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*   *
*   LP 1342 LIST PROCESSOR   *
*   *
*   512K OR 1024K, 7 TRIGGER VERSION   *
*   *
*   TECHNICAL MANUAL   *
*   *
*   AND PROGRAMMING INSTRUCTIONS   *
*   *
*   *
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ENGINEERING NOTICE

FURTHER IMPORTANT ENHANCEMENTS TO LP 1341/2 LIST PROCESSOR

As the result of continuing improvement of Hytec's products, another new artwork for the LP1341/2 has been produced, Issue 4.

The aims of this revision are as follows: -

a) To incorporate minor corrections to the Issue 3 artwork, which have no effect on the characteristics of the unit.

b) To make two distinct changes to the design in line with customer requests for enhancements, namely: -

i) More data memory: the unit can now accept bigger memory chips, so that it may have up to 1 megaword by 24 bits of data memory.

ii) Programmable self-trigger rate. The old scheme gave the user two internal trigger frequencies selected by jumpers, which were virtually useless. These have been deleted and replaced by a divided crystal oscillator capable of outputting a variety of frequencies from 0.005 Hz to 600 KHz.

The LP 1341 is still produced by Hytec using this board, with the smaller memory chips, giving 128K or 256K words of data memory, and without any self-trigger facility.

A new unit, called the LP 1342, is now offered by Hytec, using this board, which has larger memories of 512 or 1024K words, and the new programmable self trigger scheme. However, the self trigger feature makes use of the comparator register to store the desired frequency value, which means that operationally, you cannot use both functions, just one at a time.

This manual concerns itself ONLY with the board built as an LP 1342.

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1. Introduction

This manual is really aimed at people who have already used the LP1340 List Processor or the T7 (seven trigger) variant and are familiar with the basic principles of operation of Auxiliary Controllers in CAMAC Crates. Those who do not have that experience should read the data sheet and this manual very carefully before making a start. The best way to find out how to operate this module is to start with the example given and then progress from there. Section 7 contains a lot of valuable information about the possible pitfalls in setting this device to work and some more detailed information about how the hardware actually works.

Users of the LP1340/T7 will find that this unit will run the same software as that unit, except that bits 5-8 of the LAM registers will always be read as '1' by the commands F(1) A(12,13,14), so they should be masked off by software.

After you have studied the data sheet on the module, this manual will outline the basic principles of operation of the unit, what options are available and how it differs from its predecessor, the LP 1340.

The major differences between this unit and the LP 1340 are as follows: -

a) Larger Memories:

Data Store is 512K x 24 bits, optionally 1024K

Instruction Store is 8K x 16 bits and can be EEPROM.

b) New Jump Instruction Format:

The new Jump Instruction Format is as follows:

```
|16 |15 |14 |13 |12 |11 |10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

 1   1  JC2 JC1 JC0  A11                                      A1
  \ /    |   |   |    \__________                __________/
  JUMP    \     /             DESTINATION ADDRESS
            \/
     JUMP CONDITION SPECIFIERS
```

The Jump Condition Specifiers operate as follows: -

JC2	JC1	JC0	ACTION
0	0	0	Unconditional Jump
0	0	1	Jump if No Q response during last CAMAC cycle
0	1	0	Jump if data read greater than stored value
0	1	1	Jump if data read less than stored value
1	0	0	Jump unconditionally and await trigger
1	0	1	Jump if No Q and await trigger
1	1	0	Jump if data read equal to stored value.
1	1	1	Jump (unconditional) and restore Write Data Pointer.

The "Stored value" referred to above means the data written into the LP 1342's Comparator Register [F(17) A(3)] which can then be compared with actual Read Data obtained by the LP 1342 during the last dataway READ command it performed. This feature CANNOT be used if the programmable trigger is in operation [see f) below].

c) The List Processor may now read its own Instruction Pointer.

A modification has been incorporated to allow the LP1342 to read its own Instruction Pointer so that blocks of read data from different triggers can be distinguished by incorporating a "Read Instruction Pointer" command as the first in each list. The Q response to F(1) A(0) has been changed to Q=1 for this command so that the data read is retained.

d) Multiple Trigger Inputs.

The LP 1342 has seven trigger inputs via a front panel 9-way Cannon connector, which invoke a "bootstrap" program [see sect. 5] which results in an internal jump to the start of the chosen list. As we shall see later, one of the triggers (Trigger 1) may be used in the same way as the old LP1340 trigger, also, the LEMO Trigger input with its LAM links can still be used as Trigger 7.

e) The Control Register is NOT fitted.

This register, which used to work with the LP 1340's loop counter/comparator, is not fitted in the LP 1342 and is replaced by a data comparator, permitting "JUMP if Greater Than" type instructions. The "Jump and Await Trigger" function, formerly derived from a bit in the control register, is taken over by bits in the new Jump Instruction Format as seen above. This register is dual purpose, as it is used for the programmable trigger also.

f) Programmable Internal Trigger

If comparator operations are not needed, the register at subaddress A(3) can be used to control the on-board self-trigger using the bottom 6 bits. Fit jumper JP 29 and when triggers are enabled you can get the following frequencies applied to trig. 1.

[Bits 4,5 and 6 control a decade divider; bits 1,2 and 3 control a programmable 'divide-by-twelve' counter.]

Bits 6 5 4		Bits 3 2 1	
1 1 1	0.06 Hz	1 1 1	div. by 12
1 1 0	600 Hz	1 1 0	div. by 3
1 0 1	6 Hz	1 0 1	div. by 5
1 0 0	60 KHz	1 0 0	div. by 10
0 1 1	0.6 Hz	0 1 1	div. by 6
0 1 0	6 KHz	0 1 0	div. by 2
0 0 1	60 Hz	0 0 1	div. by 4
0 0 0	600 KHz	0 0 0	div. by 1

2. Configuring

Before the List Processor can be assembled into a CAMAC system, its operating mode must be decided, and its internal links set accordingly. These are as follows: -

JP1-JP23 Links to permit the appearance of a given LAM to start execution of a list of instructions. Note that this is "wire ORed" with the LEMO Trigger Input (front panel) and that use of both at the same time is inadvisable. In the case of the LP1342, this trigger input (and also the LAM triggers) are wired in as TRIGGER 7. JP1 connects in LAM1 and so on. Fit only one.

Note: All triggers are level sensitive. (Sect. 5)

Standard Setting: All OUT.

JP24,25,26 OVERFLOW SELECT

If any of these three links is fitted, then as soon as the TOP 8 or 16 BITS of the corresponding pointer reaches the "all ones" state, the LP1342 will stop, setting NO X and FINISHED as it does so. This therefore represents OVERFLOW WARNING. See also Section 7 (b).

JP24 selects the top 8 bits of the Instruction Pointer (Note that overflow is on all 16 bits, not just the 13 bits of the "real" 8K pointer).

JP25 selects the Read Data Pointer (Note that since the data memory is now 512K or even 1024K, both read and write data pointers are 24-bits, although only 19 or 20 bits have any real meaning. Thus overflow is on bits 9-24).

JP26 selects the Write Data Pointer

Standard Setting - All OUT

JP27/JP28 STOP/VETO

This determines the function of the Stop/Veto input as follows:-

JP27 - STOP. If the front panel input is taken low, the List Processor will stop after the current instruction, and set FINISHED and NO Q Status.

JP27/28 cont. JP28 - VETO. If the input is low at the time that the LP1342 advances to the next instruction, the relevant Data Memory Pointer will not be incremented (data will be ignored). Clearly this only applies if reads are being performed, and some external module is looking at data patterns and issuing VETO accordingly.

To be effective, the VETO input must be taken low no more than 500nS after the beginning of the LP1342's CAMAC Cycle, and should be held low until the end of that CAMAC cycle.

Standard Setting - JP 27 IN.

Note that in order to satisfy a number of applications where the absence of Q means "No Data Ready", this condition has been made an internal source of VETO (i.e. ignore data).

The effect of this will be to prevent the incrementing of pointers, which will mean that data will simply be ignored, when performing commands in Q Ignore Mode (either Reading or Writing), e.g. Selective Set LAM Mask, Read LAM Status.

If, therefore, your list will include instructions involving reading or writing without expecting Q=1 and you want the pointer(s) to increment, please contact Hytec for details of the required modification.

JP29 Self-Trigger Select. In = Self-Trigger Active, Out means Not Active, Register at A(3) may be used in Comparator Mode.

JP31 128K memory chip use only: do not fit.
JP32 512K memory chip use only, must be fitted.
JP33 128K memory chip use only: do not fit.
JP34 512K/1024K Memory Select.

JP34 IN - 1024K Memory
JP34 OUT - 512K Memory (512K memory mapped twice over 1024K area to allow proper overflow)

3. Detailed Operational Description

The List Processor LP1342 is an ACB Auxiliary Controller in accordance with EUR 6500. As such, it must reside in a CAMAC Crate, connected to an ACB Master Controller in stations 24 and 25 by a rear-panel 40-way ACB cable and a set of Request/Grant cables at the front. The user must connect Request to Grant In on the highest priority controller, and then Grant Out on that controller to Grant In on the next lowest priority device and so on.

It is left to the user to decide the order of priority of the controllers, bearing in mind their relative needs in terms of desired operating speed and importance of controlling actions. The LP1342 is capable of accepting and responding to ACL, but cannot generate it itself.

Having configured the LP1342, assembled the modules in the crate and connected up the ACB etc., the user can now switch on and program the LP1342 with its list(s) of commands and Write Data (if any) as follows: -

Test Booked F(27) A(0) - This tells you if the List Processor is available or not. If you get Q, OK to proceed. The List Processor is now booked to you and will give NOT Q to all subsequent Tests by other potential users. The LP 1342 will not GO unless it has been BOOKED.

FROM NOW ON WE ARE GOING TO CONSIDER THE PROGRAMMING OF THE LP1342 AS A "STANDARD" LIST PROCESSOR, FOR THE DETAILS OF HOW TO USE THE SEVEN TRIGGERS, SEE SECTION 5.

Write Instruction Pointer - F(17) A(0) - To point to the start of the list of instructions you are going to write into the Instruction Store.

Write Instruction Store - F(16) A(0) - Write a sequence of NAFs into the Store at incrementing addresses (this happens automatically); not necessary, of course, if they are already programmed in and you are just going to execute them again.

Finish with either a STOP instruction, or a JUMP instruction. Don't forget to add the Q IGNORE bit to any command where the module in question will only give X but not Q in valid circumstances. If you do not do this, the LP1342 will repeat the command for about 10 uSec and then STOP, setting the NO Q status bit.

Write Instruction Pointer again, to point to List Start. Remember that for seven trigger operation, this must be at zero since that is where the "bootstrap" jump instructions should be loaded. For "normal" operation, with dataway GO or Trigger 1, you can start anywhere.

Write Write-Data Pointer - F(17) A(1) - Point to the beginning of an area of data memory into which you are going to put Write Data to be used by the LP1342 when it executes a command involving F16 and not F8.

Write Data Memory using Write Pointer - F(16) A(1) - Writes a sequence of data words into Memory (pointer auto-increments).

Write Write-Data Pointer again to point at the start.

Remember that you can use the "Jump and Restore Write Pointer" command to re-use a set of 'constant' or 'setup' data.

Write Read-Data Pointer - F(17) A(2) - To point to the start of the area of data memory to be used to store data read from modules during valid instructions which had neither F16 nor F8 present AND which gave a TRUE Q Response.

Clear LAM Status Register (All bits) - F(23) A(12) - data 'F' HEX to clear the GO bit and any other status bits set by the previous sequence.

Clear LAM Mask Register (All bits) - F(23) A(13) - data 'F' HEX again, then:
Selective Set LAM Mask Register - F(19) A(13) - using appropriate bits to allow End status conditions to generate an Interrupt via LAM.

3.1 Starting

The List Processor is now ready to be started. In the "STANDARD" mode we are discussing now, this can be done in two ways; either by selectively setting the GO bit, bit 4, in the LAM Status Register (F(19) A(12)), or by Enabling Trigger - F(26) A(0) and giving the module an active LOW TTL trigger pulse on TRIGGER 1 via the front panel 9-way Cannon Trigger Input socket. Note that Trigger 1 causes the LP1342 to look at the instruction it is pointing at and if it is NOT a jump instruction, it will start executing commands as usual. In this way it can be made "Compatible" with existing LP1340 units. Having been placed in the "GO" condition by either of these means, the LP1342 will start doing CAMAC cycles at high speed (about 1.5 uSec each if "unopposed") until it reaches a Stop condition.

The command Test GO/Trig Enb. - F(27) A(1) - can be used to test whether the List Processor is Running or Awaiting Trigger. In either case, it would be disastrous for a computer to attempt to access the LP1342's internal registers at this time. Note that because the List Processor runs so fast, it is quite possible that if you tell it to GO, by setting bit 4 in the Status Register, then by the time you come back to ask it if it is running, it will have finished!

Whilst Execution is in progress, it is in fact possible to access all the internal registers of the LP1342 and some users successfully do this, although the data sheet implies that this is not so. This is because some of the commands to be "excluded" do not generate Q anyway, so that the only way to signal their nonacceptance would be to give NO X. This is thought to be at best misleading.

Reading the LP1342's LAM Status Register whilst execution is under way will show 8 bits of data. The bottom 3 bits (the End condition bits) should all be zero; bit 4 should be a '1' if you set it to start, (this does not happen if the LP is Triggered); bits 5 to 8 will all be read as '1' and they should be ignored.

3.2 Stopping (See also the IMPORTANT NOTE - Page 11).

There are a number of ways in which execution of a list of instructions can be terminated, as follows: -

Stop Instruction: An instruction was encountered with bit 16 set and bit 15 not set. The LP1342 stops, resets its internal GO flag (not the GO bit in the Status Register) and sets the Finished bit (bit 3) in the Status Register. The Instruction Pointer will be pointing to the Stop Instruction, and the Read and Write Pointers will be pointing to the location ABOVE the last one used.

Overflow: When the top 16 bits of the Read or Write Pointer or the top 8 bits of the Instruction Pointer selected by one of links 24, 25 and 26 has reached the all 'ones' state, the LP1342 will stop, reset its GO flag and set Finished and NO X. The pointers will not be incremented following the last instruction. The LP1342 stops, therefore, pointing to the last instruction executed and not having incremented either of the two Data Pointers. This is true of all stop conditions from here on.

External Stop: If JP 27 is IN and the Stop/Veto input is pulled low, then at the end of the current instruction, the LP1342 will stop, set Finished and NO Q and reset its GO flag.

NO X Abort: If the LP1342 does not get an X response during a CAMAC cycle (sampled at S1 time), it will stop, set NO X and reset its GO flag.

Q Repeat Fail or Time-out: If the LP1342 does not get Q to a Command and the Q Ignore bit (bit 15) is not set in the instruction, then it will repeat that instruction until either it does get Q, or the 10 uSec timer expires. The Time-out period is set internally by a capacitor, C5, whose standard value is 3n3. Apart from failing to get a good Q response from a module, there is one other way in which a Time-out can occur, which is the failure of the List Processor to gain control of the Crate through the ACB (someone is "hogging" the bus, or a wrong connection) within 10 uSec.

The effect of a Time-out is to stop the LP1342, which resets its GO flag and sets the NO Q Status bit.

When the List Processor has Finished, check that the finishing conditions are correct by reading the LAM Status Register - F(1) A(12) - then, if you wish, check that the pointers are as expected (i.e. that the right number of cycles of each type took place), then read out the data collected, if any. To do this, you must obviously reset the Read Pointer to its original value - F(17) A(2) - and then read out the data sequentially with F(0) A(2). This will auto-increment the pointer.

It is possible to read out data whilst the list processor is running by using the Write Data Pointer, but clearly that means that you cannot do any writes with the LP1342, and also that you must not read the data out faster than it is being collected. Note that the act of reading this data out concurrently will reduce the overall execution rate of the list processor because it will be sharing use of the CAMAC Dataway with the read-out controller.

Having accomplished all this, you can either perform another sequence with the List Processor, or un-book it so that another computer can use it if it wishes. The command to do this is RESET - F(25) A(15) - which does the following :-

Reset BOOKED Flag
Reset all LAM Status and Mask bits
Reset Trigger Enable, Triggered Flag and GO Flag
Reset Main Logic Sequencer and Trigger Input Logic

Z.S2 does all the above, plus: Reset all Pointers to zero.

Power-on Reset has the same effect as Z.S2.

The List Processor is now free to accept another Test Booked Command.

IMPORTANT NOTE: Stopping in Triggered Mode.

The GO state of the List Processor is the logical OR of the following:

a) The output of the GO flip flop, set by a '0' to '1' transition on bit 4 of the LAM Status Register, and

b) The output of the "Triggered" flip flop, set by a '1' to '0' transition on a trigger signal, if triggers are enabled.

When the List Processor's state machine detects a Stop condition, and in this case we are thinking primarily of a "Pointer Overflow" condition, it resets both of the above flip-flops and then sets the appropriate LAM Status Register bits to show why it stopped.

After it has done this, and if Triggers are Enabled, the reception of another trigger will cause the LP1342 to examine the state of the overflow flag, and if it is true, it will go through the procedure for stopping on overflow, that is set the relevant LAM status bits and reset the GO flag; if the flag is not set, then list execution will start as normal.

It is recommended, therefore, that an interrupt routine written to handle "Stopped LAMS" from an LP1342 working in triggered mode should Disable Triggers ON ENTRY to prevent this activity while the LP1342 is unloaded.

4. Operating Example

4.1 The following Program, written in CATY, shows a typical sequence being performed, reading data from an input module in the crate:

```
10   LP=7,1,16           'In Branch 7, Crate 1, stn. 16 with CCA2
20   MOD=8               'Module to be read in Stn. 8

100  F27 LP,0            'Test Booked  [F(27) subaddress 0]
110  IF NOTQ GOTO 1000   'Not free, error
120  F24 LP,0            'Disable Trigger just in case
130  F17 LP,0,0          'Set Instruction Pointer to zero
140  LET X=MOD*512       'Generate NAF for N8 A0 F0
150  FOR I=1 TO 100      '100 cycles
160  F16 LP,0,X          'Write NAF  [F(16) sub. 0, data X]
170  NEXT I
180  F16 LP,0,'100000    'Stop Instruction  [bit 16 set]
190  F17 LP,0,0          'Inst Pointer to zero again
200  F17 LP,1,0          'Write Pointer to zero
210  F17 LP,2,0          'Read Pointer to zero
220  F17 LP,3,0          'Comp. Reg. = 0, comparator not used
230  F23 LP,12,15        'Reset all LAM Status bits
240  F23 LP,13,15        'Reset all LAM Mask bits
250  PRINT "LIST PROCESSOR READY TO GO, HIT RETURN"
260  WAIT
270  F19 LP,12,8         'Set GO bit
280  F27 LP,1            'Test GO/Enabled
290  IF CAMQ GOTO 280    'Still going ? Wait
300  F1 LP,12,X          'Fetch LAM Status
310  IF X=12 GOTO 330    'Status correct? Expect GO + FIN
320  PRINT "FINISHED STATUS WRONG, EXP 12, GOT",X
330  F1 LP,0,X           'Fetch Inst Pointer
340  IF X=100 GOTO 360   'As expected?
350  PRINT "EXPECTED 100 INSTRUCTIONS, GOT",X
360  F1 LP,1,X           'Fetch Write Pointer
370  IF X=0 GOTO 390     'Should be none
380  PRINT "EXPECTED 0 WRITES, GOT",X
390  F1 LP,2,X           'Fetch Read Pointer
400  IF X=100 GOTO 420   'Exp 100 Reads
410  PRINT "EXPECTED 100 READS, GOT",X
420  F17 LP,2,0          'Reset Read Pointer
430  FOR I=1 TO 100      '100 Reads
440  F0 LP,2,X           'Fetch Data
450  PRINT "DATA ELEMENT ",I,"=",X
460  NEXT I
470  F25 LP,15           'Reset, finished with Engines!
480  STOP

1000 PRINT "LIST PROCESSOR NOT FREE!"
1010 STOP
```

5. Seven Trigger Operation.

The Trigger Input connector on the front panel, a 9-way Cannon socket, pinout in section 8, brings in seven active-low TTL trigger signals, each pulled up by an internal 1Kohm resistor.

The trigger inputs are LEVEL sensitive and must be held low for a minimum of 300 nSec. More than one trigger may be true at a time, since they are prioritised and latched before presentation to the Main Logic Sequencer. If one or more triggers are present when a list completes, then the highest numerical value trigger will then be serviced (trigger 7 is highest). The maximum delay between setting a trigger input true and the start of list execution is just under 2 microseconds for trigger 7; trigger 1 takes just 500 nSec. Triggers are ignored when disabled.

The trigger should be removed before the list in question completes, or it will execute again. A different trigger MAY be present at this time, however, which will be executed as soon as the Logic Sequencer gets back to the "reset" state.

Before any triggers can be handled (apart from the straightforward use of trigger 1 as we saw above), the Instruction store must be loaded with the "Bootstrap" Jump Instructions and the lists themselves.

The "Bootstrap" looks like this:

Address	Contents	Function
0006H	11000xxxxxxxxxxx	Jump to List 7 Start
0005H	11000xxxxxxxxxxx	Jump to List 6 Start
0004H	11000xxxxxxxxxxx	Jump to List 5 Start
0003H	11000xxxxxxxxxxx	Jump to List 4 Start
0002H	11000xxxxxxxxxxx	Jump to List 3 Start
0001H	11000xxxxxxxxxxx	Jump to List 2 Start
0000H	11000xxxxxxxxxxx	Jump to List 1 Start

Where "x" is part of the 11-bit jump address, and list 1 is triggered by Trigger 1 and so on. "H" means HEXADECIMAL.

Starting from the Start Address of each list, the Instructions are then loaded, finishing with a Jump to Zero and await trigger, which is:

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Notice that bit 14 is a '1' to denote "re-trigger".

After all the lists have been loaded, the Instruction Pointer should be reset to zero. The Read Pointer should also be reset to zero, then read data collected by each list will accumulate upwards, tagged if needed by Reads of the LP1342's own Instruction Pointer as mentioned above, but remember that this read will give the top 8 bits all '1's (Bits 17 - 24) due to the internal bus pull-ups.

If it is required that one (and only one) of the lists include writing data, then this should be loaded into memory, preferably at the top for obvious reasons, and the Write Pointer left pointing to it. Remember to load the "set" of write data as many times as it will be needed, unless you intend to use the same data over and over again by taking advantage of the new "Jump and Restore Write Pointer" feature available on this new unit.

The way that the bootstrap works is as follows:

a) The Main Logic Sequencer (MLS) sees the GO bit true, which comes from either the Dataway GO or the Trigger input logic.

b) The Trigger Input Logic will have generated a 3-bit code, which is presented to the MLS.

c) If the 3-bit code is greater than one, the MLS uses the code to skip through the bootstrap program to the jump instruction corresponding to the trigger.

d) If the trigger code was zero or one, then the instruction being pointed to is checked to see if it is a Jump, if not, execution starts there and then.

e) List execution proceeds as normal, finishing with a jump to zero and await trigger.

6. The MAIN LOGIC SEQUENCER

This is a PLS 105 (formerly 82S105) Programmable Logic Sequencer, which is clocked by the 10M signal, the output of the 10 MHz oscillator. This also clocks the CAMAC Cycle Generator. The Main Logic Sequencer's inputs and outputs are as follows: -

NAME	PIN NO.	FUNCTION
INPUTS		
CAT	2	Await Trigger (stop) after Jump (conditioned)
/OVF link	3	Pointer Overflow flag input
STOP	4	Ext. STOP Input
ERR	5	Overall 'OR' of possible ERRORS
/TIMEOUT	6	Timer Expired
CJNQ	7	Jump if No Q Response (conditioned)
/TCODE1	8	Trigger Code, Binary value 1
/TCODE2	9	Trigger Code, Binary value 2
GO	20	Start doing Instructions
B16	21	STOP or JUMP Instruction
B15	22	JUMP Instruction or Q Ignore
/LOOPEND	23	Done all Loops (NOT USED)
CQSTAT	24	Q State This Instruction (conditioned)
XSTAT	25	X State This Instruction
BUSYFF	26	CAMAC Cycle started OK
/TCODE4	27	Trigger Code, Binary value 4

OUTPUTS

CKINST	10	Advance Pointer(s)
FINISH	11	Set FINISHED LAM Status
NO X	12	Set NO X LAM Status
NO Q	13	Set NO Q LAM Status
START	15	Do a CAMAC Cycle
JUMP	16	Ready to load Jump Address
SJUMP	17	Load Jump Address
RGO	18	Reset Internal GO Flags

"Conditioned" means that the signal has been processed by the Jump Logic PAL, IC44, which looks at the Jump Condition Specifiers and the outputs of the comparator to decide whether to jump or not (see below).

7. Handy Hints and Conditional Jumping

a) Always remember to read the LAM Status Register after stopping, especially if things did not go as planned. Look at the STOP condition table on the data sheet to see what happened and look at the Instruction Pointer as well. Check that you have composed the Instructions properly, with bits 1-5 = Function Code, bits 6-9 are Subaddress, and bits 10-14 are Station Number and bit 15 is Q-Ignore. Thus:

INST = F + (A*32) + (N*512) [+ 16384 if Q-ignore]

b) When using pointer overflow to stop the List Processor, remember that the physical pointers are all a lot wider than they need to be, that is you only need 20 bits to address the 1024K words of the data memory, but there is a 24-bit pointer. The top 4 bits do nothing and the memory just wraps round if you count past the 20 bit boundary, but for overflow, the top 4 bits are considered and MUST be '1'. So on a unit with 1024K words, the top address is HEX 0FFFFF and address 100000 is the same as address 000000. Overflow is on the top 16 bits of the read/write data pointers, so for these pointers this is HEX FFFF00, which is at 1024K-255 words (ignoring the top 4 bits) and for the instruction pointer (overflow on top 8 bits) it is HEX FF00 (64K-255). If you wish to reach overflow after a certain number of cycles, just take that number away from the overflow value and start at that address. For example, to stop after 200,000 reads, install JP25 and start the Read Data Pointer F(17) A(2) at HEX FFFF00 - 30D40 (200,000 in HEX) which is HEX FCF1C0. Users of 512K LP 1342s will have JP31 removed so that their memory is duplicated over the top and bottom halves of the area, so they will set their start address to somewhere above the 512K boundary in the last 1024K page.

On the subject of pointers and addressing, remember that the instruction store is 8K words, but jump addresses are still restricted to the bottom 2K of that store because there are only 11 address bits in the jump instruction. Thus if you wish to return to the start of a list of commands, this must be below the 2K boundary.

On the front panel there are 5 LEDs, one for 'N', stretched to 10mSec., one for 'RUN' or GO, which comes on when the LP1342 is executing a list, and three showing which trigger is active.

These Trigger Code LEDs come on when a non-zero trigger is received and will go off when the list is completed.

If a trigger is received when triggers are not enabled, it will simply be ignored. (Early units of this type did not do this).

8. Physical and Electrical

The module is a single width CAMAC unit, with rear mounted 40-way ACB header, front panel 9-way Cannon socket Trigger Input connector, six LEMO sockets and five LEDs.

POWER CONSUMPTION

Basic Module	2300 mA Typ.
256K Memory option	+100 mA

Note: Due to the high power consumption of this module, we recommend that forced air-cooling be used.

SIGNAL STANDARDS

All inputs and outputs are at standard TTL signal levels, all open-collector.

CONNECTOR PINOUTS

Rear ACB Connector - 40 way header, pin 1 bottom right

	40	39	
AL23	38	37	AL22
AL21	36	35	AL20
AL19	34	33	AL18
AL17	32	31	AL16
AL15	30	29	AL14
AL13	28	27	AL12
AL11	26	25	AL10
AL09	24	23	AL08
AL07	22	21	AL06
AL05	20	19	AL04
AL03	18	17	AL02
AL01	16	15	GND
Request Inhibit	14	13	GND
Request	12	11	GND
	10	09	GND
ACL	08	07	GND
EN16	06	05	EN 8
EN 4	04	03	EN 2
EN 1	02	01	GND

All signals on the ACB are ACTIVE LOW

Trigger Input Connector - 9-way Cannon Socket.

Pin	Function
1	Trigger Input 1 ("Standard" Trigger)
2	Trigger Input 2
3	Trigger Input 3
4	Trigger Input 4
5	Trigger Input 5
6	Trigger Input 6
7	Trigger Input 7
9	GROUND.

Parts list for: - LP1342 ISSUE 4

Part	Type	Outline	Manufacturer
IC1	74622,74LS622	DIL20	
IC2	74622,74LS622	DIL20	
IC3	74622,74LS622	DIL20	
IC4	74642,LS642-1	DIL20	
IC5	74642,LS642-1	DIL20	
IC6	74642,LS642-1	DIL20	
IC7	74652,LS652	DIL24.3	
IC8	74652,LS652	DIL24.3	
IC9	7405,7405	DIL14	
IC10	PLS100,PLS100 "1341P10"	DIL28	
IC11	74245,HCT245	DIL20	
IC12	74245,HCT245	DIL20	
IC13	74245,HCT245	DIL20	
IC14	74682,LS682	DIL20	
IC15	74682,LS682	DIL20	
IC16	PAL22P10, "1341P16V"	DIL24.3	
IC17	PAL22P10, "1341P17"	DIL24.3	
IC18	PAL22P10, "1341P18V"	DIL24.3	
IC19	74593,LS593	DIL20	
IC20	74593,LS593	DIL20	
IC21	74593,LS593	DIL20	
IC22	74245,HCT245	DIL20	
IC23	74245,HCT245	DIL20	
IC24	74593,LS593	DIL20	
IC25	74593,LS593	DIL20	
IC26	74593,LS593	DIL20	
IC27	74245,HCT245	DIL20	
IC28	74245,HCT245	DIL20	
IC29	7414,74LS14	DIL14	
IC30	7475,74LS75	DIL16	
IC31	7408,74LS08	DIL14	
IC32	628128,628512	DIL32	
IC33	628128,628512	DIL32	
IC34	628128,628512	DIL32	
IC35	74593,LS593	DIL20	
IC36	74593,LS593	DIL20	
IC37	7474,74LS74	DIL14	
IC38	7404,74LS04	DIL14	
IC39	7404,74LS04	DIL14	
IC40	74374,HCT374	DIL20	
IC41	74374,HCT374	DIL20	
IC42	74622,ALS622	DIL20	
IC43	74622,ALS622	DIL20	
IC44	PAL22P10,"LP1431P4SP"	DIL24.3	
IC45	628128,628512 ***	DIL32	
IC46	628128,628512 ***	DIL32	
IC47	628128,628512 ***	DIL32	
IC48	6264,6264	DIL28	
IC49	6264,6264	DIL28	
IC50	PLS105, "BRAINV9F"	DIL28	

*** 1024K Memory only

Parts list for: - LP1342 ISSUE 4

Part	Type	Outline	Manufacturer
IC51	74174,74LS174	DIL16	
IC52	75452,75452	DIL8	
IC53	PLS100, "1341P53"	DIL28	
IC54	7475,74LS75	DIL16	
IC55	7408,74LS08	DIL14	
IC56	7408,74LS08	DIL14	
IC57	7405,7405	DIL14	
IC58	7430,74LS30	DIL14	
IC59	PAL18P8,"LPPALV3"	DIL20	
IC60	PAL18P8,"LPPALV3"	DIL20	
IC61	PAL16V8,"LPTRIG2C"	DIL20	
IC62	74374,LS374	DIL20	
IC63	NOT FITTED	DIL8	
IC64	NOT FITTED	DIL8	
IC65	74132,74S132	DIL14	
IC66	7474,74LS74	DIL14	
IC67	7400,74LS00	DIL14	
IC68	74123,74LS123	DIL16	
IC69	7432,74LS32	DIL14	
IC70	NOT FITTED	DIL8	
D1	1N5401,1N5401	DDCMC	
D2	1N4148,1N4148	DO35	
D3	1N4001,1N4001	DO41	
D5	1N4148,1N4148	DO35	
D6	1N4148,1N4148	DO35	
D7	1N4148,1N4148	DO35	
D8	1N4148,1N4148	DO35	
D9	1N4148,1N4148	DO35	
D10	1N4148,1N4148	DO35	
D11	1N4148,1N4148	DO35	
D12	1N4148,1N4148	DO35	
XT1	HC18S,10MHz	HC18U	
R1	RESA8,3K3	RESA8	
R2	RESA8,2K2	RESA8	
R3	RESA8,100K	RESA8	
R8	RESA8,560R	RESA8	
R9	RESA8,10K	RESA8	
R10	RESA8,10K	RESA8	
R11	RESA8,10K	RESA8	
R12	RESA8,1K0	RESA8	
R13	RESA8,680R	RESA8	
R14	RESA8,100K	RESA8	
R15	RESA8,100K	RESA8	
R16	RESA8,10K	RESA8	
R17	RESA8,1K0	RESA8	
R18	RESA8,3K9	RESA8	
C1	CAPR4D4E,47U/16V	CAPR4D4E	
C2	CAPR4D4E,47U/16V	CAPR4D4E	
C3	CAPR4D4E,10uF16V	CAPR4D4E	
C4	CAPR2W2,56pf	CAPR2W2	
C5	CAPR2W2,3N3	CAPR2W2	
C6-C36 inc.	100nF CER.	CAPR2W2	

Parts list for: - LP1342 ISSUE 4

Part	Type	Outline	Manufacturer
C37	CAPR2W2,56pf	CAPR2W2	
C38	CAPR2W2,470pF	CAPR2W2	
C41	CAPR2W2,1n0	CAPR2W2	
C42	CAPR2W2,2n2	CAPR2W2	
RN1	RN8COM,1K	SIL9	
RN2	RN8COM,10K	SIL9	
RN3	RN8COM,10K	SIL9	
RN4	RN8COM,1K	SIL9	
RN5	RN8COM,470R	SIL9	
CO1	PL40-01,IDC40	ACB	
CO2	SK9D,D9SK	9WCANBD	
FS1	FUSECMC,3A	FUSECMC	
BT1	Not fitted		
JP1-34	JUMPER,JP	JP	
LD1	LEDT5MM,N	LED5H	
LD2	LEDT5MM,RUN	LED5H	
LD3	LEDT5MM,TRIG CODE 4	LED5H	
LD4	LEDT5MM,TRIG CODE 2	LED5H	
LD5	LEDT5MM,TRIG CODE 1	LED5H	
LM1	LMSP,TRIGGER IN	LMSP	
LM2	LMSP,FINISHED OUT	LMSP	
LM3	LMSP,STOP/VETO	LMSP	
LM4	LMSP,REQUEST	LMSP	
LM5	LMSP,GRANT-IN	LMSP	
LM6	LMSP,GRANT-OUT	LMSP	