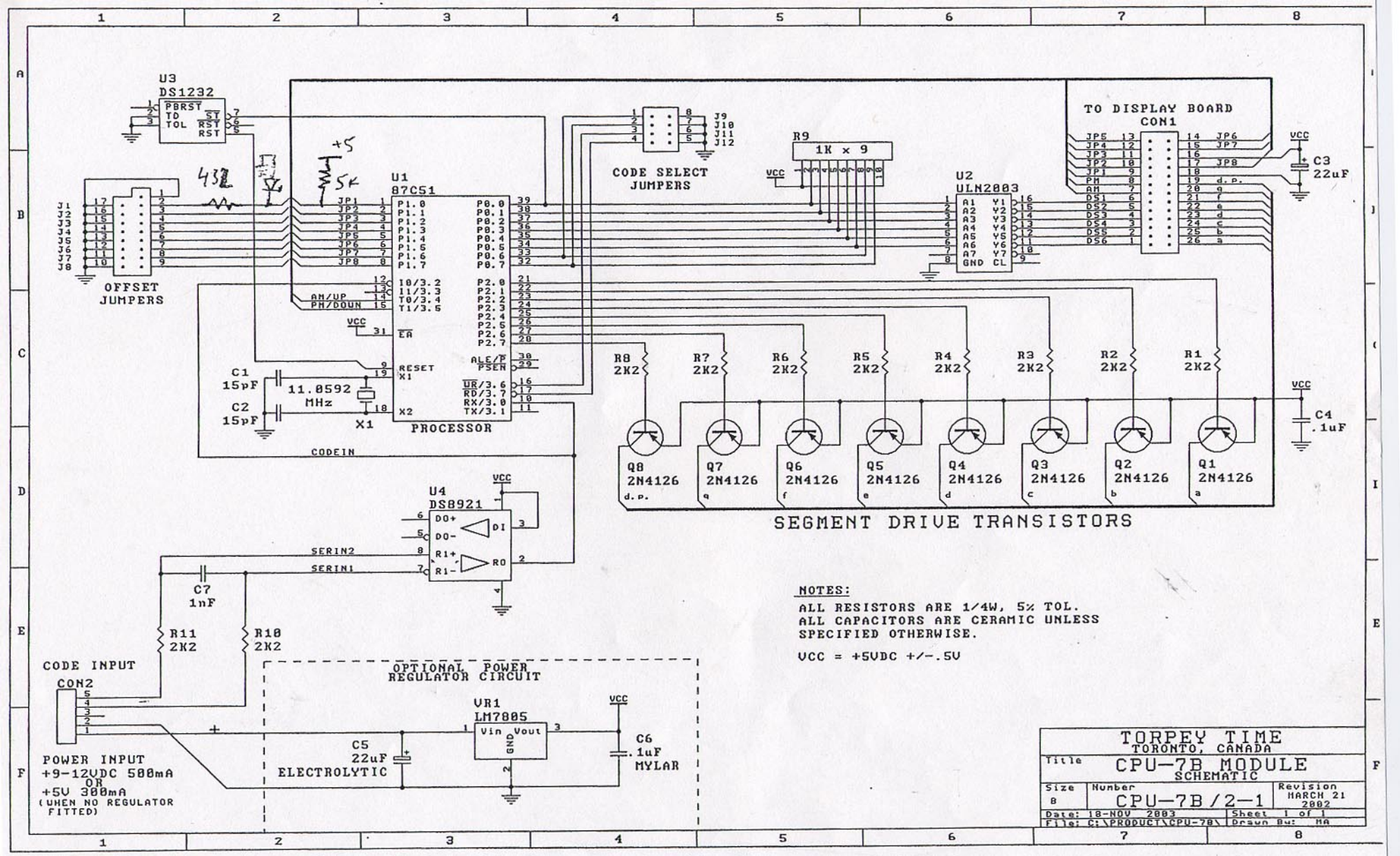
You are now ready to install your Torpey NPR Clock. Choose a convenient location, plug in the power adapter, and connect the telephone-style modular plug to your NPR Control Bus.

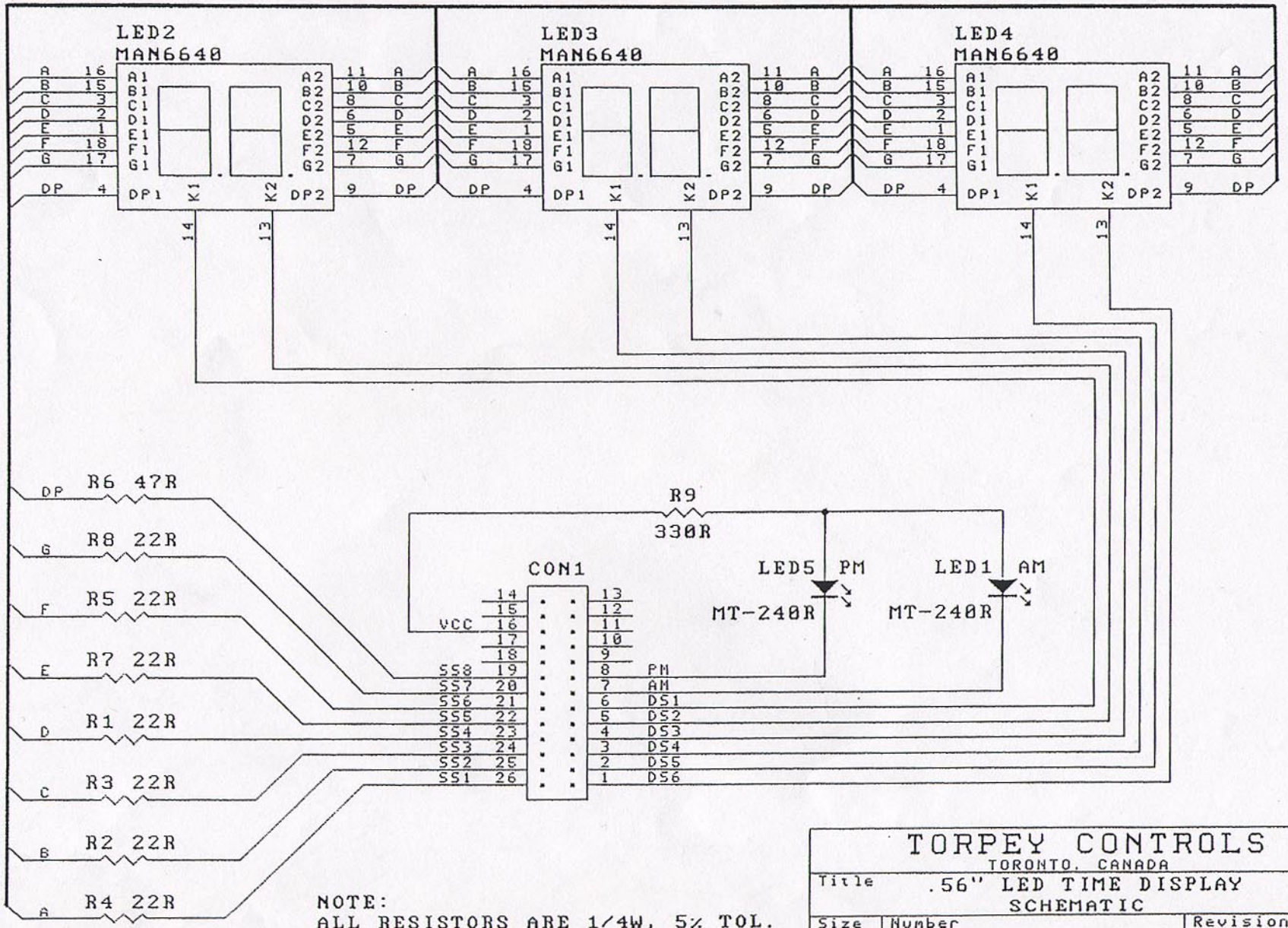
When the unit is first powered up, it will begin counting from 00:00:00, with its colons flashing. After a few seconds, it will receive its Time Packet, and set itself to that time. The colons will stop flashing.

NOTE: If the time shown is not in your time zone, or if you desire conversion from 24-hour to 12-hour standard, then consult Section 4 of this manual for Time Offsets.

The unit is delivered to operate in the 24-hour mode of operation. That is, whatever is sent from the SOSS is displayed.

NOTE: IF THE COLONS OF THE DISPLAY BEGIN TO FLASH AFTER THE UNIT IS SYNCHRONIZED, THIS IS AN INDICATION THAT THE UNIT HAS NOT RECEIVED A TIME PACKET FOR OVER A MINUTE, AND IS RUNNING FROM ITS CRYSTAL FREQUENCY AS A REFERENCE. CHECK THAT YOUR MODULAR PLUG IS STILL CONNECTED TO THE CONTROL BUS, AND THAT NOTHING HAS DISTURBED THE SOSS SETUP.


U3
DS1232
PBRST
TD
TOL
ST
RST
RST
+5
5K
U1
87C51
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P0.0
P0.1
P0.2
P0.3
P0.4
P0.5
P0.6
P0.7
P2.0
P2.1
P2.2
P2.3
P2.4
P2.5
P2.6
P2.7
I0/3.2
I1/3.3
T0/3.4
T1/3.5
AM/UP
PM/DOWN
EA
RESET
X1
X2
ALE/P
PSEN
WR/3.6
RD/3.7
RX/3.0
TX/3.1
PROCESSOR
OFFSET
JUMPERS
CODE SELECT
JUMPERS
R9
1K x 9
U2
ULN2803
TO DISPLAY BOARD
CON1
C3
22uF
C4
.1uF
C1
15pF
C2
15pF
11.0592
MHz
X1
CODEIN
R8
2K2
R7
2K2
R6
2K2
R5
2K2
R4
2K2
R3
2K2
R2
2K2
R1
2K2
Q8
2N4126
d.p.
Q7
2N4126
g
Q6
2N4126
f
Q5
2N4126
e
Q4
2N4126
d
Q3
2N4126
c
Q2
2N4126
b
Q1
2N4126
a
SEGMENT DRIVE TRANSISTORS
U4
DS8921
DO+
DO-
R1+
R1-
DI
RO
SERIN2
SERIN1
C7
1nF
R11
2K2
R10
2K2
CODE INPUT
CON2
POWER INPUT
+9-12VDC 500mA
OR
+5V 300mA
(WHEN NO REGULATOR
FITTED)
OPTIONAL POWER
REGULATOR CIRCUIT
VR1
LM7805
Vin
Vout
GND
C5
22uF
ELECTROLYTIC
C6
.1uF
MYLAR
NOTES:
ALL RESISTORS ARE 1/4W, 5% TOL.
ALL CAPACITORS ARE CERAMIC UNLESS
SPECIFIED OTHERWISE.
VCC = +5VDC +/-.5V
TORPEY TIME
TORONTO, CANADA
Title
CPU-7B MODULE
SCHEMATIC
Size
B
Number
CPU-7B/2-1
Revision
MARCH 21
2002
Date: 18-NOV 2003
Sheet 1 of 1
File: C:\PRODUCT\CPU-7B\
Drawn By: MA



NOTE:
ALL RESISTORS ARE 1/4W, 5% TOL.
VCC = +5VDC

TORPEY CONTROLS TORONTO, CANADA		
Title: .56" LED TIME DISPLAY SCHEMATIC		
Size: A	Number: DSP-31/2-1	Revision: MARCH 19 1999
Date: 17-JUL 2000		Sheet 1 of 1
File: \product\dsp-31\ds		Drawn By:RAS/RJT/MA