GRC TBC-11 SPECIFICATIONS

October, 1978

SYSTEM FUNCTIONS

TERMINATOR

The last card in a Q-bus backplane must be a terminator. The TBC provides a 220 ohm impedance termination for the bus.

POWER SEQUENCING

The power signal generation circuit provides proper powering up and powering down of an LSI-11 system. In addition, systems with non-volatile memory (i.e. core) can provide handling of power interruptions. For such systems, a power-fail software routine can save the contents of the stack pointer register, the processor status word register, the general purpose register, and other device registers which the user desires saved. A power-up software routine, which is part of the power-fail software, will restore the saved registers when the system is initialized.

PROM BOOTSTRAP

Space is provided for two 8-bit PROMS to be used for a bootstrap. Their addressing is set to respond to 173000(8) with a window of 256(10) words. The window size may be changed to 512, 1024, or 2048 words and the address may be placed at any multiple of the window size starting at zero by modifying a set of jumpers on the board. Proms of the 2704/2708/2716 family or equivalent may be used.

CONSOLE PANEL

The TBC contains logic to interface an external SPDT switch to provide the Halt/Run Enable function. The TBC will also drive an incandescent or (optional) LED lamp to indicate when the processor is "Running" (i.e. fetching instructions). Optional console panel functions are a manual line time clock On/Off switch and a LED type "DC On" indicator.

PROGRAMMABLE LINE TIME CLOCK

Sometimes called Real Time Clock, the line time clock, when activated, generates an interrupt on the Event line, synchronized to the AC line frequency. The clock is automatically turned on by software during the bootstrap in version 3 of RT-11 operating system. Options available are external clock input, external clock turn-on, and interrupt line rather than Event line stimulation.

RT-11 V03 turns on the clock automatically. Version 2 does not. To turn it on:

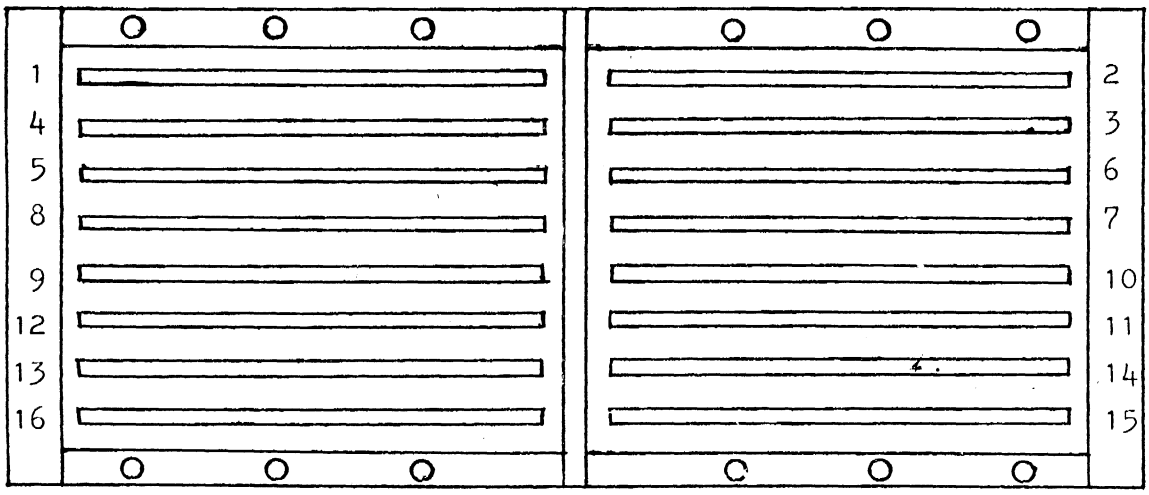
1. Boot the system
2. Halt the system
3. Access location 177546
4. Insert the value 100
5. Type "P" to continue

The LTC requires 28VAC-center tapped with the center tap connected to ground. Power should be connected to pins BC1 and BE1 on one side of the quad backplane, and correspondingly to pins DC1 and DE1 on the other side. It can also be connected at PC foil pads at the front of the board, labeled J1-1 and J1-2. The current requirement is about 15 ma.

The LTC control register is at octal address 177546 with contents as shown below.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	MON	IE	S	0	0	0	0	0

BITS	DESCRIPTION
15-8	Zero - Not used
7	MON - Monitor is set when a line time clock (LTC) pulse has occurred (every 16.67 ms for 60 Hz and 20 ms for 50 Hz). Reset by being read and BINIT. Read only.
6	IE - Interrupt Enable, when set, enables interrupts from LTC. Interrupt is generated on either the BEVNT L line or the BIRQL line, depending on the state of bit 5. Reset by writing a "0" or by BINITL. Read/write.
5	S - Select, when set along with bit 6 and an interrupt occurs, activates the BIRQL line. A vector of 100(8) is generated when the processor responds. When reset, under the same conditions as above, the BEVNTL line is activated. Set by writing a "1" into it. Reset by writing a "0" or by BINITL. Read/write.
4-0	Zero - Not used.



BACKPLANE

TBC Placement

Boards should be placed in the backplane in such a manner that backplane continuity is preserved. This requires that the slots be filled in order starting from the upper left and proceeding downward in a zig-zag pattern with the TBC as the last board. See figure.

Jumper Options

To disable the addressing for the PROM sockets, jumper G39-G40 must be cut. (This jumper normally sets the address range.)

The following tables indicate which jumpers (Gxx) should be in place for PROMs and other options. Use Tables 2 and 4 to set the PROM starting address and address range, Table 3 to set the window size, and Table 1 to set the power. Use Table 5 to convert the Line Time Clock from automatic to manual turn-on, or from internal line frequency to externally generated clock. An external line clock can be connected through J2 pin 4 or backplane pin BK1.

Table 1

Power Options For Proms	G28, G29	G29, G30	G25, G26	G26, G27	
2704	In	Out	In	Out	
2708	In	Out	In	Out	
82S2708	Out	Out	Dc	Out	*
2716	Out	In	Out	In	

Dc=Don't care

Table 2

Prom Starting Address	G1, G2	G2, G3	G4, G5	G5, G6	G7, G8	G8, G9	G10, G11	G11, G12	Notes	
00XXXX	Out	In	Out	In	Out	In	Out	In		
01XXXX	Out	In	Out	In	Out	In	In	Out	1,2	
02XXXX	Out	In	Out	In	In	Out	Out	In	2	
03XXXX	Out	In	Out	In	In	Out	In	Out	1,2	
04XXXX	Out	In	In	Out	Out	In	Out	In		
05XXXX	Out	In	In	Out	Out	In	In	Out	1,2	
06XXXX	Out	In	In	Out	In	Out	Out	In	2	
07XXXX	Out	In	In	Out	In	Out	In	Out	1,2	
10XXXX	In	Out	Out	In	Out	In	Out	In	1,2	
11XXXX	In	Out	Out	In	Out	In	In	Out	1,2	
12XXXX	In	Out	Out	In	In	Out	Out	In	2	
13XXXX	In	Out	Out	In	In	Out	In	Out	1,2	
14XXXX	In	Out	In	Out	Out	In	Out	In		
15XXXX	In	Out	In	Out	Out	In	In	Out	1,2	
16XXXX	In	Out	In	Out	In	Out	Out	In	2	
17XXXX	In	Out	In	Out	In	Out	In	Out	1,2	*

XXXX=See table 4. * Normal factory setting

Notes: 1. Starting address not available for 2708, 2716, etc, with window size of 1024. See Table 2. (Both G10-G11 and G11-G12 out)

2. Starting address not available for 2716, etc., with window size of 2048. See Table 2. (G10-G11, G11-G12, G7-G8 and G8-G9 out)

Table 3

Prom Wind	G13, G14	G14, G15	G16, G17	G17, G18	G17, G19	G19, G20	G20, G21	G20, G22	G31, G32	G32, G33	G42, G43	G43, G44	G46, G47	G47, G48	Used
256	In	Out	Out	In	Out	Out	In	Out	Out	In	In	Out	In	Out	Boot
512	Out	In	Out	In	Out	Out	In	Out	In	Out	Out	In	Out	In	2704
1024	Out	In	In	Out	Out	In	Out	Out	In	Out	Out	In	In	Out	2708
2048	Out	In	In	Out	In	Out	Out	In	In	Out	Out	In	In	Out	2716

Boot = Normal factory setting

Table 4

Prom Address Range	G37, G39	G38, G39	G39, G40	G39, G41	When Used	
XX1000--XX1776	In	Out	Out	Out	--	
XX3000--XX3776	Out	In	Out	Out	Boot	*
XX5000--XX5776	Out	Out	In	Out	--	
XX7000--XX7776	Out	Out	Out	In	--	
XX0000--XX1776	In	Out	Out	Out	2704	
XX2000--XX3776	Out	In	Out	Out	2704	
XX4000--XX5776	Out	Out	In	Out	2704	
XX6000--XX7776	Out	Out	Out	In	2704	
X00000--X03776	In	Out	Out	Out	2708	
X04000--X07776	Out	In	Out	Out	2708	
X10000--X13776	Out	Out	In	Out	2708	
X14000--X17776	Out	Out	Out	In	2708	
X00000--X07776	In	Out	Out	Out	2716	
X10000--X17776	Out	In	Out	Out	2716	
X20000--X27776	Out	Out	In	Out	2716	
X30000--X37776	Out	Out	Out	In	2716	

* Normal factory setting

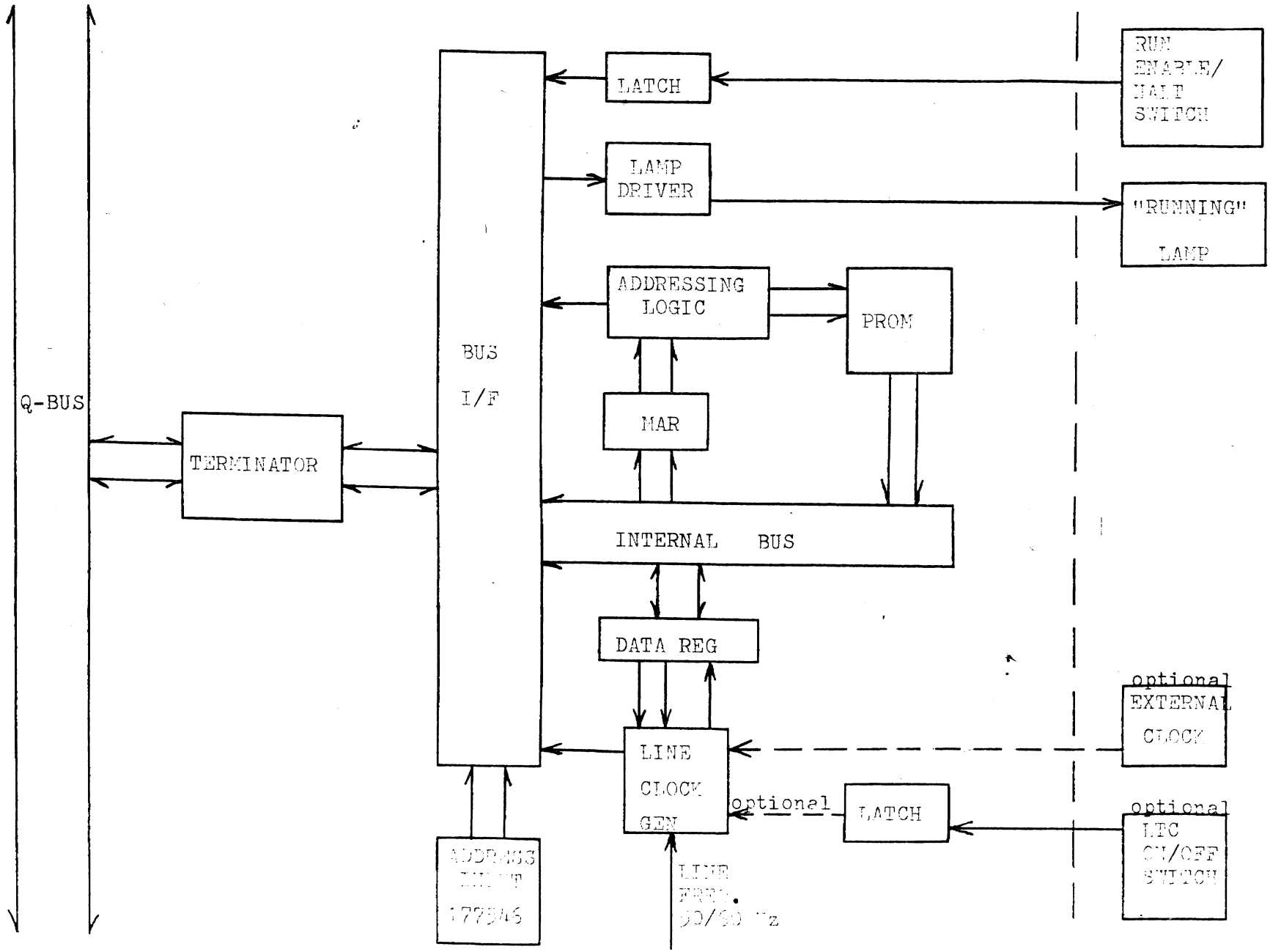
Table 5

Misc. Otions	Jumpers In	Out	
Auto Ltc.	G52, G53	G53, G54	*
Manual Ltc.	G53, G54	G52, G53	
Int. Ltc.Clk.	G49, G50	G50, G51	*
Ext. Ltc.Clk.	G50, G51	G49, G50	
For "RUN" light being LED	Cut run between pads R16 and add 47 ohm 1/4W resistor.		

* Normal factory setting

Cable Pinouts:

J2 pin #:
1. LTC manual switch "on" position
2. Run-Enable/Halt switch "Run" position
3. Run-Enable/Halt switch "Halt" position
4. External clock
5. 5 volts
6. no connection
7. DC-on light wired for LED
8. LTC manual switch "off" position
9. Running light, incandescent or LED (LED requires change as per Table 5)
10. Ground


Q-BUS
TERMINATOR
BUS
I/F
LATCH
LAMP
DRIVER
ADDRESSING
LOGIC
PROM
MAR
INTERNAL BUS
DATA REG
LINE
CLOCK
GEN
optional
LATCH
RUN
ENABLE/
HALT
SWITCH
"RUNNING"
LAMP
optional
EXTERNAL
CLOCK
optional
LTC
ON/OFF
SWITCH