

Phillips Scientific

Precision Charge/Time Generator

CAMAC MODEL 7120

Hall A

FEATURES

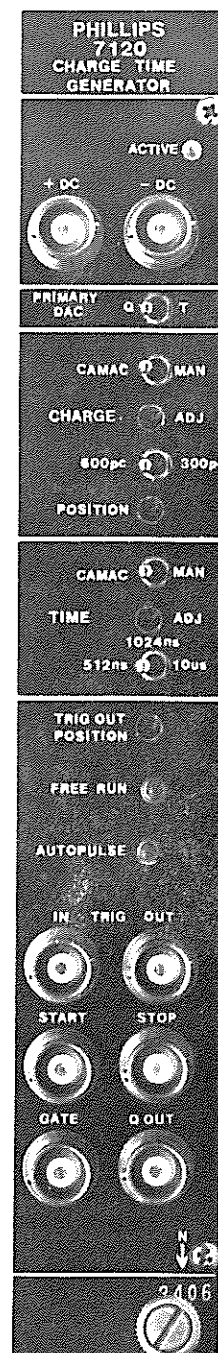
- * Calibrated CHARGE and TIME outputs
- * MANUAL or CAMAC control of either or both CHARGE and TIME outputs
- * 16-Bit DAC reference for precise CAMAC control of primary outputs
- * CHARGE OUT simulates fast PMT and wire chamber signals
- * -300 pC and -600 pC full scale CHARGE ranges
- * CHARGE OUT timing relative to GATE OUT is variable
- * GATE OUT is width programmable 0 - 10 μ sec, 3 ranges
- * START and STOP OUT coincidence with leading and trailing edges of GATE OUT
- * $\pm$ DC OUT track selected Primary output, $\pm$ 5v or $\pm$ 10v full scale
- * CAMAC triggering, external triggering, or FREE RUN mode
- * VARIABLE delay TTL TRIGGER OUT provides a flexible scope trigger
- * BNC connectors used for all signals

DESCRIPTION

The PHILLIPS Model 7120 is a calibrated programmable Charge Source/Time Interval generator packaged in a double-wide CAMAC module. It was specifically designed for testing and calibrating charge- and time-to-digital converter circuits.

The various full scale ranges and operating modes of the Model 7120 are selected by front panel switches which provide full manual control of all operating modes. The positions of these switches can be read out via CAMAC. Control of CHARGE and TIME outputs is either MANUAL via front panel 15-turn potentiometers or CAMAC via internal Digital to Analog Converters (DACs).

The 7120 contains a Primary DAC (16 bits) and a Secondary DAC (8 bits) for precise CAMAC control of its outputs. A two-position toggle switch (PRIMARY OUT) is used to select whether the CHARGE output or the TIME outputs (GATE, START, STOP) will be connected to the Primary DAC. The non-Primary section (TIME or CHARGE) gets connected to the Secondary DAC. When testing a gated current integrating ADC the PRIMARY output would normally be CHARGE, so as to provide finer control over the CHARGE OUT signal as compared to the GATE signal. The TIME outputs would be selected as Primary when testing TDCs, or whenever finer control over the time interval is desired. The $\pm$ DC outputs always track the section designated as Primary, regardless of the position of its CAMAC/MANUAL switch.



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OUTPUT CHARACTERISTICS

Charge Output : Negative going pulse very similar in shape to typical fast PMT signals (refer to scope photographs for timing details). There are two full scale charge ranges, selected by a front panel toggle switch: -600 pC and -300 pC, which deliver -3.5 V and -1.75 V into 50 Ω

Timing of QOUT relative to the leading edge of the GATE output is controlled by a 15-turn pot. The charge pulse can be positioned to precede the GATE by at least 20 nsec or to occur anywhere within the selected full scale time range.

Gate Output : -32 mA current source (double amplitude NIM), back terminated with 50 Ω ; rise and fall times less than 1.5 nsec. The GATE output is active from the leading edge of the START output to the leading edge of the STOP output. Note that due to finite rise and fall times gates with widths less than 4 nsec will start to lose amplitude.

Start and Stop Outputs : -32 mA current sources (double amplitude NIM), back terminated with 50 Ω ; rise and fall times less than 1.5 nsec; pulse widths 50 nsec. START to STOP full scale time interval as measured from leading edge to leading edge is determined by the TIME RANGE switch setting. Linearity is 11 bits (0.05%), accuracy is $\pm 2\%$ of selected full scale. START to STOP time jitter is less than 50 psec RMS on the 512 nsec range, and proportionately greater on the other time ranges.

$\pm$ DC Outputs : Positive and negative DC voltage outputs, current limited to 100 mA. Output magnitudes of either can be set via internal jumpers to be 0 to 10v or 0 to 5v. The position of these jumpers may be read by CAMAC. The magnitude of the output voltages is determined by the TIME or CHARGE section designated to be Primary and will therefore be set by the Primary DAC when in CAMAC mode or by the appropriate front panel pot when in MANUAL mode.

Trigger Output : Positive-going pulse, quiescently at 0 v, approximately 20 nsec wide, risetime less than 3 nsec; capable of delivering 4v into 50 Ω . The position of the output pulse relative to the leading edge of the GATE and START outputs is variable anywhere within and slightly exceeding the selected time range via a 15-turn pot.

INPUTS

Trigger Input : Accepts a standard (-16 mA) NIM pulse, 50 Ω input impedance. The leading edge of the TRIGGER IN signal will cause the 7120 to execute one cycle. This input will also terminate the FREE RUN mode. Input rates should not exceed 10 KHz to maintain settling time requirements within the module.

FRONT PANEL CONTROLS

Primary Out : Two position toggle switch, determines which section (CHARGE or TIME) is controlled by the 16-bit DAC when under CAMAC control.

Charge Mode : Two position toggle switch, selects either CAMAC or MANUAL control of QOUT.

Charge Adjust : 15-turn pot, active when charge mode is MANUAL. Allows for manual adjustment of QOUT from 0 pC to the selected full scale Charge range.

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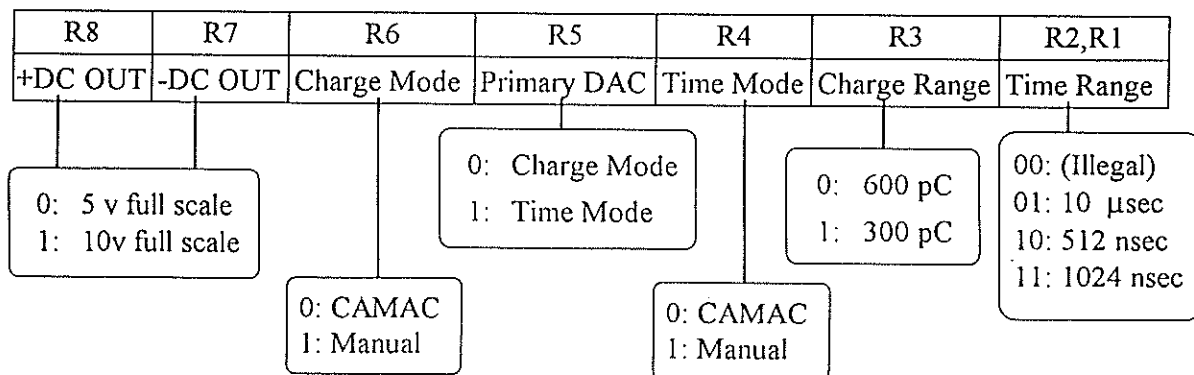
FRONT PANEL CONTROLS (continued)

- Charge Range** : Two position toggle switch, selects either 300 pC or 600 pC full scale for QOUT.
- Time Mode** : Two position toggle switch, selects either CAMAC or MANUAL control of the GATE and START/STOP outputs.
- Time Adjust** : 15-turn pot, active when Time mode is MANUAL. Allows for manual adjustment of the GATE and START/STOP time intervals over the selected TIME full scale range.
- Time Range** : Three position toggle switch, selects the full scale time interval for the GATE and START/STOP intervals: 512 nsec, 1024 nsec, or 10 μ sec.
- Trigger Out Position** : 15-turn pot, position the TRIG OUT pulse relative to the leading edge of the GATE OUT signal.
- Free Run** : Momentary pushbutton, causes the 7120 to cycle at a 10 KHz rate. Amplitudes and intervals are as they were before this mode was entered. Free run mode is automatically terminated upon receipt of a CAMAC execute command or a TRIG IN signal.
- Autopulse** : Momentary pushbutton, causes the 7120 to enter the Autopulse mode. The 7120 will automatically cycle at a 10 KHz rate, with its Primary amplitude ramping from 0 to its full scale value in approximately 1 second. If an external TRIG IN is received during this time, the ramp will stop at its current value and the AUTOPULSE light will go on. Reading the value of $\pm$ DC OUT will indicate the ramp's value, which will correspond to the current TIME or CHARGE output.

This mode is useful for quickly checking the thresholds of discriminators. Connect the QOUT or DC OUT to the input of the discriminator; the discriminator output goes to the TRIG IN connector. When the light goes on, the $\pm$ DC outputs will correspond to the discriminator's threshold.

CAMAC COMMANDS

F0-A0 Reads the state of the switches and jumpers controlling the module. Q and X are always true.



CAMAC COMMANDS (continued)

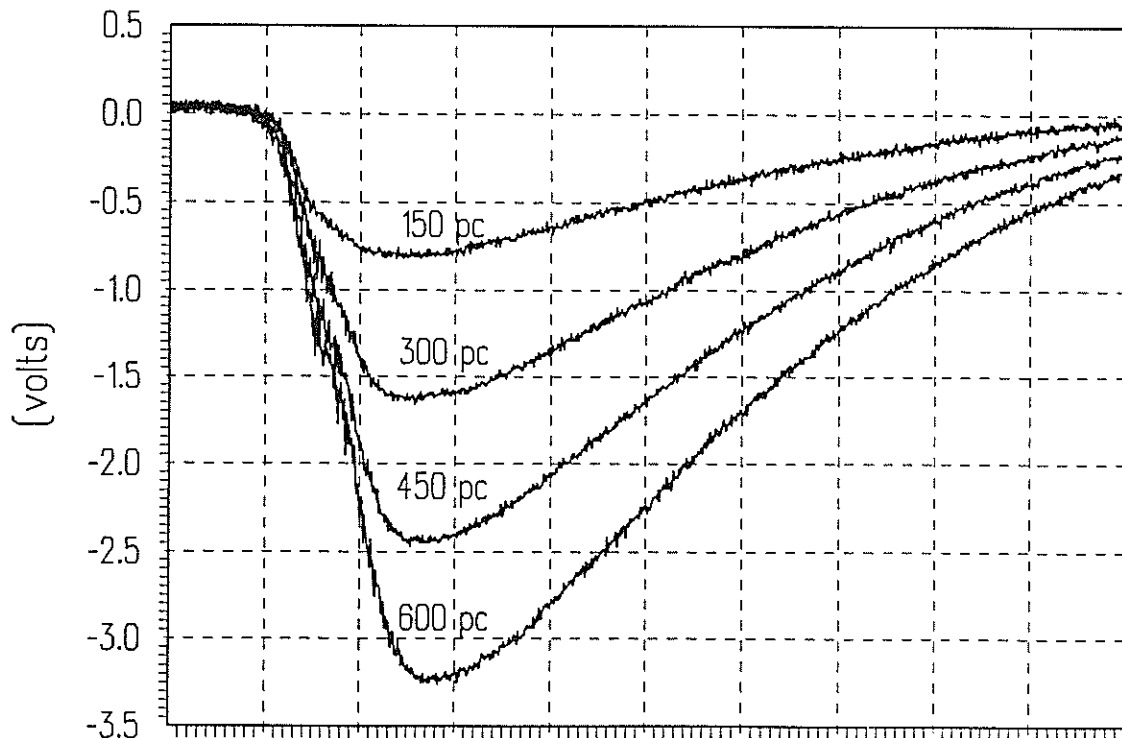
- F16·A0:** Loads the 16-bit Primary register and executes one cycle 100 μ sec after S1. If the Primary output is in the MANUAL mode the DAC register is still loaded, but the 7120 outputs will continue to be controlled by the manual control. Switching back to CAMAC will cause the new value of the DAC register to take control. Q is true when in CAMAC mode, false when in MANUAL. X is always returned true.
- F16·A2:** Loads the 8-bit Secondary register. If the Secondary output is in the MANUAL mode the DAC register is still loaded, but the outputs will not change. Switching back to CAMAC will cause the new value of the DAC register to take control. Q is true when the selected Secondary section is in the CAMAC mode, false when in MANUAL. X is always returned true.
- Z:** Clears both Primary and Secondary registers at S2 time and causes a cycle to be generated. If in CAMAC mode the output value will be 0; if in MANUAL mode the value will correspond to the position of the appropriate pot.

POWER SUPPLY REQUIREMENTS

+6V @ 1 A
+24V @ 400 mA

-6V @ 1 A
-24V @ 400 mA

7120 Charge Output into 50 Ω



[2 nsec/div]

4/94

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MODEL 7120 Q.C. SHEET S/N.11184...

NAME MARCO M.

DATE 6-29-94

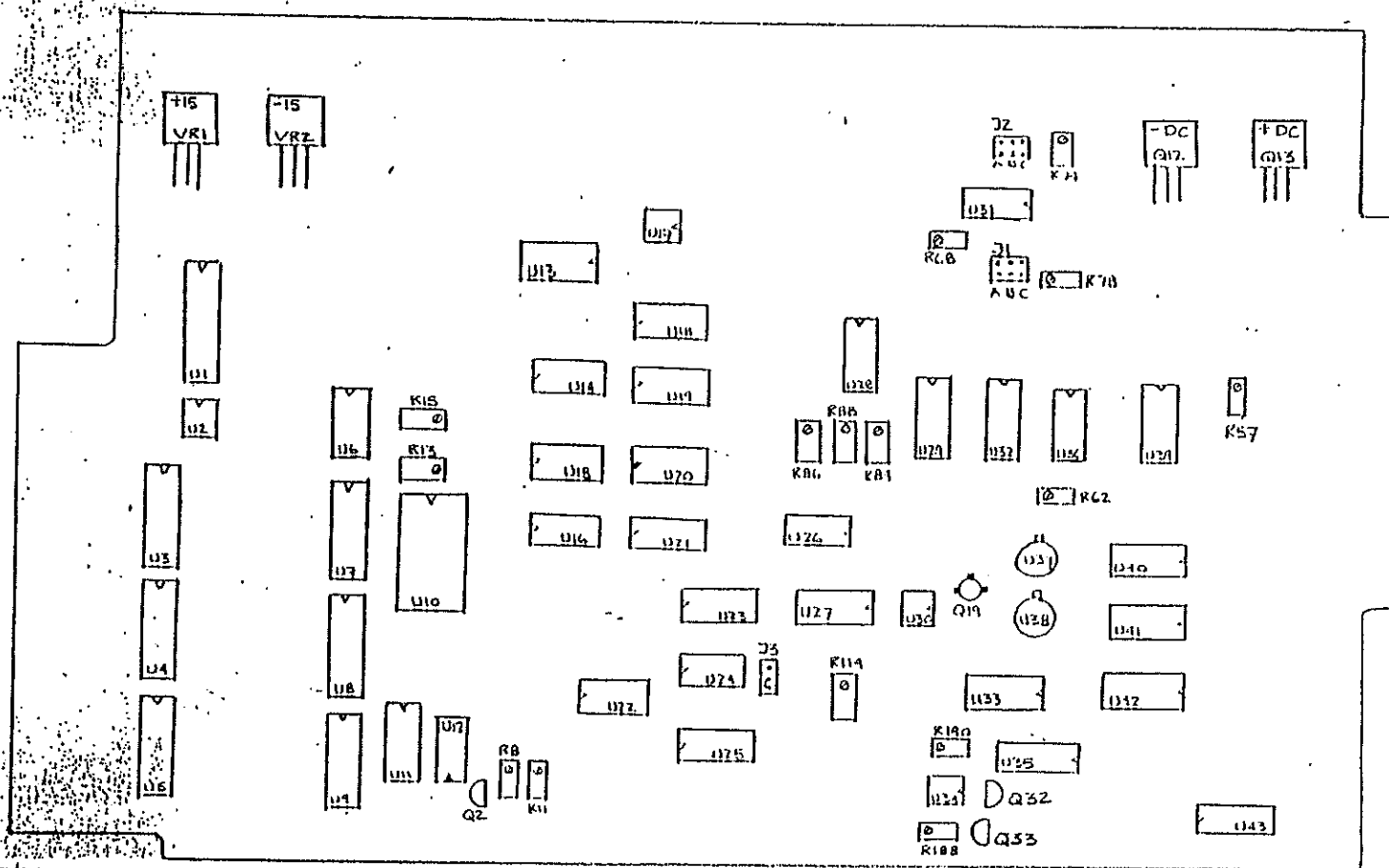
Visual Inspection

Level 1 Operation (Procedure Sections 1.0 to 9.8)

6 Hour Burn-In Cycle

Level 2 Operation (Repeat Sections 1.0 to 9.8)

PARAMETER		VALUE	UNITS
Positive DC Outputs (+ 5.00 Volts)		+5.00	VOLTS
Positive DC Outputs (+ 10.00 Volts)		+10.00	VOLTS
Negative DC Outputs (- 5.00 Volts)		-5.00	VOLTS
Negative DC Outputs (- 10.00 Volts)		-10.00	VOLTS
Trigger Out	Level	4.2	VOLTS
	Risetime	3.9	nSec
	Falltime	5.9	nSec
	Width	29.0	nSec
Start Out	Level	885	mv
	Risetime	1.1	nSec
	Falltime	1.6	nSec
	Width	50	nSec
Stop Out	Level	880	mv
	Risetime	1.0	nSec
	Falltime	1.5	nSec
	Width	50	nSec
Gate Out	Level	880	mv
	Risetime	1.0	nSec
	Falltime	1.5	nSec
	Width (@ 100 nSec)	100	nSec
Level 3 calibrations (Procedure Sections 10.0 to 11.74)			
Full Scale Charge (Section 11.6.4)		600	pC
Charge Pedestal (Section 11.7.3)		.100	pC



7120 Parts List:

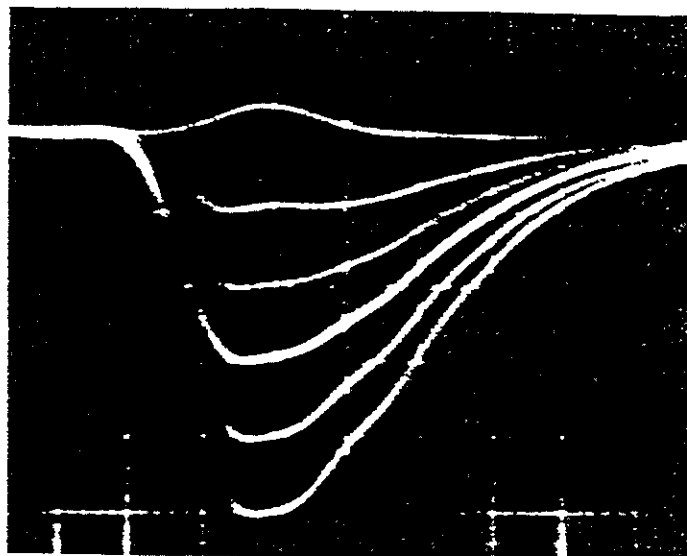
75451 - 1 pcs. {U2}	HC74 - 1 pcs. {U18}
HCT540 - 2 pcs. {U3,U4}	HC221 - 4 pcs. {U19,U20,U21,U25}
AS756 - 1 pc. {U5}	HC02 - 1 pc. {U22}
HC08 - 1 pc. {U6}	HC138 - 1 pc. {U23}
HC564 - 2 pcs. {U7,U8}	HC.74 - 1 pc. {U24}
HC574 - 1 pc. {U9}	LF13333 -4 pcs {U28,U29,U32,U39}
DAC 701BH - 1 pc. {10}	AD 711 - pc. {U30}
DAC 1020 - 1 pc. {11}	10H131 -4 pcs. {U35,U40,U41,U42}
LT1014 - 3 pcs. {U12,U26,U31}	6485 - 2 pcs. {U37,U38}
HC10 - 2 pcs. {U14,U15}	9487 - 1 pc. {U33}
SD5002 - 3 pcs. {U13,U27,U43}	AD713 - 1 pc. {U36}
HC132 - 1 pc. {U16}	
AD 712 - 2 pcs. {U17,U34}	
10 001 2018	

50 mV/Box

2 nS/Box

(TEK 475 Scope)

0 V
 -50 mV-
 -100 mV-
 -150 mV-
 -200 mV-
 -250 mV-

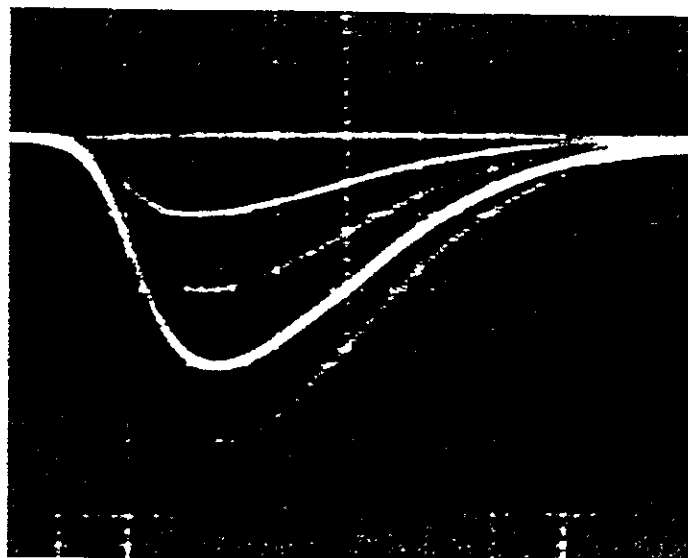


CHARGE OUT SIGNAL
 (Low Level Charge Signals)

MODEL 7120 Charge Source

1 V/Box 2 nS/Box

0 V
 -1 V-
 -2 V-
 -3 V-
 -4 V-



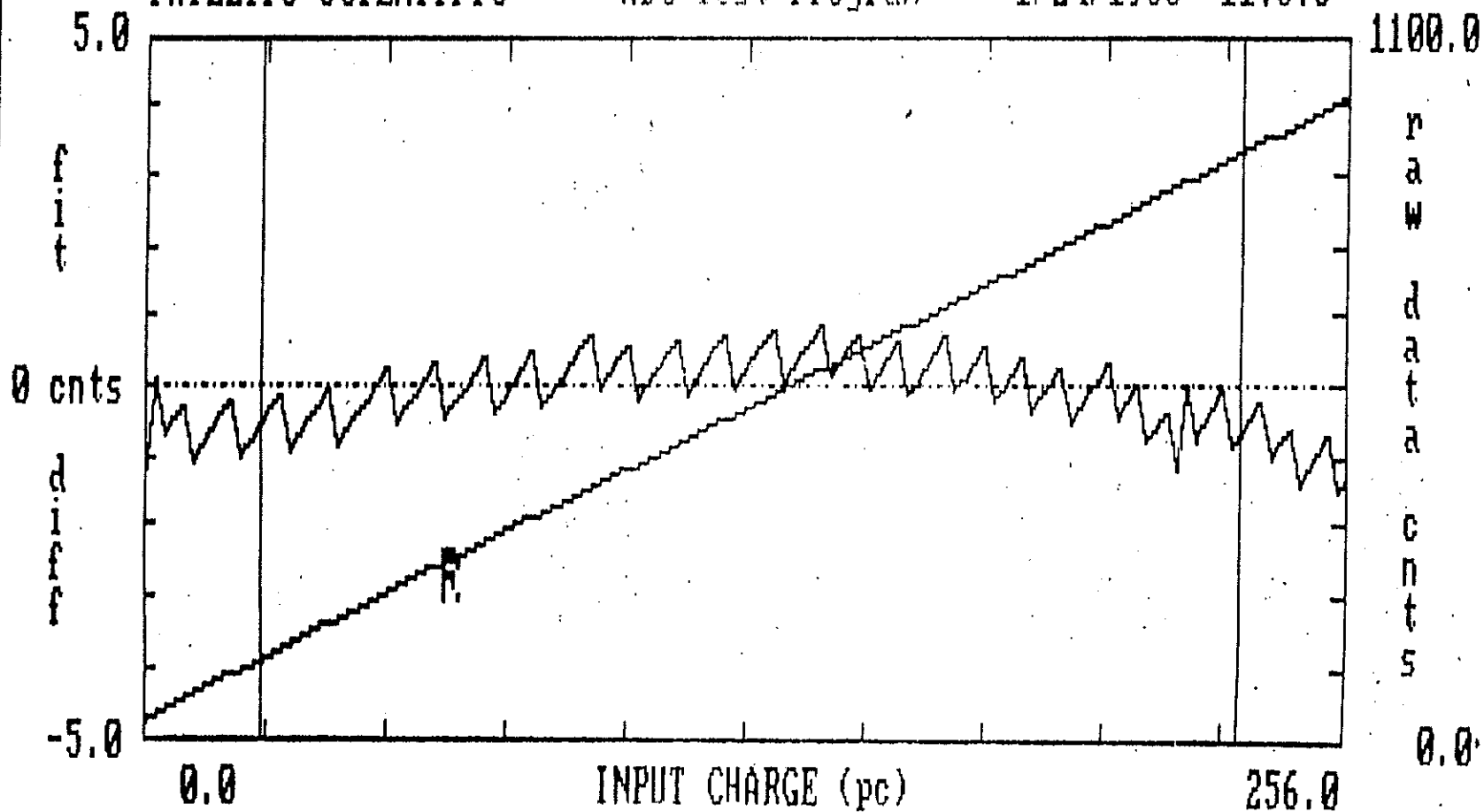
≈ 600 pc

HIGH LEVEL CHARGE SIGNALS

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ADC Test Program

1/24/1986 11:5:5



ADC(chan)= 1 Gate(ns)= 120 mxcnts=1006 Pnts=128 Cyc= 1 Swp= 1 SA=1
Gain(pc/cnt)=0.263 Ofst(cnts)= 26 Paramfile= 420TEST Lcmd= HC

Exit Help Commands Parameters Execute-Test use ← → or Enter Cmd= HC

Tek



Cursors

Window 1

Def Wfm

1V

500mV
/div
EA

trig'd

-4V



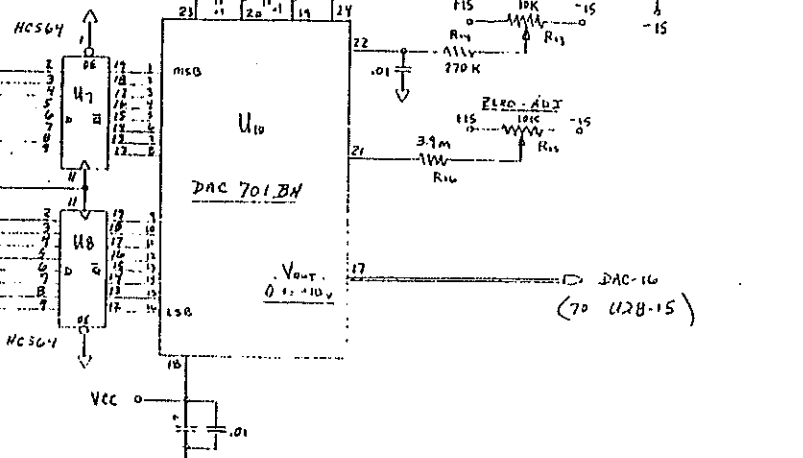
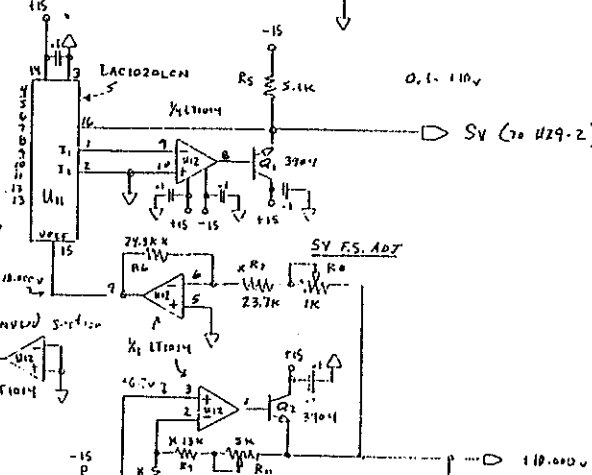
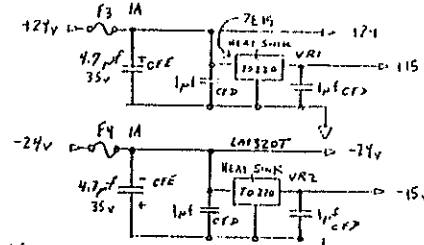
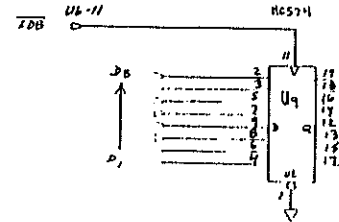
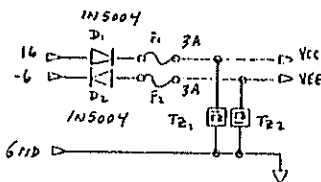
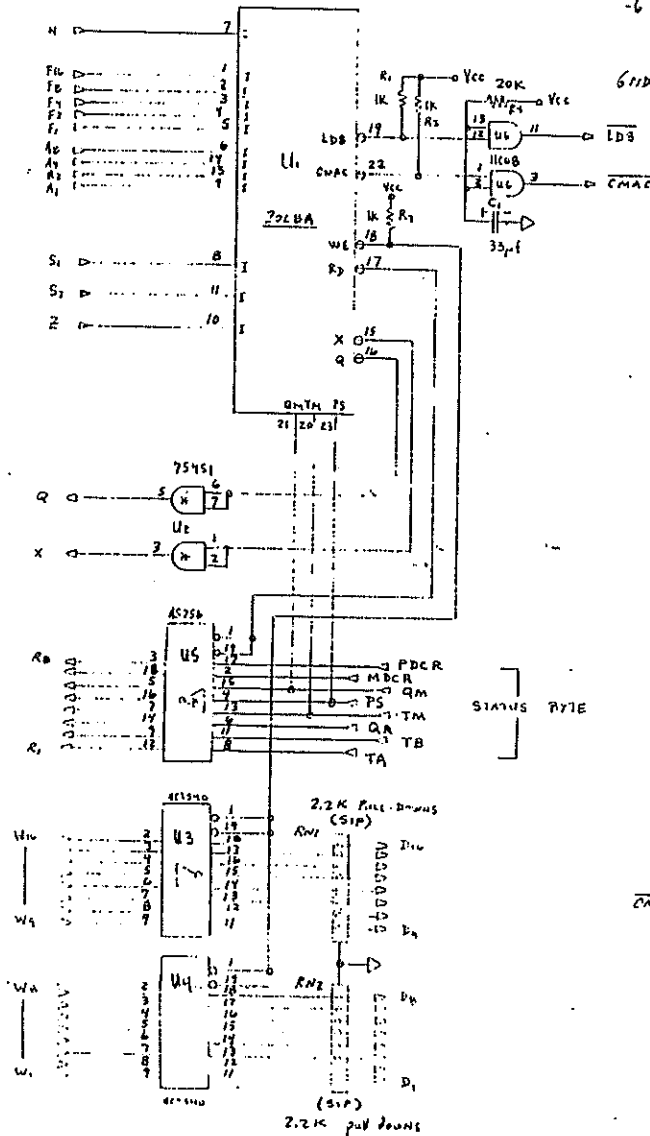
-45.6ns

20ns/div

154.4ns

Rise	Fall	Area	Measure- ments	Main Size
20.91 ns	2.272 ns	-30.00 nVs		20ns/div
Peak-Peak	Width		Compare-% References	Main Pos -40ns
2.725 V	11.88 ns			Remove Wfm 2
				Pan/ Zoom
				C1 Main
				off

Philips Scientific Model 7120 page 1.15
CMAC & DAC SECTION

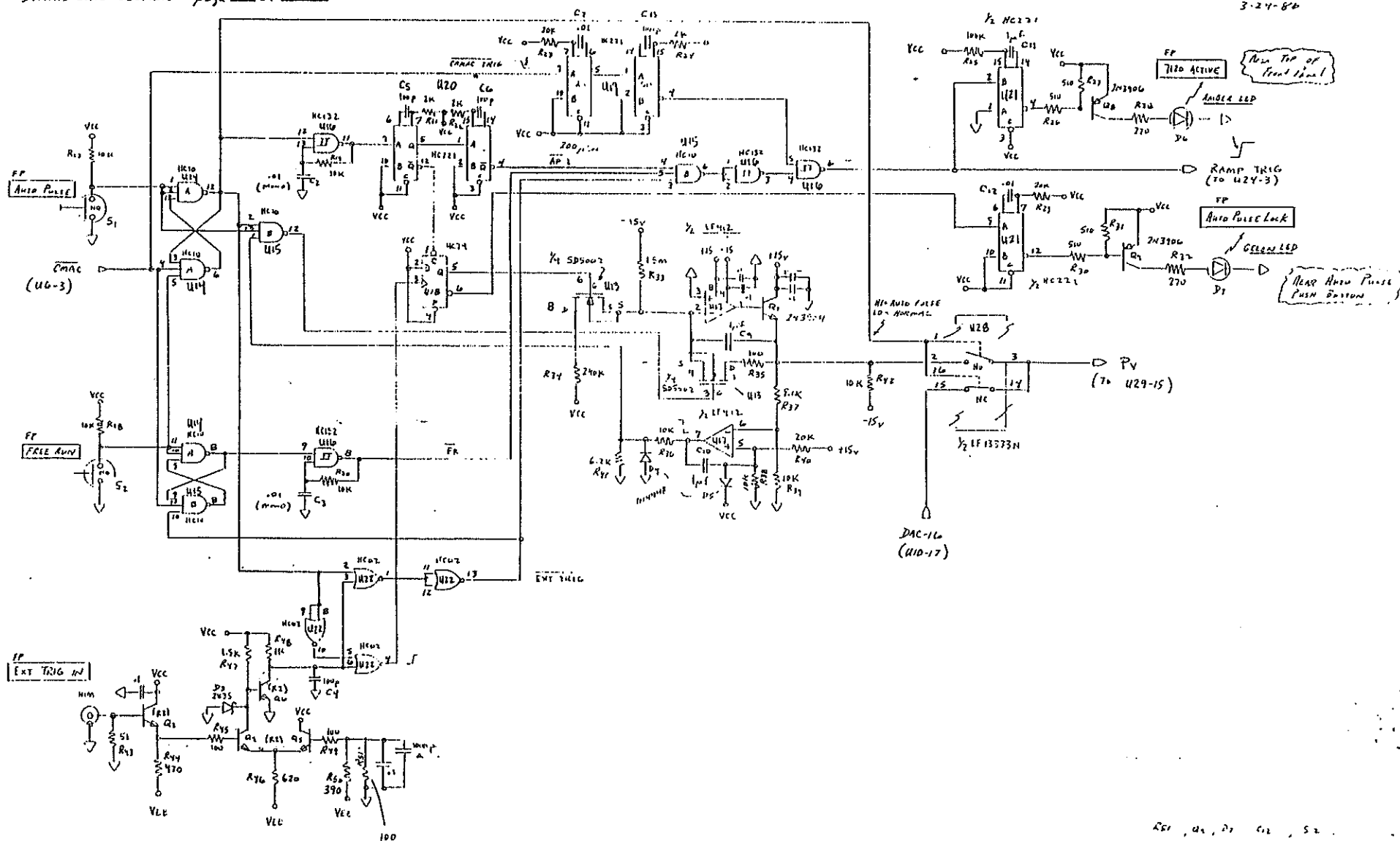


KAR
3-25-86

V01, U1, U2, D1, D2, R1, R2

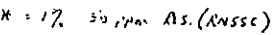
CHILLIPS SCIENTIFIC Model 7120
DIGITAL CTRL SECTION page 2 of 5

KACR
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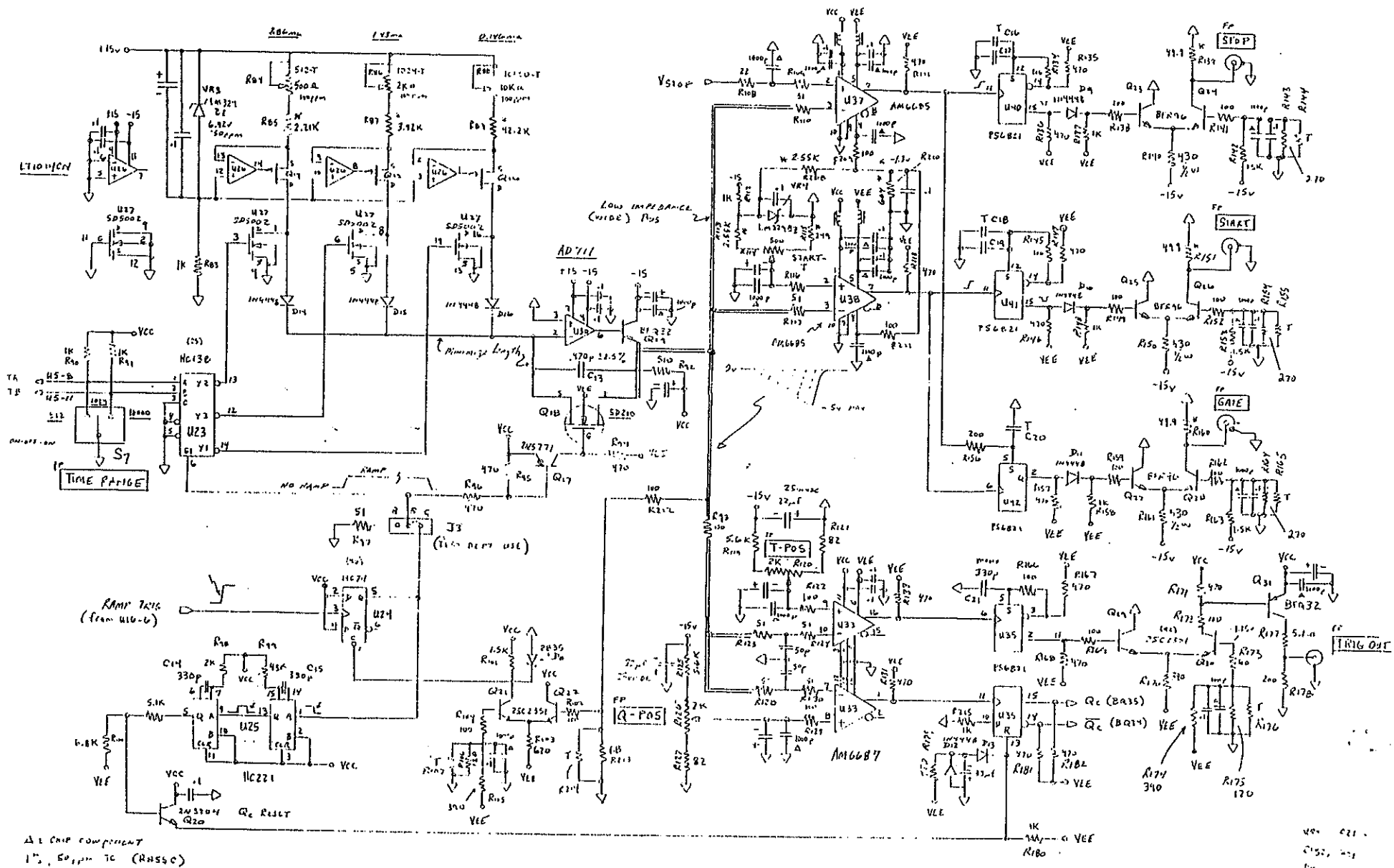


PHILLIPS SCIENTIFIC Model 712W
ANALOG GRL SECTION page 3 of 5

KARE
3-21-EG



All parts, (100, 11m MAR TC.)



ΔE CRIP COMPONENT
1st, 50,000 TC (RASSC)

PHILLIPS Scientific Model 7120
CHARGE (C) SECTION: page 5 of 5

KARR
3-21-86

