

K.P. SELECTOR TEST PROGRAM

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See TN 155 and drawings : 374-101-1 unit cabling  
374-102-1 circuit 374-901  
374-103-1 " 374-902  
374-104-2 " 374-903

Note : The tests of the circuits 374-904, 374-905 and 374-906  
are not included in the present test program.

1. NECESSARY INSTRUMENTS

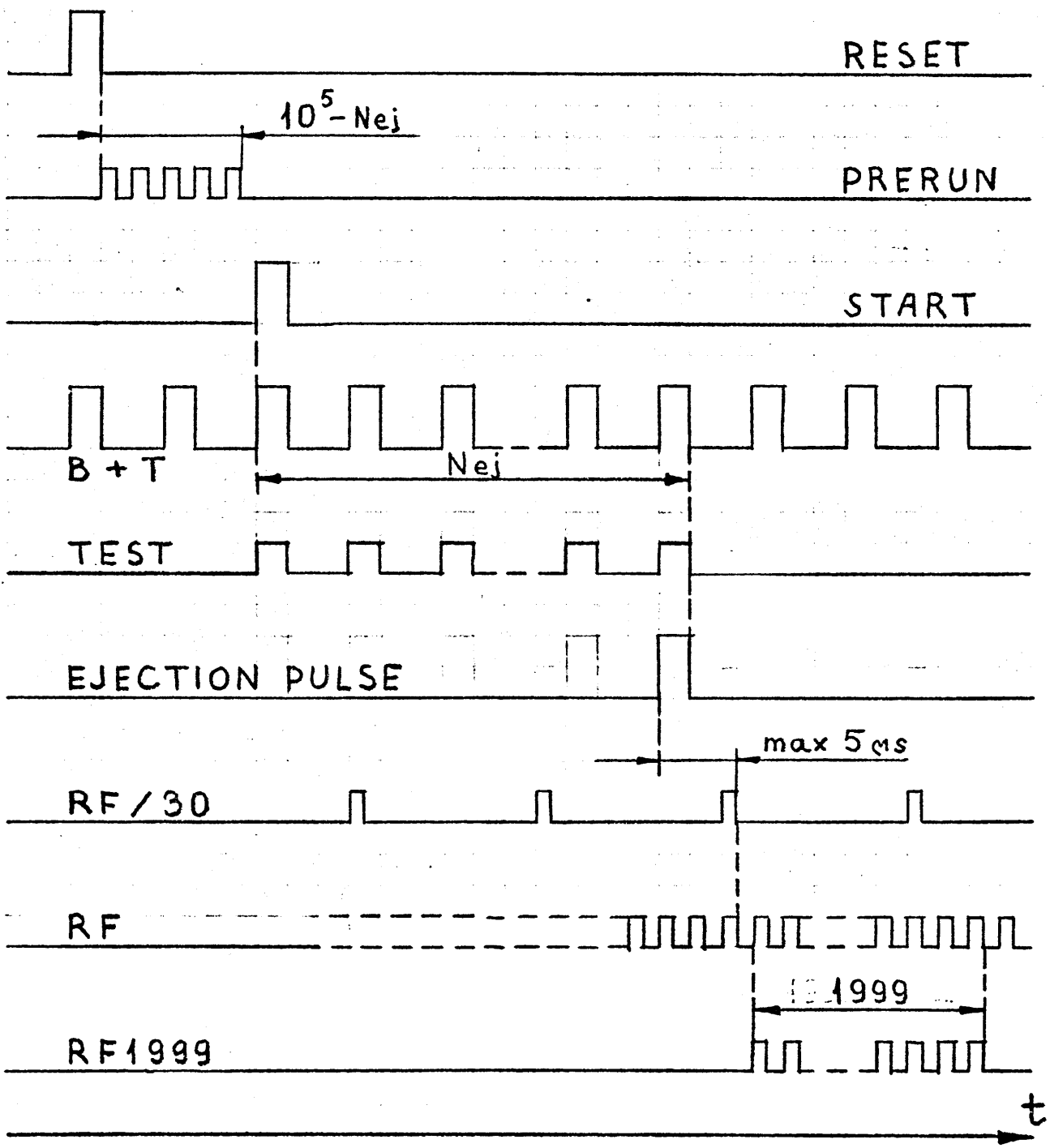
- Stabilized power supply +5V dc ( $\sim$  1A) ;
- Stabilized power supply +24V dc ( $\sim$ 0,6A) ;
- Stabilized power supply +250V dc ( $\sim$ 20mA) ;
- Multimeter ;
- Counter (min 6 MHz) with the START-STOP arrangement ;
- Oscilloscope (min 50 MHz) ;
- Remote control unit with the connection cables ;
- Assembled crate for the K.P. selector ;
- 6L extension for the K.P. selector with the connection cables ;
- Simulator of the accelerator timing pulses ;

2. OPERATIONAL SIGNALS

2.1 Pulse definition

Title	Connector		Parameters	Function
	No.	contact		
<u>Input pulses:</u>				
RESET	3	3	+20V/1 $\mu$ s	<p><u>Of the pulse front edge:</u></p> <p>Reset of the EJ. PULSE counter and flip-flops 32 "a" (pin 3), 27 (pin 4), 51 and 52 ;                      Set of the RF 1999 counter to 001 and flip-flop 50, preparing the gate 55 for a subsequent opening by the flip-flop 52 ;</p> <p><u>Of the pulse rear edge:</u></p> <p>Reset of the flip-flop 32 "b" (pin 6) ;                      Set of the flip-flop 31 which provides the access of the 1.5 MHz pulse train to the EJ. PULSE counter by way of the gate 37 (pin 10).</p>
START	3	2	+20V/1 $\mu$ s	<p>Set of the flip-flop 32 "a" (pin 2), initiating the B+T pulse count by means of the gate 37 (pin 12).</p>
B+T train	3	4	+20V/1 $\mu$ s pr $\sim$ 10 KHz	Count pulses, delivering the preselected EJ. PULSE
RF train	3	7 (18)	+4V/80 ns pr $\sim$ 6MHz	Count pulses, delivering the RF 1999 train pulses.
RF/30 train	3	9 (10)	+4V/80 ns pr $\sim$ 0.2 MHz	Clock of the flip-flop 52, initiating the RF pulse count by means of the gate 55.
<u>Output pulses:</u>				
RESET	1	42 (143)	+20V/1 $\mu$ s	<p>Control of the PRE/POST scalers belonging to the given K.P. selector.</p>
START	1	40 (141)	+20V/1 $\mu$ s	
B+T train	1	44 (145)	+20V/1 $\mu$ s pr $\sim$ 10 KHz	
PRERUN	3	5 (16)	+4V/0.3 $\mu$ s pr $\sim$ 1.5 MHz	
RF 1999	3	11 (12)	+4V/80 ns pr $\sim$ 6 MHz	
EJ. PULSE 1	3	13 (14)	+20V/1 $\mu$ s	
EJ. PULSE 2	3	15 (16)	+20V/1 $\mu$ s	
TEST	3	49	+4V/1 $\mu$ s pr $\sim$ 10 KHz	

2.2 Pulse sequence



3. TEST REPORT

The units must be numbered. The general test report indicates for each unit :

- the anomalies determined ;
- the replaced components ;
- the +5V and +24V power supply consumption.

All printed circuits equipped with their components must pass the thermal cycle under a temperature of ~ +60° C before the assembling. The parameters of the cycle are indicated in the test report.

4. TEST PROGRAM

- 4.1 Check visually the assembling of the printed circuits and the cabling of the unit.
- 4.2 Check the correct assembling of the M031 preselectors.
- 4.3 Connect the unit with the +5V, +24V and +250V power supplies. Measure the consumed currents, which have to be :

Card index	Consumption (mA)		
	+5V	+24V	+250V
374-901 *)	225	225	15
374-902	320	55	-
374-903	255	35	-
Total	800	315	15
*) preselector position is 77777.			

REMOTE-LOCAL mode

- 4.4 Press the push-button REMOTE on the remote control unit and check the indication of the REMOTE mode on both the unit itself and the K.P. selector.

Check the conformity of the display with all positions of the remote control unit preselector :

decade  $10^0$  positions 0 to 9  
 "  $10^1$  " 0 to 9  
 .....  
 "  $10^4$  " 0 to 9

In all 50 positions per unit.

- 4.5 Press the push-button LOCAL on the K.P. selector and check the indication of the LOCAL mode on both the K.P. selector and the remote control unit. Repeat the conformity test (item 4.4) with the K.P. preselector.

RESET

4.6 Check the RESET pulse shape at point R-65 of the card 374-902 (+20V/1  $\mu$ s). Stop the 1.5 MHz oscillator generation having inserted two temporary base-emitter shorts. After the RESET pulse has occurred, check the presence of the logical 1 voltage at the output Q of the flip-flop 31 (pin 8) and that of the logical 0 voltage at the following points of the card 374-902 :

a) the counter outputs :

R-12, 6, 7, 13	of decade	$10^0$
R-24, 18, 19, 25	" "	$10^1$
R-36, 30, 31, 37	" "	$10^2$
R-48, 42, 43, 49	" "	$10^3$
R-57, 54, 55, 58	" "	$10^4$

b) the output Q of the flip-flop 32 "a" (pin 15)

c) the output Q of the flip-flop 32 "b" (pin 11)

d) the output Q of the flip-flop 27 (point F-6).

Restore the 1.5 MHz oscillator generation having extracted the both temporary base-emitter shorts.

4.7 Check the RESET pulse shape at point R-4 of the card 374-903 (-4V/1  $\mu$ s versus +4V offset). After the RESET pulse has occurred, check the output Q voltage of the flip-flops 50, 51 and 52, which must correspond to the logical "1", "0" and "0" respectively.

4.8 Check the RESET pulse shape at point R-5 of the card 374-903 (-4V/1  $\mu$ s versus +4V offset). After the RESET pulse has occurred, check a voltage at the Q outputs of the synchronous counter which must correspond to the logical 1 for the flip-flop 38 and to the logical 0 for the flip-flops 39 to 49.

PRERUN

4.9 Check the 1.5 MHz oscillation parameters at pin 9, 10 of the gate 35 (card 374-902) :

prf  $\sim$  1.5 MHz

amplitude +4V

duty cycle  $\sim$  50%

4.10 Check the coincidence pulse shape at the input S of the flip-flop 32 "b" (pin 7) which has to be -4V/0.3  $\mu$ s versus +4V offset.

4.11 Check the overflow pulse shape at the output of the gate 29 pin 11 (-4V/0.6  $\mu$ s versus +4V offset). After the overflow pulse has occurred, check the logical state of the counter outputs (see item 4.6 a), which must be 00 001.

4.12 Check the PRERUN parameters at the coaxial connector BNC 75Ω :

- prf ~ 1.5 MHz
- amplitude +4V
- duty cycle ~ 50%

Measure a number of the prerun pulses under 00 000 and 99 999 positions of the K.P. preselector. The measurement results must correspond to the figure :

$$10^5 - N_{ej}$$

where :  $N_{ej}$  - ejection pulse index set on the K.P. preselector.

In our case they will be  $10^5$  and 1 respectively,

START

4.13 Check the START pulse shape at point R-64 of the card 374-902 (+20V/1 μs). After the START pulse has occurred, check the presence of the logical 1 voltage at the output Q of the flip-flop 32 "a" (pin 15).

B+T TRAIN

4.14 Check the train parameters at point R-63 of the card 374-902 :

- prf ~ 10 KHz
- amplitude +20V
- pulse duration ~ 1 μs.

EJECTION PULSE

4.15 Check the coincidence pulse shape at the input of the blocking oscillator BO (pin 9), which has to be -4V/1 μs versus +4V offset.

4.16 Check the EJECTION PULSE shape at the coaxial connector BNC 75Ω (+20V/1μs). The indicator lamp flash is about 100 ms.

4.17 Check the selection of the EJECTION PULSE from the B+T train, measuring a number of the TEST pulses for the following positions of the K.P. preselector :

- 0 to 9      decade  $10^0$
- 0 to 9      "       $10^1$
- .....
- 0 to 9      "       $10^4$

In all 50 measurements per unit.

The measurement counter read-outs must correspond to the EJECTION PULSE index set on the K.P. preselector.

RF/30 TRAIN

- 4.18 Check the train parameters at point R-36 (↓R-35) of the card 374-903 :

prf ~ 0.2 MHz  
amplitude +4V  
pulse duration 80 ns

- 4.19 Check the voltage shape at point R-6 of the card 374-903 which must have +4V step caused by either the EJ.PULSE (bridge position "C" on the card 374-902) or the RF-START pulse (bridge position "B"). When the step has occurred, check the presence of the logical 1 voltage at the output Q of the flip-flop 52.

Switch off the RF/30 train temporarily. Check that after RESET pulse this output has the logical 0 state which is kept when the step occurs. Switch on the RF/30 train again.

RF-TRAIN

- 4.20 Check the RF train parameters at point R-48 (↓R-47) of the card 374-903 :

prf ~ 6 MHz  
amplitude +4V  
duty cycle ~ 50<sup>o</sup>/o

RF 1999

- 4.21 Check the RF 1999 train parameters at the coaxial connector BNC 75Ω :

prf ~ 6 MHz  
amplitude +4V  
duty cycle ~ 50<sup>o</sup>/o

Measure a number of the RF 1999 pulses which has to be 1999.