ADVANCED ELECTRONIC INSTRUMENTATION

Triple 2-Fold Overlap
Type 312

(CERN N6237)

ELECTRONICS

borer + co

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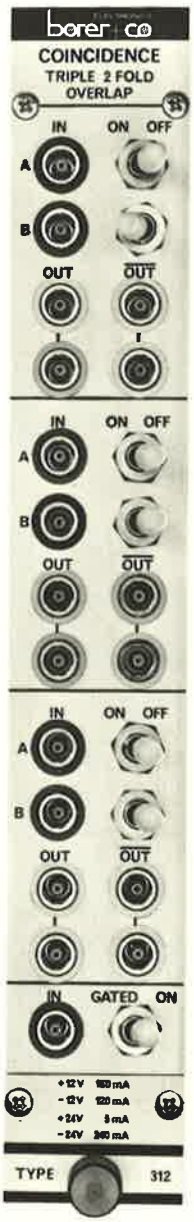
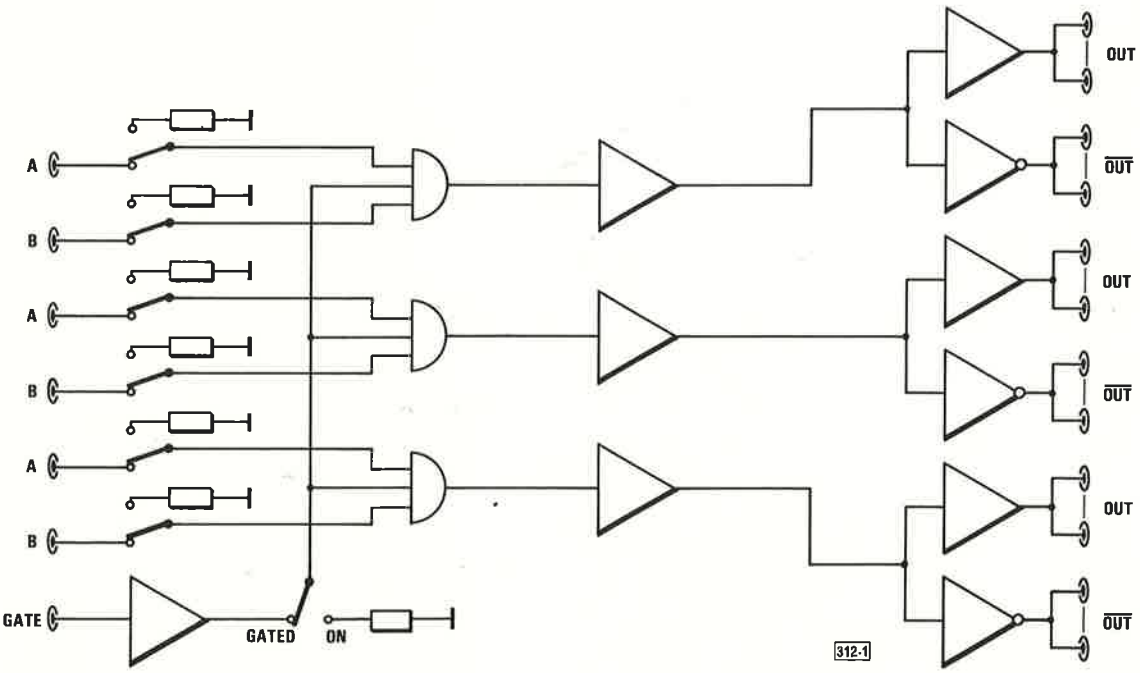
PRODUCT ANNOUNCEMENT

TRIPLE 2-FOLD OVERLAP Type 312

- True overlap operation
- 2ns minimum overlap
- Rates in excess of 150MHz
- Common gate
- NIM-Bin compatible



Module Type 312 contains three identical independent 2-fold overlap coincidence circuits which can, when required, be controlled by a single common gate. Outputs are produced only for as long as coincidence is present at the corresponding activated inputs.
Designed to accept NIM-standard signals, each of the 50Ω inputs is provided with a switch to render it inactive for timing purposes, etc. The instrument may operate as a coincidence or as an anti-coincidence unit by the application of logic or complementary input signals respectively. Overlaps from as little as 2ns will produce full amplitude NIM-standard outputs at rates of 150MHz or more. Each of the three sections provides a dual logic and a dual complementary output. The gate input will accept NIM-standard signals at rates of up to 125MHz; minimum pulse width to open or close the gate or to overlap with an input is 2,5ns. A front panel switch is provided to enable the module in the absence of gate signals. The propagation delays between each input, the gate and the coincidence stage are all accurately equalized.
This instrument is an industrialized version of the CERN Type N 6237 made suitable for housing in a conventional NIM-Bin. The instrument has been produced on the basis of documents and drawings designed and developed by the European Organisation for Nuclear Research (CERN) which has no intention of giving, in any case, any guarantee whatsoever regarding the quality or the performances of the items produced. Manufacturing quality and the operational performance are, however, covered in full by the normal Borer guarantee.



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SPECIFICATIONS

Inputs:		2 per section
	Impedance	50Ω
	Level	NIM-standard
	Pulse width	2ns min, dc max
	Rate, max	150MHz min
Outputs:		2 NIM, 2 $\overline{\text{NIM}}$ per section
	Impedance	High, current sources
	Pulse width	Equal to input width or overlap
	Propagation delay	7,5ns ± 1,2ns
Gate:		1 input, common to all sections
	Impedance	50Ω
	Level	NIM-standard; ''1'' = On, ''O'' = OFF
	Pulse width	2,5ns, min, dc max
	Rate, max	125MHz min
Physical dimensions		1 x NIM-Norm
Power requirements		+ 12V 150mA, -12V 120mA + 24V 5mA, -24V 240mA

COINCIDENCE TYPE N 6237

Adjustment and Test Procedure

A) INSTRUMENTS REQUIRED

1) Power Supply +24 V (min 200 mA) -24 V (min 400 mA).
2) Sampling oscilloscope Tektronix-Type 561 or equivalent.
3) EH pulse generator Model 122 or equivalent.
4) Coincidence Test Unit, Type N 2018 CERN NP or equivalent.
5) Shaper, Type N 2618 CERN NP or equivalent.
6) Delay 2.5 - 66 nsec, Type N 9053 CERN NP or equivalent.
7) Vacuum voltmeter - HP 412 A or equivalent.
8) Cables: required length for the following "Lemo" cables:
   6 x 2 nsec, 3 x 0.5 nsec, 2 x (3-5) nsec
   Other cables: 2 "Gen. Radio" cables of 3-5 nsec
9) 11 "Lemo" 50 ohm matching pieces, 4 female - female "Lemo" 50 ohm connectors and 2 Adaptors Lemo-Gen. Radio
10) Check out file (N 6237-21 A4), points marked T have to be recorded.

B) ADJUSTMENT PROCEDURE

1) Turn all potentiometers fully anticlockwise.
2) Outputs must be matched, nothing must be connected to input.
3) All switches "ON" and connect the supply voltages. The consumption must be 180 $\pm$15 mA from +24 V and 410 $\pm$20 mA from -24 V. Check zener voltages: $\pm$6.0 $\pm$0.3 V; $\pm$12.0 $\pm$0.5 V.
4) D.C. Adjustment

   a) Input circuit

   Gate switch: "ON" position; switch "ON" one Input for each channel and check if the voltage across tunnel diodes D7, D15, D23 is -5 mV to -20 mV. Switch "OFF" all Inputs and this voltage should become -400 mV to -550 mV. Measure now the input voltage at single input "ON" (while the other are

"OFF"), which should be +30 mV to -50 mV.

b) Gate Circuit

All IN and gate in "ON" position.
Vacuum voltmeter: +1 V range, neg. terminal at ground and the other terminal on ~~emitter~~ collector T20, turn P4 (R91) till meter reads +375 mV. Leave one input "ON" for each channel and put gate switch into "GATED" position. Measure forward voltages across D25, D26, D27. -T- Connect the input of the gate to a -16 mA current supply. Measure now forward voltages across D28, D29, D30 (of diagram) -T- Check if |VD25-VD28| , |VD26-VD29| , |VD27-VD30| are ⩽40 mV.

c) Output: Gate and one Input or each channel in "ON" state. Vacuum voltmeter: 1 volt range and one terminal at -6 V of zener D33 (top channel). Measure the emitter voltage of T4 and T5. -T- Choose between transistors T4 and T5 that one which has the highest foreward base emitter voltage just measured above. Bias its base 400 mV forward by turning P1 (R14). The amount by which the base emitter voltage of the other transistor is less, must not exceed 170 mV. Repeat the same procedure for the other channels.

C. PULSE TESTS

1) Make arrangement as shown on Drawing N-6237- 2044 or make an equivalent.

2) All inputs in "OFF" state and the gate "ON", Adjust the generator for -800 mV, 5 nsec at -600 mV pulse measured on Channel A of the scope.

3) Single input sensitivity.

Disconnect 4 of the 5 input cables and match these. Reduce the signal to -550 mV and feed the remaining cable sequentially to every single input set at "ON" state. Output signals must be present. Repeat this operation for every channel.

4) Gate input sensitivity.

Only one input "ON" for each channel, set the gate in "GATED" position and feed into gate a signal of -550 mV as above. Connect

sequentially to each input in "ON" state -16 mA. D.C. and verify that at the outputs of the corresponding channel a correct pulse is present.

5) Gated dual COINCIDENCE.

Repeat operation C/1 and C/2 but with all input switches "ON" and Gate in "GATED" condition. Then check the coincidence action in top channel by adding and subtracting 6 nsec at the Gate input, using the delay box: the OUT signals must disappear due to this delay addition or subtraction. Repeat this operation for the other channels by connecting the cable used for Input B of the top channel to the B Input of the other channels.

6) Anticoincidence.

Modify the test set-up as shown by dotted lines in Drawing 20 A4. Feed in 4 signals of -800 mV, 3,5 nsec at -600 mV. All inputs and Gate "ON", check the presence of an output signal from the top channel. When it is switched in "GATED" position, output signal should disappear and reappear when 6,5 nsec of delay cable is added or subtracted on delay box. Repeat this operation for the other channels by moving again the B input to the middle and bottom channel.

7) Amplitude and shape of output signals:

Feed in single -800 mV pulses of 5,0 nsec at -600 mV levels. Outputs should be as follows:

OUT: - Width at 700 mV level from 4,5 to 6,0 nsec -T-
- Amplitude: 750-900 mV (→15-18 mA)
- $t_{01} \leqslant 1{,}7$ nsec, $t_{10} \leqslant 2{,}0$ nsec -T-

$\overline{\text{OUT}}$: - Width at -200 mV level from 5,0 nsec to 6,3 nsec -T-
- $t_{10} \leqslant 1{,}5$ nsec, $t_{01} \leqslant 2{,}0$ nsec

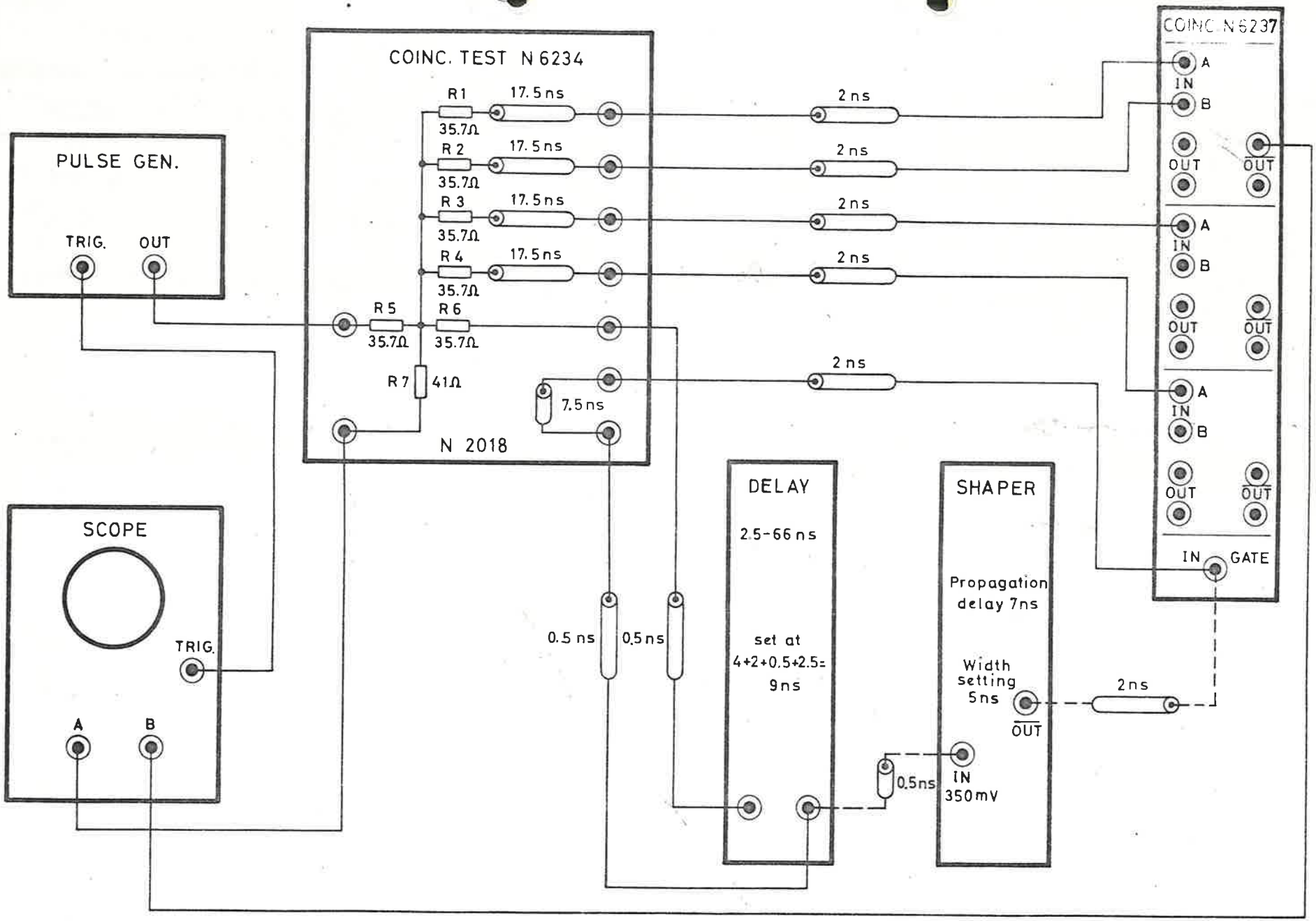
8) Rate Test:

Connect "single" input -800 mV, T about 2 ns at -600 mV, repetition about ~~200~~ 150 MHz. Determine spacing for which all OUT reach the Pulse Spec. K

minimum output "1" band (-700 mV) and level between pulses comes down inside the output "0" band (-100 mV), it has to be ≤ 5 nsec. -T-

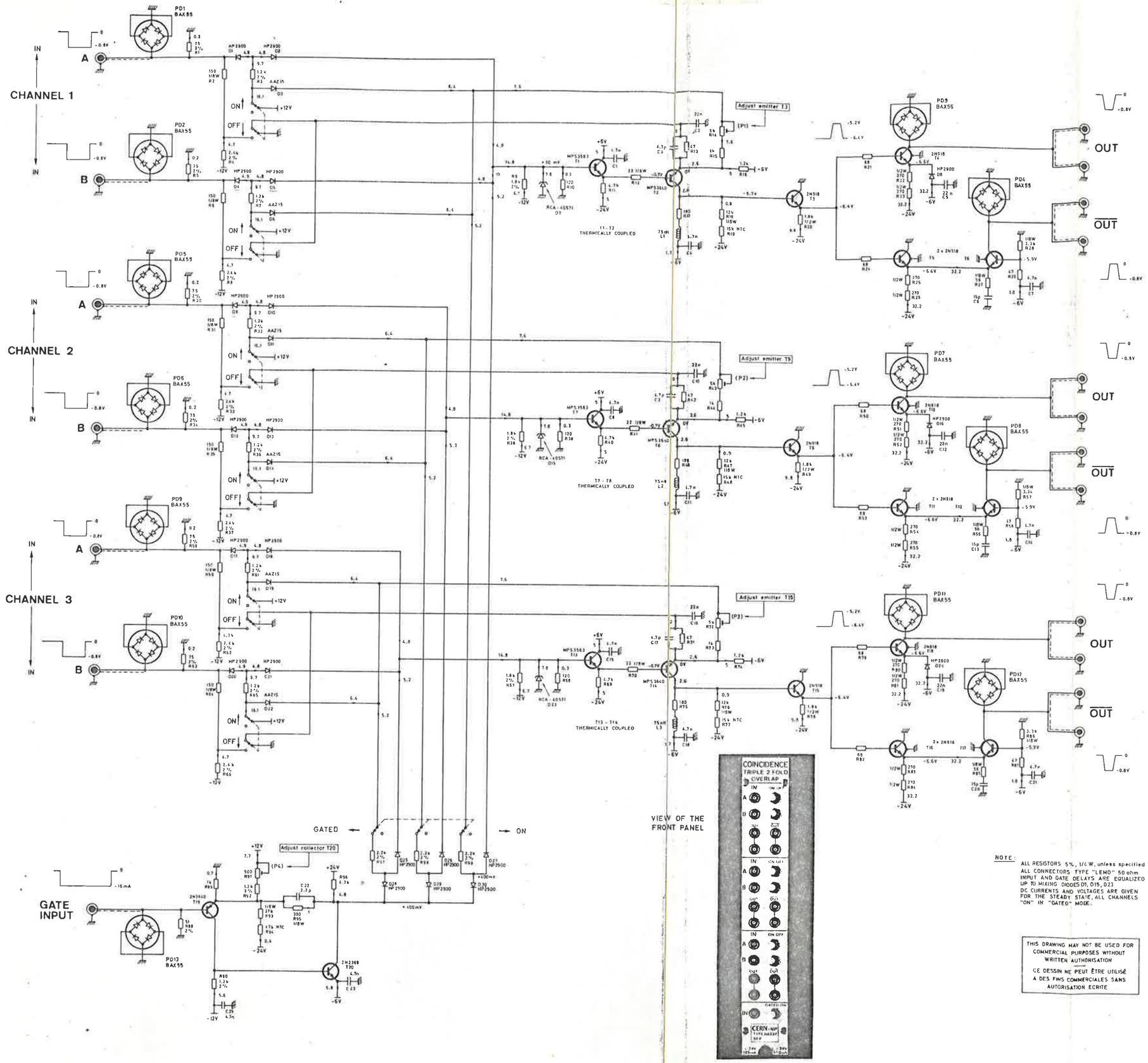
N.B. Risetimes (t_{01}) and falltimes (t_{10}) are measured between maximum output "0" (-100 mV) and minimum output "1" (-700 mV).

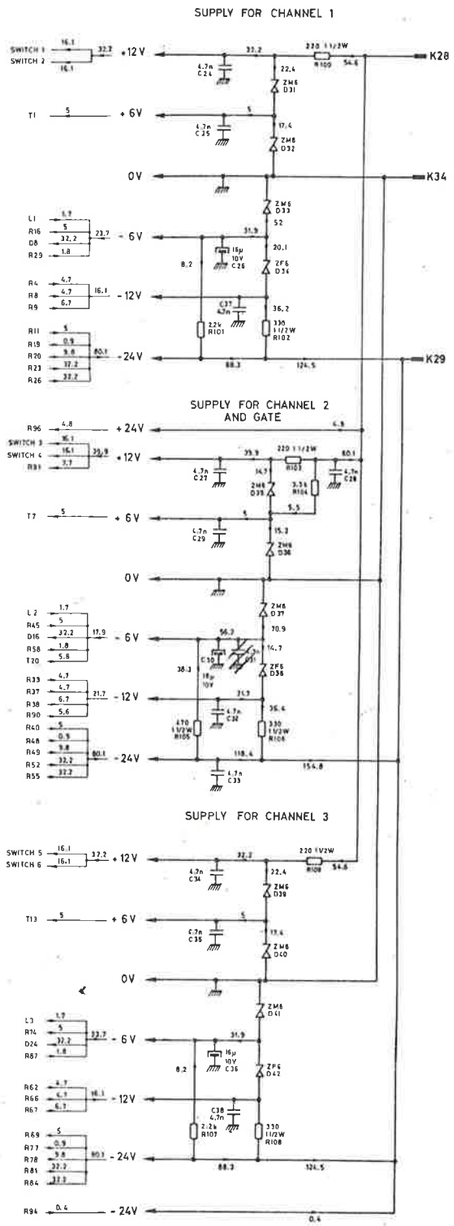
F.Nanni
H.Verweij
4.9.1969



-SOLID LINE CONNECTIONS AS STATED IN C1 PROCEDURE
-DOTTED LINE CONNECTIONS AS STATED IN C6 PROCEDURE

CERN-NP
N 6237-20A4
4.9.69 Schmall





Total currents : + 24V → 180 mA
- 24V → 410 mA

NOTE:
ALL RESISTORS 5%, 1/4 W, unless specified
ALL CONNECTORS TYPE "LEMO" 50 ohm
INPUT AND GATE DELAYS ARE EQUALIZED UP TO MIXING DIODES D1, D15, D23
DC CURRENTS AND VOLTAGES ARE GIVEN FOR THE STEADY STATE, ALL CHANNELS "ON" IN "GATED" MODE.

DESIGNERS: F.NANNI, H.VERWEIJ

CIRCUIT DIAGRAM
COINCIDENCE TRIPLE 2-FOLD OVERLAP - TYPE: N6237

CERN-NP, GENEVE
N6237 - 2A0
14.6.1968

SIS/R/16441

26. Feb. 1971