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LNF-82/15(NT)
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L. Trasatti: A PROM PROGRAMMER FOR CANDI.

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Bipolar PROM's (Programmable Read Only Memories) are becoming more and more popular, due to their speed and to the possibilities of economy and flexibility they offer the hardware designer (they have been described as "the hardware's software").

Typical examples of their use are memory decoding (with the possibility to change adresses by simply replacing a chip) or generation of complicated timing sequences with minimal chip count.

We have built a PROM programmer for CANDI[1-5] which, using the TM990/302 EPROM programming facility with a minimal addition of hardware is capable of programming the entire family of Texas Instruments Series 14 and series 18 PROM's.

The circuit diagram is shown in Figg. 1, 2 and 3. Two 8-bit three state latches (SN74LS373) service the bidirectional data bus, and a series of eight reed relays pull the input corresponding to the bit to be programmed to OV. The necessary power is supplied by the CANDI system. Five different I.C. sockets provide the different pin assignements for the 10 different PROM's to be programmed. Table I shows the correspondence between sockets and PROM's.

TABLE I - Correspondence between sockets and PROM's.

Socket	PROM	
S1	TBP18SA030, TBP18S030	(SN74S188, SN74S288)
S2	TBP14S10 , TBP14SA10	(SN74S287, SN74S387)
S3	TBP18SA22 , TBP18S22	(SN74S470, SN74S471)
S4	TBP18S42 , TBP18SA42	(SN74S472, SN74S473)
S5	TBP18S46 , TBP18SA46	(SN74S474, SN74S475)

An interactive BASIC program allows simple use of the programmer. The program asks for the type of PROM, establishing the necessary default values, then defines a memory area corresponding to an area of the PROM. The area need not coincide with the entire contents of the PROM, thus allowing partial programming.

Other possibilities include Memory Input (input from keyboard the values to be programmed into the PROM), Memory Display (decimal and hexadecimal display of memory contents), Verify PROM Erased (check that no PROM locations have already been programmed), Read PROM to Memory (copy PROM contents to memory area), Program PROM and compare PROM to Memory.

During programming, a bit at a time is programmed and then verified. If a bit results not programmed, the programming is interrupted and a message is displayed. During verification and comparison, only the PROM locations not equal to the corresponding memory locations are displayed.

An example of a programming sequence is shown in Fig. 4.

A printed circuit board version of the programmer, which simply plugs into connector P3 of the TM990/302 board, is under construction in the P.C. Board facility of LNF.

References.

(1) - O. Ciaffoni et al., A CAMAC system controller using the TEXAS TMS9900 microprocessor as stand-alone and PDP11 connected unit, Frascati report LNF-80/27 (1980).

(2) - O. Ciaffoni et al., Il nodo intelligente di acquisizione dati da CAMAC "CANDI", Frascati report LNF-81/25 (1981).

(3) - O. Ciaffoni et al., Data acquisition system for cosmic ray muon background tests under the Gran Sasso tunnel, Frascati report LNF-81/36 (1981).

(4) - O. Ciaffoni et al., CANDI, a microprocessor based CAMAC acquisition system with distribution intelligence features, in Proceedings of the Summer School on 'Data Acquisition for High Energy Physics', Varenna 1981.

(5) - O. Ciaffoni et al., CANDI USER'S GUIDE, Frascati report LNF-81/45 (1981).

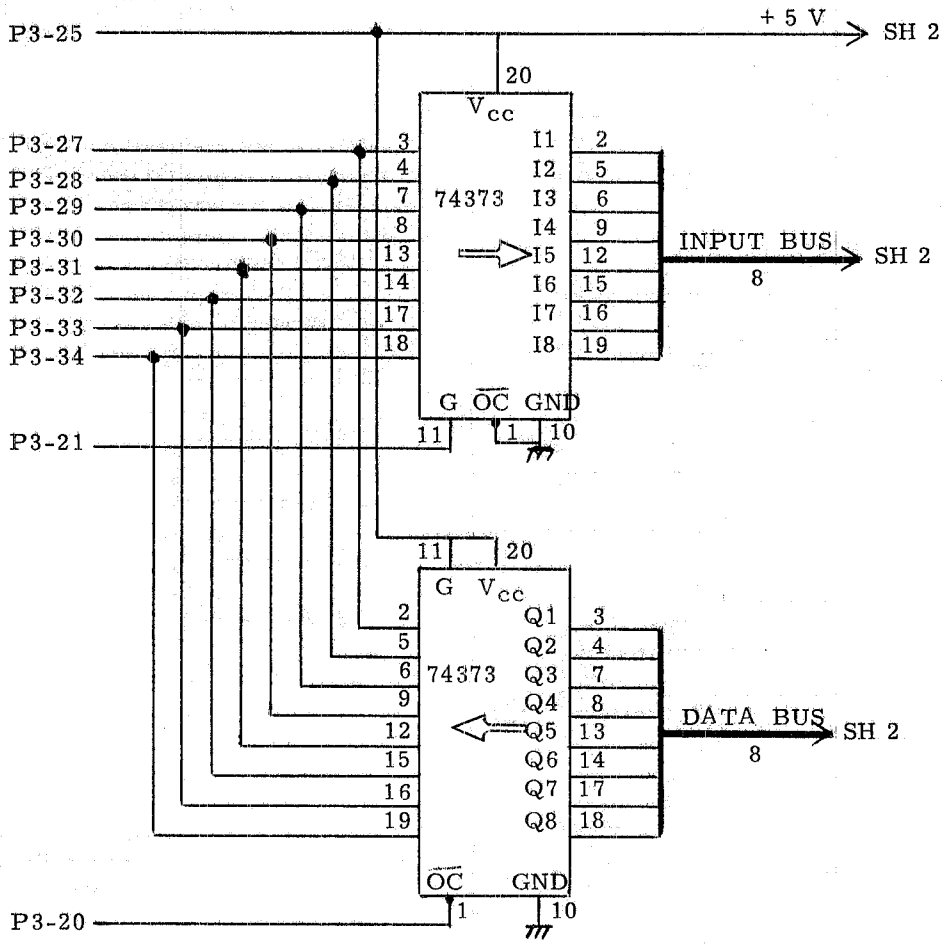

FIG. 1 - PROM Programmer schematics (1 of 3).

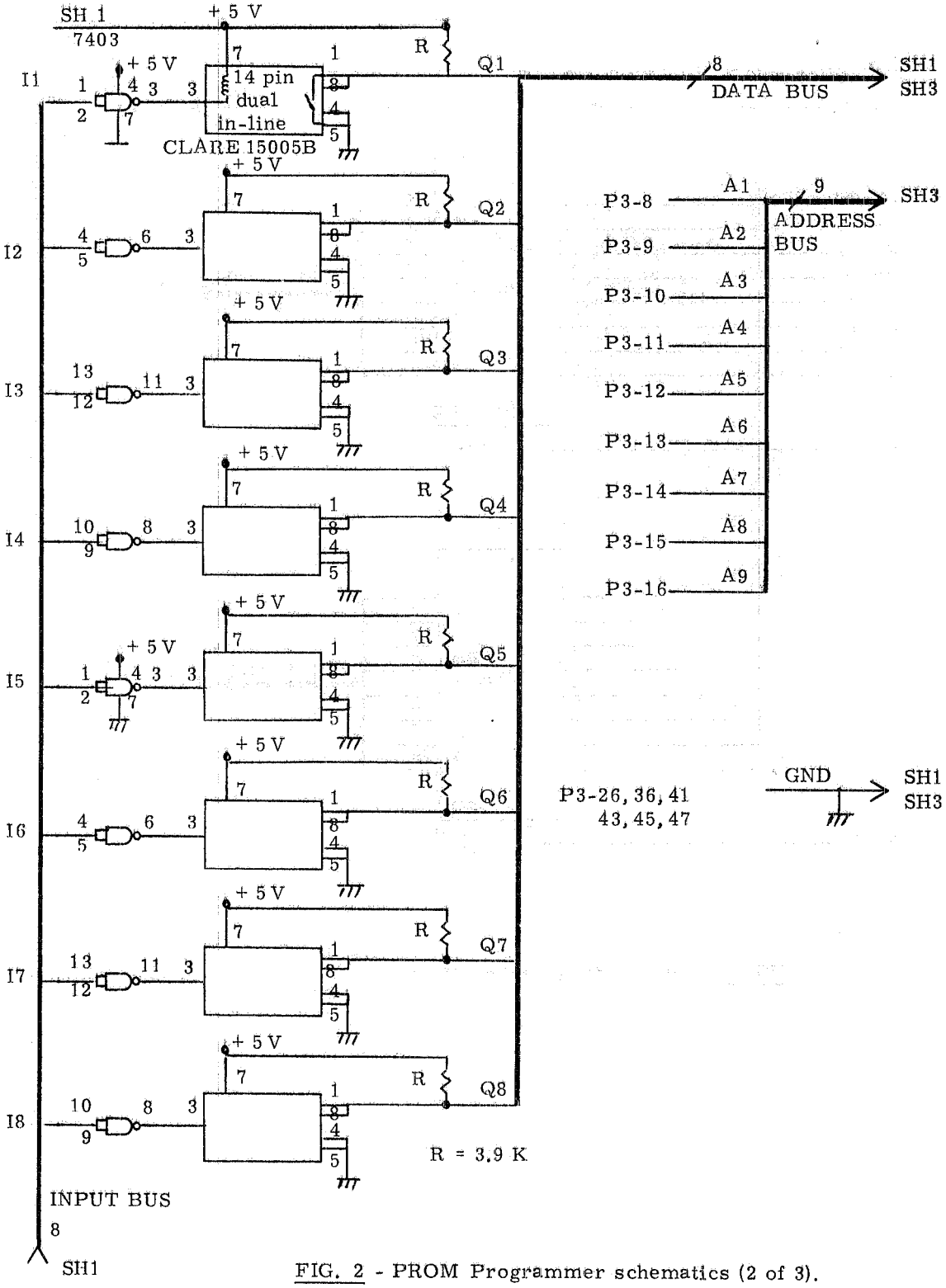

FIG. 2 - PROM Programmer schematics (2 of 3).

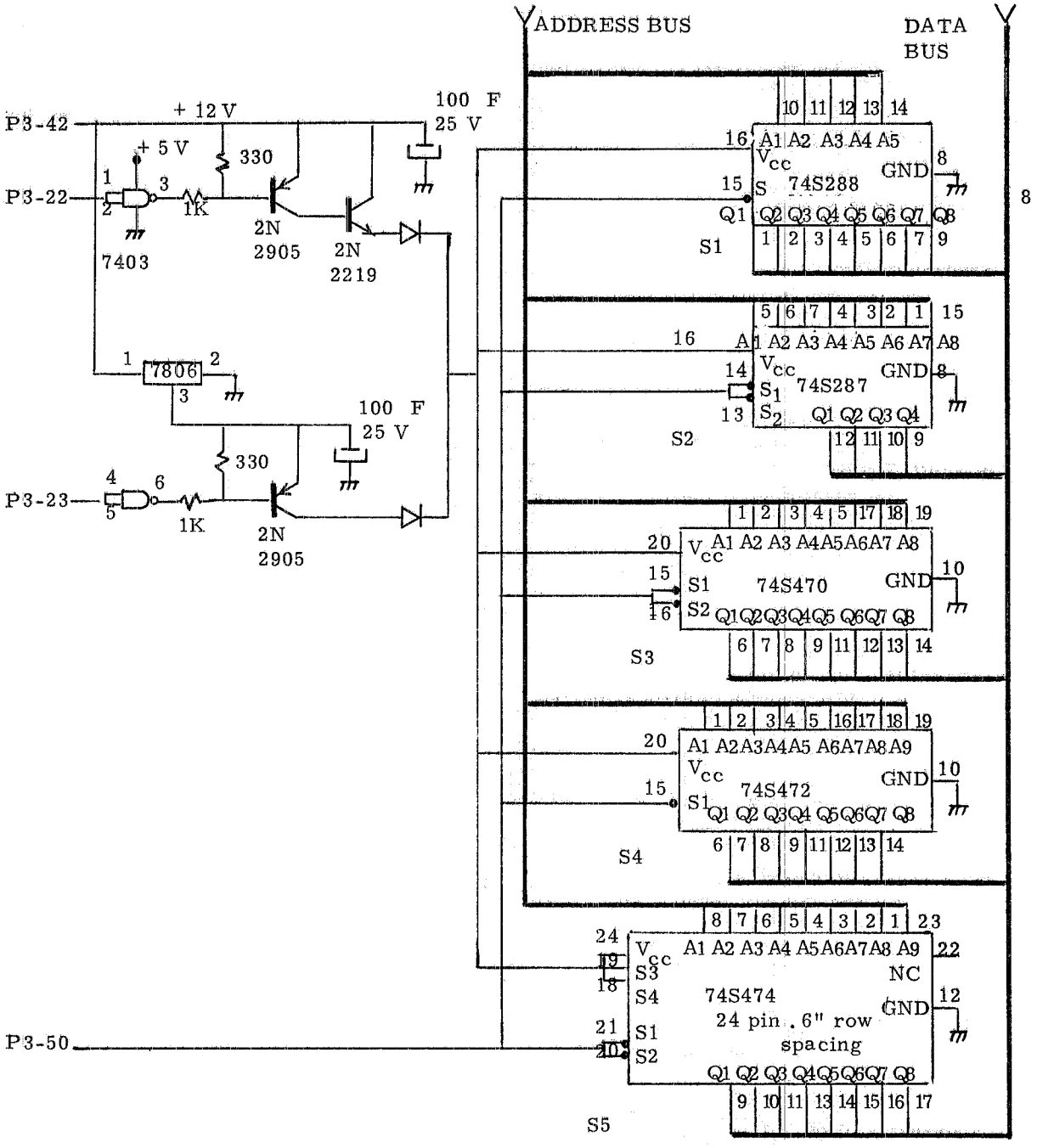

FIG. 3 - PROM Programmer schematics (3 of 3).

FIG. 4 - Programming example.

```
RUN
DO YOU WANT TO :
  INPUT PROM PARAMETERS (TYPE I) OR
  INPUT MEMORY          (TYPE M) OR
  DISPLAY MEMORY        (TYPE D) OR
  VERIFY PROM ERASED    (TYPE V) OR
  READ PROM TO MEMORY   (TYPE R) OR
  PROGRAM PROM          (TYPE P) OR
  COMPARE PROM TO MEM   (TYPE C)     ?: I

  INPUT PARAMETERS (CR=NO CHANGE)
  PROM TYPE=74287:
  MEMORY START = 0:
  MEMORY END   = 255:
  PROM START   = 0:


  DO YOU WANT TO :
  INPUT PROM PARAMETERS (TYPE I) OR
  INPUT MEMORY          (TYPE M) OR
  DISPLAY MEMORY        (TYPE D) OR
  VERIFY PROM ERASED    (TYPE V) OR
  READ PROM TO MEMORY   (TYPE R) OR
  PROGRAM PROM          (TYPE P) OR
  COMPARE PROM TO MEM   (TYPE C)     ?: V

  VERIFYING PROM FROM 0HTO 0FFH

PROM O.K.

  DO YOU WANT TO :
  INPUT PROM PARAMETERS (TYPE I) OR
  INPUT MEMORY          (TYPE M) OR
  DISPLAY MEMORY        (TYPE D) OR
  VERIFY PROM ERASED    (TYPE V) OR
  READ PROM TO MEMORY   (TYPE R) OR
  PROGRAM PROM          (TYPE P) OR
COMPARE PROM TO MEM   (TYPE C)     ?: I

  INPUT PARAMETERS (CR=NO CHANGE)
PROM TYPE=74287:
MEMORY START = 0: 60H
MEMORY END   = 255:   7FH
PROM START   = 0: 60H


  DO YOU WANT TO :
  INPUT PROM PARAMETERS (TYPE I) OR
  INPUT MEMORY          (TYPE M) OR
  DISPLAY MEMORY        (TYPE D) OR
  VERIFY PROM ERASED    (TYPE V) OR
  READ PROM TO MEMORY   (TYPE R) OR
  PROGRAM PROM          (TYPE P) OR
COMPARE PROM TO MEM   (TYPE C)     ?: M
```

```
INPUT MEMORY CONTENT (<CR>=NO CHANGE, -<CR>=GO BACK)

   ADDRESS                    MEM
  DEC      HEX          DEC      HEX
   96      060H           0      0H: 4
   97      061H           0      0H: 0FH
   98      062H           0      0H: 4
   99      063H           0      0H: 0FH
  100      064H           0      0H: 4
  101      065H           0      0H: 0FH
  102      066H           0      0H: 4
  103      067H           0      0H: 0FH
  104      068H           0      0H: 7
  105      069H           0      0H: 0FH
  106      06AH           0      0H: 7
  107      06BH           0      0H: 0FH
  108      06CH           0      0H: 7
  109      06DH           0      0H: 0FH
  110      06EH           0      0H: 7
  111      06FH           0      0H: 0FH
  112      070H           0      0H: 1
  113      071H           0      0H: 0FH
  114      072H           0      0H: 9
  115      073H           0      0H: 0FH
  116      074H           0      0H: 5
  117      075H           0      0H: 0FH
  118      076H           0      0H: 0DH
  119      077H           0      0H: 0FH
  120      078H           0      0H: 3
  121      079H           0      0H: 0FH
  122      07AH           0      0H: 0AH
  123      07BH           0      0H: 0FH
  124      07CH           0      0H: 7
  125      07DH           0      0H: 0FH
  126      07EH           0      0H: 0FH
  127      07FH           0      0H: 0FH


 DO YOU WANT TO :
 INPUT PROM PARAMETERS (TYPE I) OR
 INPUT MEMORY          (TYPE M) OR
 DISPLAY MEMORY        (TYPE D) OR
 VERIFY PROM ERASED    (TYPE V) OR
 READ PROM TO MEMORY   (TYPE R) OR
 PROGRAM PROM          (TYPE P) OR
 COMPARE PROM TO MEM   (TYPE C)      ?: D

 MEMORY CONTENT

   ADDRESS                              MEM
  DEC      HEX                         HEX
   96      60H       04H  0FH  04H  0FH  04H  0FH  04H  0FH
  104      68H       07H  0FH  07H  0FH  07H  0FH  07H  0FH
  112      70H       01H  0FH  09H  0FH  05H  0FH  0DH  0FH
  120      78H       03H  0FH  0AH  0FH  07H  0FH  0FH  0FH


 DO YOU WANT TO :
 INPUT PROM PARAMETERS (TYPE I) OR
 INPUT MEMORY          (TYPE M) OR
 DISPLAY MEMORY        (TYPE D) OR
 VERIFY PROM ERASED    (TYPE V) OR
 READ PROM TO MEMORY   (TYPE R) OR
 PROGRAM PROM          (TYPE P) OR
COMPARE PROM TO MEM   (TYPE C)      ?: P
```

```
PROGRAMMING PROM FROM 060HTO 07FH
USING  MEMORY    FROM 060HTO 07FH


                                ADDRESS  BIT

    060H    0
    060H    1
    060H    3
    062H    0
    062H    1
    062H    3
    064H    0
    064H    1
    064H    3
    066H    0
    066H    1
    066H    3
    068H    3
    06AH    3
    06CH    3
    06EH    3
    070H    1
    070H    2
    070H    3
    072H    1
    072H    2
    074H    1
    074H    3
    076H    1
    078H    2
    078H    3
    07AH    0
    07AH    2
    07CH    3

PROM PROGRAMMED O.K.

DO YOU WANT TO :
INPUT PROM PARAMETERS  (TYPE I) OR
INPUT MEMORY           (TYPE M) OR
DISPLAY MEMORY         (TYPE D) OR
VERIFY PROM ERASED     (TYPE V) OR
READ PROM TO MEMORY    (TYPE R) OR
PROGRAM PROM           (TYPE P) OR
COMPARE PROM TO MEM    (TYPE C)      ?: C

COMPARING PROM FROM 060HTO 07FH
TO MEMORY      FROM 060HTO 07FH

PROM O.K.
```