

TO: Catalog Holders
FROM: Shirley Spence x5002 50-424
SUBJECT: Catalog Updating/Indexes

DATE: September, 1980

The Monolithic Circuit/Hybrid Circuit Catalog is set-up to give the user all of the basic information needed for a given circuit that has "Turned Regular" and is in production.

The catalog will be updated at the end of each quarter. The pages with the new circuit information will be distributed to each catalog holder at that time.

The catalog is set up in circuit numerical order.

The indexes for each section are set up as follows:

- Blue Pages - By Circuit Number
(e.g., M018, M019, etc.)
- Yellow Pages - By Part Number
(e.g., 155-0004-00, 155-0005-00, etc.)
- Green Pages - By Circuit Type
(e.g., General Circuits, A/D and D/A Circuits, etc.)
- Tan Pages - Engineering/Production Contacts
(e.g., Krishna Verma/Steve Fierro, etc.)



MONOLITHIC CIRCUITS

BY CIRCUIT NUMBER

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Horizontal Lockout Logic	155-0009-00	M001
Chop Divider/Blanking, Type 3	155-0010-00	M004
Chop and Clock Blanking	155-0011-00	M012
"Z" Axis Logic	155-0012-00	M015
Miller Integrator and Delay Pick-Off	155-0028-XX 155-0042-XX	M018
Analog to Decimal Converter	155-0014-01	M019
Data Switch	155-0015-01	M020
Horizontal Chop and Alternate Binary	155-0013-00	M022
Decade Counter	155-0017-00	M025
Zero Logic	155-0018-00	M026
Decimal Point and Spacing	155-0019-00	M027
Output Assembler	155-0020-00	M028
Timing Generator	155-0021-00	M029
Readout System 576	155-0004-01	M033
Readout System 576	155-0005-00	M034
Readout System 576	155-0006-01	M035
Channel Switch	155-0022-XX	M036
Channel Switch	155-0022-00	M036
Readout System 576	155-0007-01	M038
Readout System 576	155-0008-01	M039
Sweep Control	155-0056-00	M042
D/A Converter	155-0038-XX	M045
Quad Timing Unit	155-0031-01	M047

TITLE	PART NUMBER	CIRCUIT
Probe Power Supply	155-0033-00	M048
Dual Output Amplifier	155-0047-00	M050
Trigger and Sweep	155-0048-XX 155-0055-00	M052
Quad Operational Amplifier	155-0035-00 155-0116-00	M053
2 Op Amps/2 Current Sources	155-0057-00	M053
Input Amplifier	155-0032-XX	M055
Dual Probe	155-0034-00	M061
423 Vertical Amplifier	155-0050-01	M065
423 "Z" Axis/HV Regulator	155-0051-00	M068
Gain Trim Amplifier	155-0059-00	M077
Sweep Control	155-0049-01	M079
HF Output Amplifier	203-0080-90	M080
FT Doubler Amplifier	155-0061-00	M083
485 Vertical Amplifier	155-0078-10	M084
Vertical Output Amplifier	203-0088-90	M089
Vertical Output Amplifier	203-0089-90	M089
Power Supply Regulator	155-0067-02	M091
Input Protection and Probe Logic	155-0076-00	M094
Channel Switch	155-0091-00	M095
Logic Probe Logic	203-0096-90	M096
Normalizing Circuit	155-0106-00	M101
Vertical Output Amplifier	203-0102-90	M102
Dual Op Amps and Channel Switch	155-0083-00	M105
Legend Generator	155-0110-00	M119

TITLE	PART NUMBER	CIRCUIT
Trigger circuit	155-0109-01	M120
Trigger Amp; Source Select & Peak-to-Peak	155-0126-00	M121
Fast Trigger Circuit	155-0150-00	M122
5-Digit BCD Counter	155-0119-00	M123
Sync Counter	155-0144-00	M124
FT Doubler	203-0126-90	M126
7-Segment Character Generator	155-0114-00	M127
Vertical Amplifier	203-0130-90	M130
Trigger Sub-System	155-0121-00	M131
Sweep Control	155-0122-00	M132
Sweep and Pick-Off	155-0123-00	M133
Trigger Source Selector and Amplifier	155-0160-00	M136
Horizontal Preamplifier	155-0124-00	M138
4-Decade Counter and Memory	155-0171-00	M150
Pulse Output Amplifier	155-0145-00	M151
CRT Geometry Correction	155-0152-00	M152
Display Multiplexer	155-0154-00	M154
4-Bit Parallel ADC	203-0155-90	M155
Trigger Generator	155-0151-00	M159
Character Generator M24-N	155-0023-00	M160
Character Generator M24-S	155-0024-00	M161
Character Generator M24-P	155-0025-00	M162
Character Generator M24-L1	155-0026-00	M163
Character Generator M24-L2	155-0027-00	M164
Legend Generator M92-R	155-0086-00	M165

TITLE		PART NUMBER	CIRCUIT
Legend Generator	M92-C1	155-0087-00	M166
	M92-C2	155-0088-00	M167
Legend Generator	M92-C3	155-0104-00	M169
Legend Generator	M92-C3	155-0105-00	M170
Legend Generator	M92-A	155-0135-00	M171
Dual Strobe Generator		155-0170-00	M175
5-Bit ECL D/A Converter		203-0177-90	M177
Channel Switch and FT Doubler		203-0178-90	M178
Digital Storage Vertical Control		155-0157-00	M180
Digital Storage Horizontal Control		155-0158-00	M181
7000 Series DVM		155-0185-00	M187
Trigger Circuit		155-0195-00	M188
Sync Generator		155-0188-00	M192
Horizontal Output Amplifier		203-0196-90	M196
Horizontal Output Amplifier		203-0197-90	M197
Clamp and Sensor		203-0198-90	M198
Input Amplifier		203-0199-90	M199
FT Doubler		155-0187-00	M207

MONOLITHIC CIRCUITS

BY PART NUMBER

<u>TITLE</u>	<u>CIRCUIT</u>	<u>PART NUMBER</u>
576 Readout System	M033	155-0004-00
576 Readout System	M034	155-0005-00
576 Readout System	M035	155-0006-01
576 Readout System	M038	155-0007-00
576 Readout System	M039	155-0008-00
Horizontal Lockout Logic	M001	155-0009-00
Chop Divider and Blanking (Type 3)	M004	155-0010-00
Clock and Chop Blanking	M012	155-0011-00
Z-Axis Logic	M015	155-0012-00
DC Binary	M022	155-0013-00
Analog to Decimal Converter	M019	155-0014-01
Data Switch	M020	155-0015-01
Decade Counter	M025	155-0017-00
Zero Logic	M026	155-0018-00
Decimal Point and Spacing	M027	155-0019-00
Output Assembler	M028	155-0020-00
Timing Generator	M029	155-0021-00
Channel Switch	M036	155-0022-00
Character Generator	M160	155-0023-00
Character Generator	M161	155-0024-00
Character Generator	M162	155-0025-00
Character Generator	M163	155-0026-00

TITLE	CIRCUIT	PART NUMBER
Character Generator	M164	155-0027-00
Miller Integrator and Delay Pick-Off	M018	155-0028-00
Quad Timing Unit	M047	155-0031-01
Input Amplifier	M055	155-0032-00
Probe Power Supply	M048	155-0033-00
Dual Diode	M061	155-0034-00
Quad Operational Amplifier	M053	155-0035-00
D/A Converter	M045	155-0038-01 155-0038-02
Dual Output Amplifier	M050	155-0047-00
Trigger and Switch	M052	155-0048-01
Sweep Control	M079	155-0049-01
Vertical Preamplifier	M065	155-0050-01
Z-Axis and HV Regulator	M068	155-0051-00
Trigger and Switch	M052	155-0055-00
Sweep Control	M042	155-0056-00
2 Op Amp/2 Current Source	M053	155-0057-00
Gain Trim Amplifier	M077	155-0059-00
FT Doubler Amplifier	M083	155-0061-00
Power Supply Regulator	M091	155-0067-02
Input Protection and Probe Logic	M094	155-0076-00
485 Vertical Amplifier	M084	155-0078-00
Quad Operational Amplifier	M105	155-0083-00
Legend Generator	M165	155-0086-00
Legend Generator	M166	155-0087-00

TITLE	CIRCUIT	PART NUMBER
Legend Generator	M167	155-0088-00
Channel Switch	M095	155-0091-00
Legend Generator	M169	155-0104-00
Legend Generator	M170	155-0105-00
Trigger Switch	M120	155-0109-01
Legend Generator	M119	155-0110-00
BCD to 7-Segment Decoder	M127	155-0114-00
Quad Operational Amplifier	M053	155-0116-00
5-Digit BCD Counter	M123	155-0119-00
Trigger Sub-System	M131	155-0121-00
Sweep Control	M132	155-0122-00
Sweep and Pickoff	M133	155-0123-00
Horizontal Preamplifier	M138	155-0124-00
Trigger Amplifier	M121	155-0126-00
Legend Generator	M171	155-0135-00
Sync Stripper	M124	155-0144-00
Pulse Output Amplifier	M151	155-0145-00
Sweep Trigger	M159	155-0151-00
CRT Geometry Correction	M152	155-0152-00
Display Multiplexer	M154	155-0154-00
Vertical Control	M180	155-0157-00
Horizontal Control	M181	155-0158-00
Trigger Amplifier and Channel Switch	M136	155-0160-00
Dual Strobe Generator	M175	155-0170-00

TITLE	CIRCUIT	PART NUMBER
4-Decade Counter and Memory	M150	155-0171-00
7000 Series DVM	M187	155-0185-00
FT Doubler	M207	155-0187-00
Sync Generator	M192	155-0188-00
Trigger Circuit	M188	155-0195-00
HF Output Amplifier	M080	203-0080-90
Vertical Output Amplifier	M089	203-0089-90
Logic Probe Logic	M096	203-0096-90
Vertical Output Amplifier	M102	203-0102-90
FT Doubler Amplifier	M126	203-0126-90
Vertical Amplifier	M130	203-0130-90
4-Bit Flash A/D Converter	M155	203-0155-90
5-Bit D/A Converter	M177	203-0177-90
Channel Switch and FT Doubler	M178	203-0178-90
Horizontal Output Amplifier	M196	203-0196-90
Horizontal Output Amplifier	M197	203-0197-90
Clamp and Sensor	M198	203-0198-90
Input Amplifier	M199	203-0199-90

INTEGRATED CIRCUITS ENGINEERING/MANUFACTURING CONTACTS

BY CIRCUIT NUMBER

<u>ICE CONTACT</u>	<u>ICM CONTACT</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Mike Metcalf	Kurt Dichmann	155-0009-00	M001
Mike Metcalf	Kurt Dichman	155-0010-00	M004
Mike Metcalf	Steve Stark	155-0011-00	M012
George Wilson	Steve Stark	155-0012-00	M015
Mike Metcalf	Steve Stark	155-0028-00 155-0028-01 155-0042-02 155-0042-03	M018
Mike Metcalf	Dave VanCleve	155-0014-01	M019
Mike Metcalf	Dave VanCleve	155-0015-01	M020
Mike Metcalf	Kurt Dichmann	155-0013-00	M022
Mike Metcalf	Dave VanCleve	155-0017-00	M025
Mike Metcalf	Dave VanCleve	155-0018-00	M026
Mike Metcalf	Dave VanCleve	155-0019-00	M027
Mike Metcalf	Dave VanCleve	155-0004-01	M033
Mike Metcalf	Dave VanCleve	155-0005-00	M034
Mike Metcalf	Dave VanCleve	155-0006-01	M035
Einar Traa	Kurt Dichmann	155-0022-00 155-0022-01	M036
Mike Metcalf	Dave VanCleve	155-0007-01	M038
Mike Metcalf	Dave VanCleve	155-0008-01	M039
Mike Metcalf	Steve Stark	155-0056-00	M042

ICE CONTACT	ICM CONTACT	PART NUMBER	CIRCUIT
Mike Metcalf	Dave VanCleve	155-0031-01	M047
Einar Traa	Steve Stark	155-0033-00	M048
Mike Metcalf	Kurt Dichmann	155-0047-00	P050
Mike Metcalf	Steve Stark	155-0048-00 155-0048-01 155-0055-00	M052
Mike Metcalf	Kurt Dichmann	155-0035-00 155-0057-00 155-0116-00	M053
Einar Traa	Kurt Dichmann	155-0032-00 155-0032-01	M055
Einar Traa	Kurt Dichmann	155-0050-01	M065
Mike Metcalf	Kurt Dichmann	155-0051-00	M068
George Wilson	Kurt Dichmann	155-0059-00	M077
Mike Metcalf	Dave Perkins	155-0049-02	M079
George Wilson	Steve Stark	155-0080-90	M080
George Wilson	Steve Stark	155-0061-00	M083
George Wilson	Steve Stark	155-0078-10	M084
Einar Traa	Dave Perkins	203-0089-90	M089
Mike Metcalf	Dave Perkins	155-0067-02	M091
Mike Metcalf	Dave Perkins	155-0076-00	M094
Einar Traa	Steve Stark	155-0091-00	M095
Mike Metcalf	Kurt Dichmann	203-0096-90	M096
Walt Ainsworth	Kurt Dichmann	155-0106-00	M101
Einar Traa	Dave Perkins	203-0102-90	M102
Mike Metcalf	Kurt Dichmann	155-0083-00	M105
Mike Metcalf	Dave Perkins	155-0110-00	M119

ICE CONTACT	ICM CONTACT	PART NUMBER	CIRCUIT
Walt Ainsworth	Dave Perkins	155-0109-00	M120
Walt Ainsworth	Dave Perkins	155-0126-00	M121
Walt Ainsworth	Dave VanCleve	203-0122-90	M122
Randy Young	Dave DeGrenier	155-0119-00	M123
Ken Schlotzhauer	Steve Stark	155-0144-00	M124
George Wilson	Steve Stark	203-0126-90	M126
Walt Ainsworth	Steve Stark	155-0114-00	M127
Einar Traa	Kurt Dichmann	203-0130-90	M130
Walt Ainsworth	Steve Stark	155-0121-00	M131
Mike Metcalf	Steve Stark	155-0122-00	M132
Mike Metcalf	Steve Stark	155-0123-00	M133
Walt Ainsworth	Kurt Dichmann	155-0160-00	M136
Bob Nordstrom	Steve Stark	155-0124-00	M138
Mike Metcalf	Dave VanCleve	155-0171-00	M150
Ken Schlotzhauer	Steve Stark	155-0145-00	M151
Binoy Rosario	Steve Stark	155-0152-01	M152
Binoy Rosario	Steve Stark	155-0154-00	M154
Bob Nordstrom	Dave VanCleve	203-0155-90	M155
Carl Battjes	Dave Perkins	155-0207-00	M156
Dick Hung	Dave VanCleve	155-0151-00	M159
Mike Metcalf	Dave VanCleve	155-0023-00	M160
Mike Metcalf	Dave VanCleve	155-0024-00	M161
Mike Metcalf	Dave VanCleve	155-0025-00	M162
Mike Metcalf	Dave VanCleve	155-0026-00	M163

<u>ICE CONTACT</u>	<u>ICM CONTACT</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Mike Metcalf	Dave VanCleve	155-0027-00	M164
Mike Metcalf	Dave Perkins	155-0086-00	M165
Mike Metcalf	Dave Perkins	155-0087-00	M166
Mike Metcalf	Dave Perkins	155-0088-00	M167
Mike Metcalf	Dave Perkins	155-0104-00	M169
Mike Metcalf	Dave Perkins	155-0105-00	M170
Mike Metcalf	Dave Perkins	155-0135-00	M171
Bob Nordstrom	Dave VanCleve	203-0175-90	M175
Bob Nordstrom	Kurt Dichmann	203-0177-90	M177
Randy Young	Dave DeGrenier	155-0157-00	M180
Randy Young	Dave DeGrenier	155-0158-00	M181
Don Larson	Dave DeGrenier	155-0185-00	M187
Don Larson	Dave DeGrenier	155-0188-00	M192

GENERAL CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Channel Switch	155-0022-00	M036
Quad Timing Unit	155-0031-01	M047
Dual Output Amplifier	155-0047-00	M050
Dual Diode	155-0034-00	M061
Power Supply Regulator	155-0067-02	M091
Channel Switch	155-0091-00	M095
Normalizing Circuit	155-0106-00	M101
Digital Storage Vertical Control	155-0157-00	M180
Digital Storage Horizontal Control	155-0158-00	M181
TV Sync Generator	155-0188-00	M192

OPERATIONAL AMPLIFIER CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Quad Operational Amplifier	155-0035-00 155-0116-00	M053
2 Op Amps/2 Current Sources	155-0057-00	M053
Dual Op Amps and Channel Switch	155-0083-00	M105

MAINFRAME LOGIC CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Horizontal Lockout Logic	155-0009-00	M001
Chop Divider and Blanking (Type 3)	155-0010-00	M004
Clock and Chop Blanking	155-0011-00	M012
Z-Axis Logic	155-0012-00	M015
Horizontal Chop and Alternate Binary (Type 2)	155-0013-00	M022

KNOB READOUT SYSTEM CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Analog to Decimal Converter	155-0014-01	M019
Data Switch	155-0015-01	M020
Decade Counter	155-0017-00	M025
Zero Logic	155-0018-00	M026
Decimal Point and Spacing	155-0019-00	M027
Output Assembler	155-0020-00	M028
Timing Generator	155-0021-00	M029
Legend Generator	155-0110-00	M119
4-Decade Counter and Memory	155-0171-00	M150
Character Generator	155-0023-00	M160
	155-0024-00	M161
	155-0025-00	M162
	155-0026-00	M163
	155-0027-00	M164
Legend Generator	155-0086-00	M165
	155-0087-00	M166
	155-0088-00	M167
	155-0104-00	M169
	155-0105-00	M170
	155-0135-00	M171

READOUT SYSTEM CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Beta Computer	155-0004-01	M033
Beta Computer	155-0005-00	M034
Beta Computer	155-0006-01	M034
Readout I	155-0007-01	M038
Readout II	155-0008-01	M039
5-Digit BCD Counter	155-0119-00	M123
7-Segment Character Generator	155-0114-00	M127

HORIZONTAL SYSTEM CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Miller Integrator and Delay Pick-off	155-0028-XX 155-0042-XX	M018
Sweep Control	155-0056-00	M042
Trigger and Sweep	155-0048-XX 155-0055-00	M052
Sweep Control	155-0049-01	M079
Trigger	155-0109-01	M120
Trigger Amplifier Source Select and Peak-to-Peak Auto	155-0126-00	M121
Fast Trigger	155-0150-00	M122
Trigger Sub-System	155-0121-00	M131
Sweep Control	155-0122-00	M132
Sweep and Pick-Off	155-0123-00	M133
Trigger Source Selector and Amplifier	155-0160-00	M136
Horizontal Preamplifier	155-0124-00	M138
Trigger Generator	155-0151-00	M159

A/D AND D/A CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
D/A Converter	155-0038-XX	M045
Display Multiplexer	203-0155-90	M155
Dual Strobed Comparator	155-0170-00	M175
5-Bit ECL D/A Converter	203-0177-90	M177

VERTICAL AMPLIFIER CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Input Amplifier	155-0032-XX	M055
Vertical Preamplifier	155-0050-01	M065
Gain Trim Amplifier	155-0059-00	M077
HF Output Amplifier	203-0080-90	M080
FT Doubler Amplifier	155-0061-00	M083
485 Vertical Amplifier	155-0078-10	M084
Vertical Output Amplifier	203-0089-90	M089
Vertical Output Amplifier	203-0102-90	M102
FT Doubler Amplifier	203-0126-90	M126
Vertical Amplifier	203-0130-90	M130

TV AND CRT CONTROL CIRCUITS

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Z-Axis and HV Regulator	155-0051-00	M068
Sync Stripper	155-0144-00	M124
Pulse Output Amplifier	155-0145-00	M151
CRT Geometry Correction	155-0152-00	M152
Display Multiplexer	155-0154-00	M154

PROBE CONTROL CIRCUIT

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
PRobe Power Supply	155-0033-00	M048
Input Protection and Probe Logic	155-0076-00	M094
Logic Probe Logic	203-0096-90	M096

DESCRIPTION

The horizontal lockout logic receives inputs from the horizontal chop and alt. binary, "A" sweep delay control, "A" sweep gate, "B" sweep holdoff and "B" sweep gate. Logic is performed on these signals to provide lockout for "A" sweep or "B" sweep and alternating signals for the horizontal chop and alt. binary.

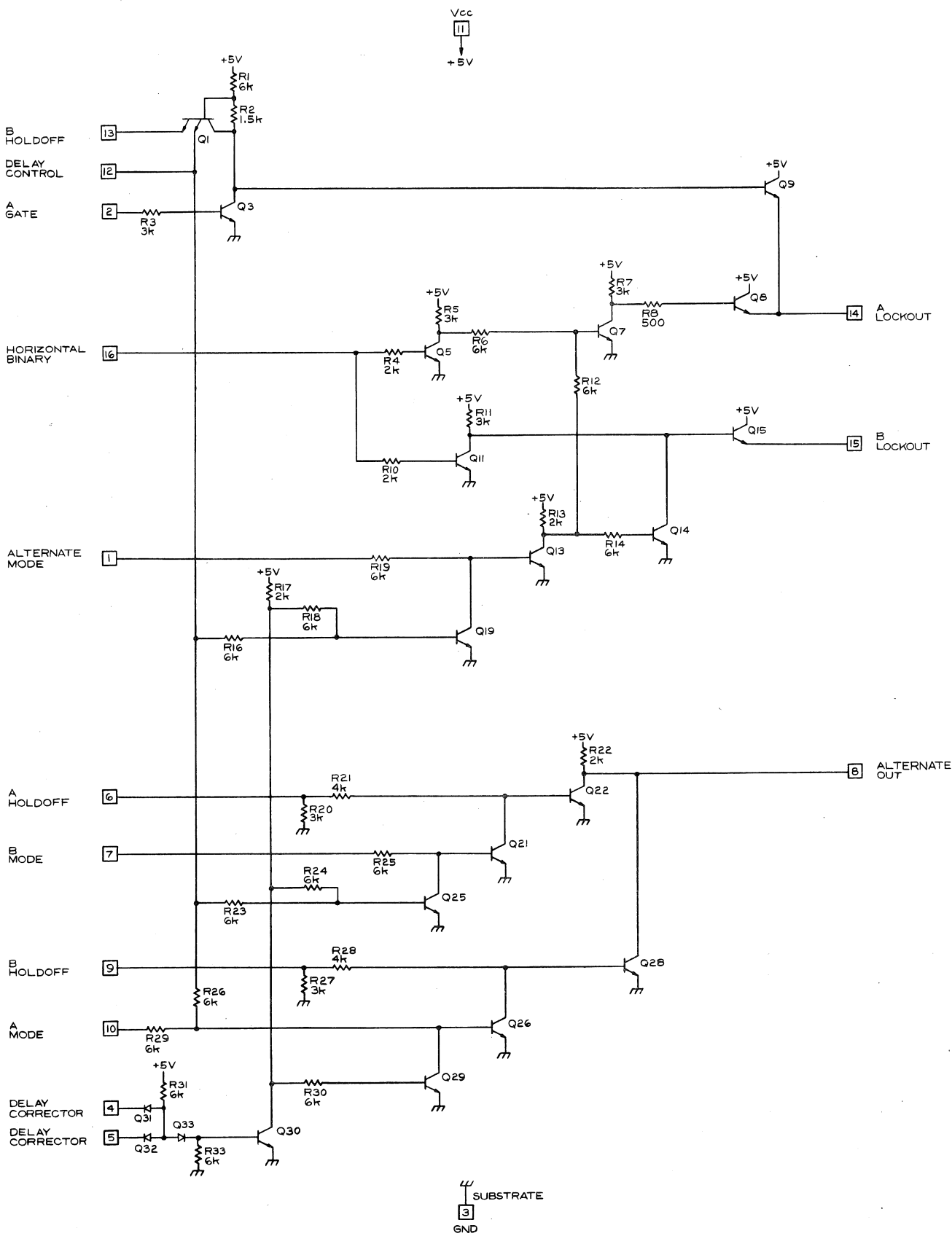
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Les Larson

INSTRUMENT USAGE 7704A A7704
 R7704 7844
 7504 7514
 7904



ENGR	<i>A.H. Peters</i>	8-22-75	PROCESS	200.n/g
DWN BY	J. Langley	8-19-75	PACKAGE	16 PIN DIP
CHK BY	<i>David Van Cleave</i>	10-23-75	DIE SIZE	45mil X 45mil
TYPE	MONOLITHIC	HORIZONTAL LOCKOUT LOGIC		M001
INTEGRATED CIRCUIT ENG/MFG			PART NO. 155-0009-00	
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

The chop divider receives a clock signal from the chop decoder and blanking circuit and counts it down by two for the vertical switch, and by four for the plug-in chop. It also provides a horizontal chop blanking pulse if the horizontal mode switch is CHOP.

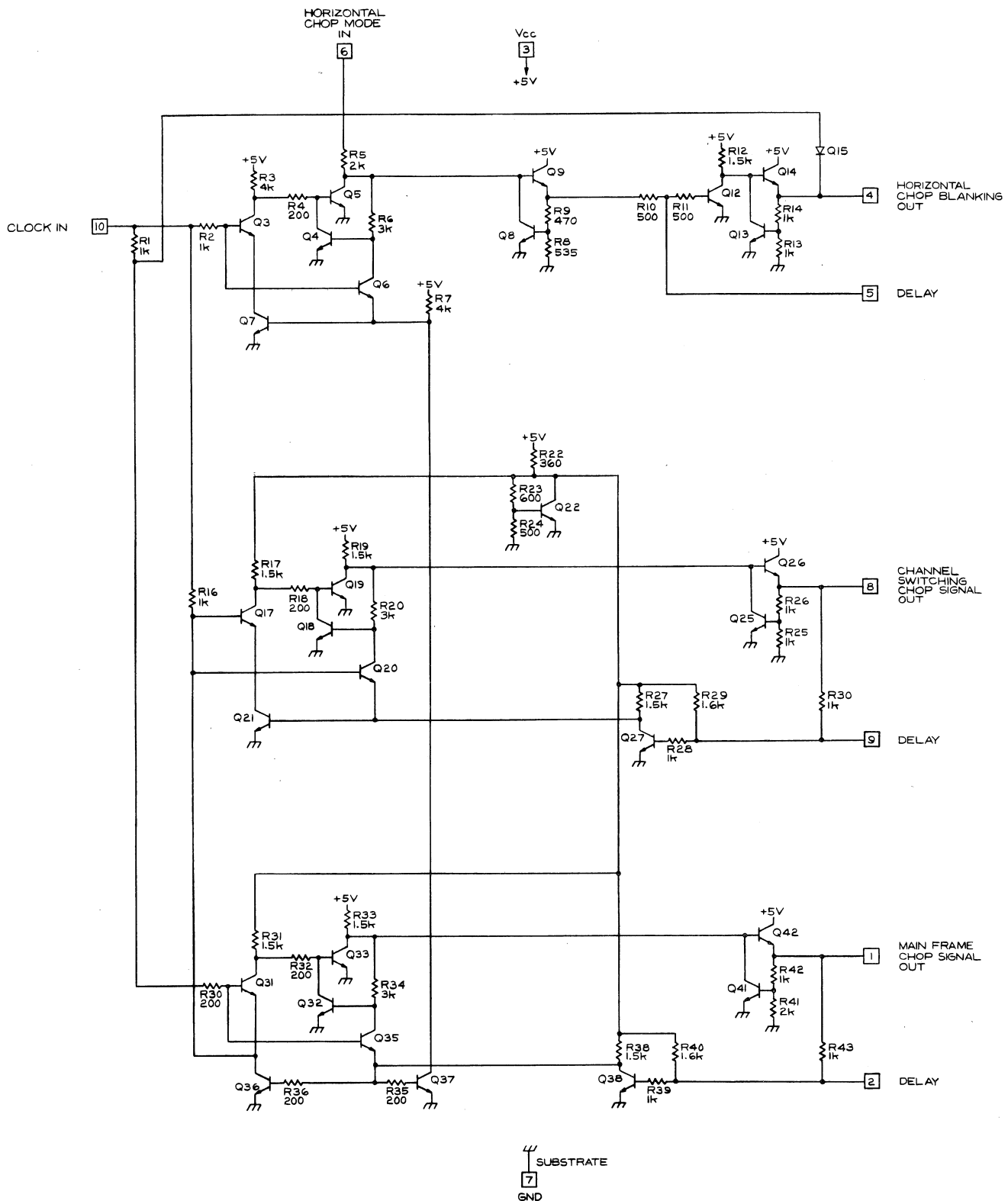
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 10 Lead T0-5

DESIGNER Les Larson

INSTRUMENT USAGE 7704A
A7704
R7704
7504
7514
7904



ENGR	<i>M. J. Martin</i>	9-9-75	PROCESS	200 n/d
DWN BY	J. Langley	9-2-75	PACKAGE	10 LEAD TO-5
CHK BY	<i>David Van Allen</i>	10-23-75	DIE SIZE	45mil X 40mil
TYPE	MONOLITHIC	CHOP DIVIDER & BLANKING (TYPE 3)		M004
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				PART NO. 155-0010-00

DESCRIPTION

This Integrated Circuit generates the 2 MHz chop clock signal for triggering the chop counter (M004) as well as the chop blanking waveform. The blanking waveform can be delayed in time and varied in width over a certain range to accommodate different delay lines. It also has fine logical inputs which are the plug-in and mainframe modes that are used to decide if chop blanking should be used at a certain time.

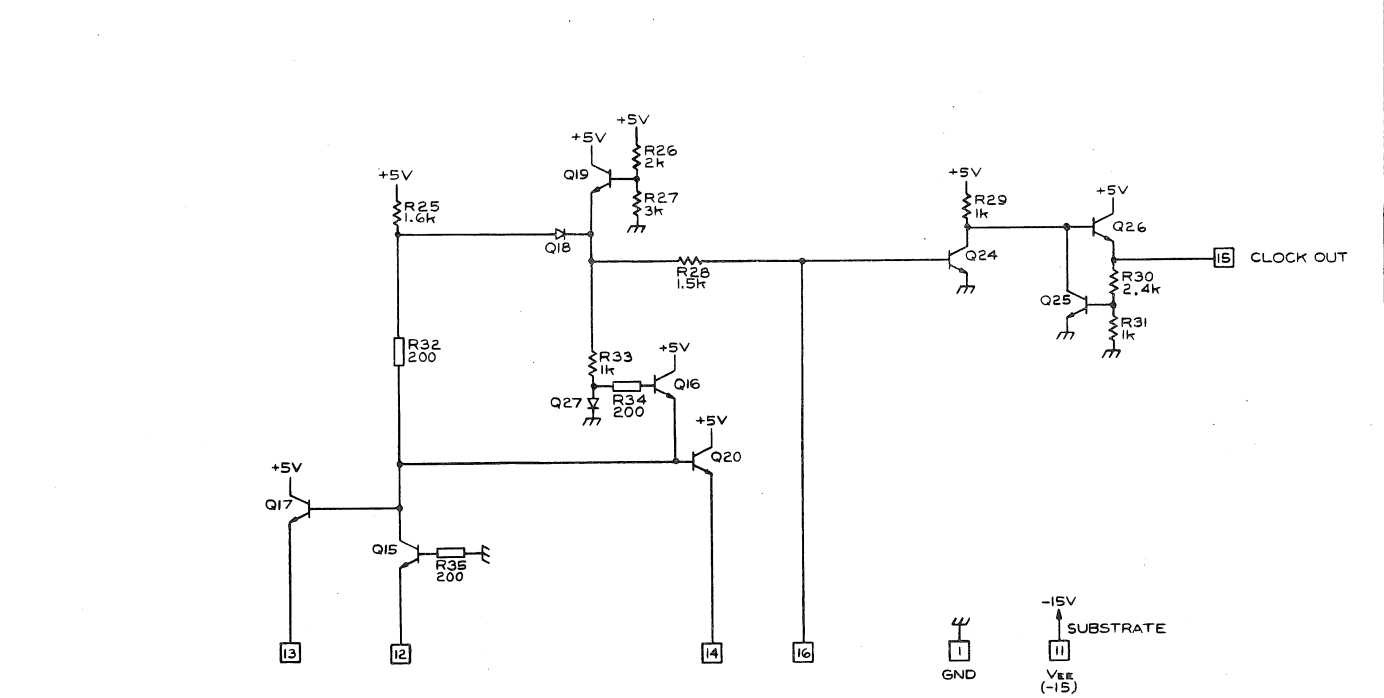
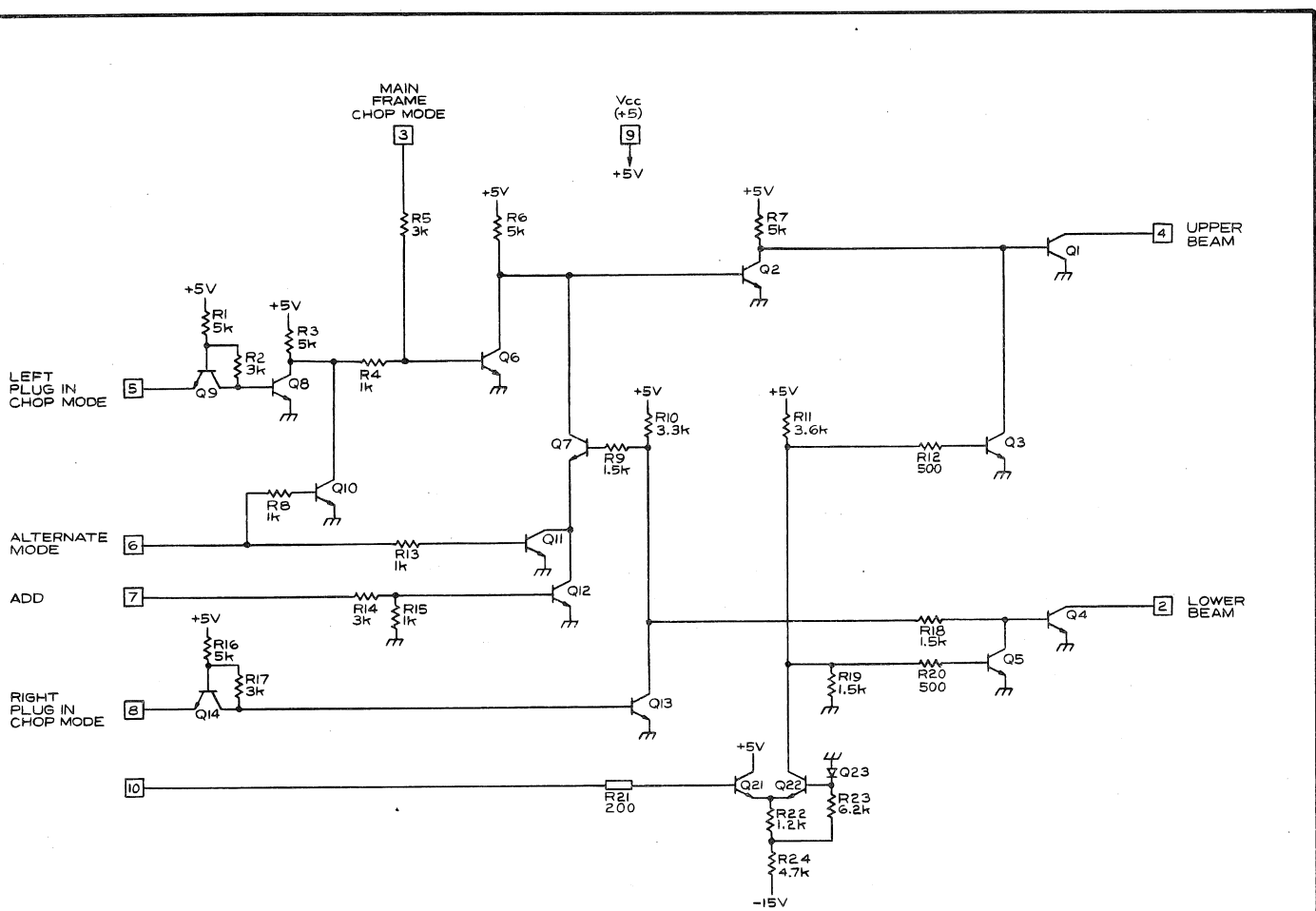
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Les Larson

INSTRUMENT USAGE	7704A	7603	A7704
	7603G	R7704	7603H
	7403	7603K	7504
	7613	7514	7633
	7904	485	7844
	4851	7313	4852
	R7603	7903	7603N11
	7912		



NOTE:
 1. INDICATES CROSS UNDER RESISTOR.

ENGR	<i>M.H. Austin</i>	9-9-75	PROCESS	200 μ /d
DWN BY	J. Langley	9-8-75	PACKAGE	16 PIN DIP
CHK BY	<i>David VanD...</i>	10-23-75	DIE SIZE	40mil X 50mil
TYPE	MONOLITHIC	CLOCK & CHOP BLANKING		MO12
INTERGATED CIRCUITS ENGS/MFG		PART NO. 155-0011-00		
TEXTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

This Integrated Circuit is a signal conditioner for the main Z Axis Amplifier. It is under control of the horizontal switch drive, "A" gate, "B" gate, delay control, "A" intensity control and "B" intensity control. With these signals, it properly selects, at one output, either "A" intensity, or "A" intensified by "B" for delaying modes.

Additional functions are chop blanking for vertical and horizontal, external and plug-in Z axis input, and fast limiting of the composite signal. The signals are further limited at slow sweep speeds to prevent burning of the CRT.

PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Les Larson

INSTRUMENT USAGE

485	7504
4851	7514
4852	7844
7704	7903
A7704	7904
R7704	7912
7704A	

MILLER INTEGRATOR AND DELAY PICK OFF

155-0028-00
 155-0028-01 M018G
 155-0042-02
 155-0042-03

DESCRIPTION

The M018 is a gated Miller Integrator with a delay pick-off comparator. Maximum slew rate is 10 V/ μ S. RTL logic input controls the Miller run up and the delayed gate output.

PROCESS 200 Ω /Sq, P-

POWER SUPPLY. V_{EE} +15 Volts, I_{EE} -11 mA

PACKAGE 10 Lead T05

DESIGNER Joe Burger

INSTRUMENT USAGE 155-0028-00

1480 1481
 1482 1485
 26G1 26G2
 26G3 7L12
 7L13 5S14
 7S14

155-0028-01

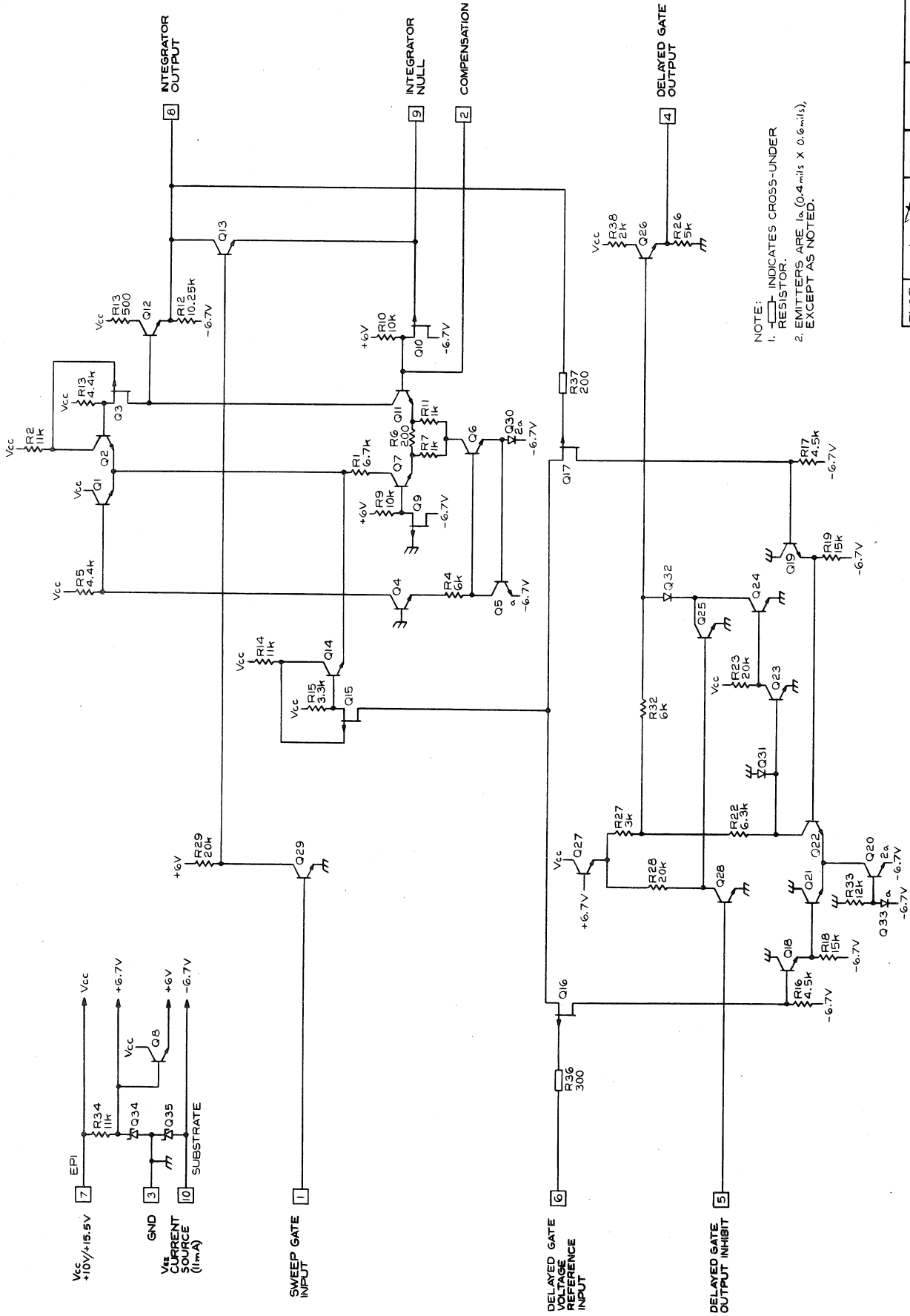
432
 434

155-0042-02

1401A
 5S14N
 7L12
 7L13
 7S14

155-0042-03

7B53 314K
 5B10N 5B12N
 5B40 5B42
 5B42G 55B31
 5B53 RG501
 5B10 5B12
 5B53A



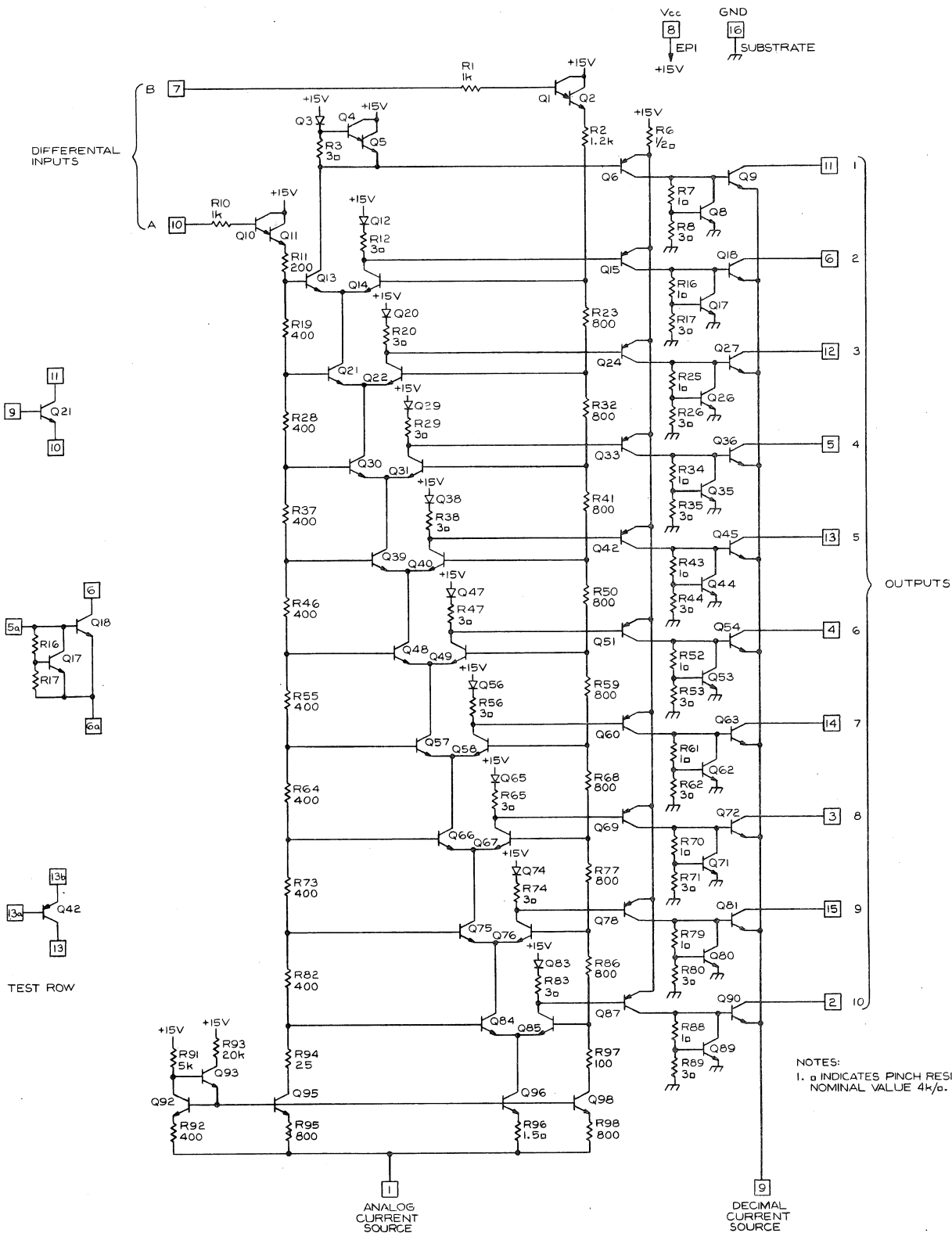
NOTE:
 1. \square INDICATES CROSS-UNDER
 2. EMITTERS ARE 1μ (0.4 mils X 0.6 mils),
 EXCEPT AS NOTED.

ENGR	M. H. M...	6-10-76	PROCESS	200 μ /p	P-
DWN BY	J. Langley	4-1-76	PACKAGE	10 LEAD TO-5	
CHK BY	Linda Berg	7-13-76	DIE SIZE	50 mil X 50 mil	
TYPE	MONOLITHIC		MILLER INTEGRATOR & DELAY PICKOFF	MO18G	
INTEGRATED CIRCUIT ENG/MFG		BEAVERTON, OREGON, U.S.A.			
		PART NO. 155-0028-00			

DESCRIPTION

The M019 converts differential analog input voltage to one of ten output indications, with a transition spacing of $500 \text{ mV} \pm 2\%$ and a transition zone of less than 5 mV . The outputs may be wired as current steering, in which case one of the circuit terminals accepts the current input, or in the form of saturated transistors. Ratings of the output circuits are 15V and 25 mA .

PROCESS	200 Ω /Sq	
POWER SUPPLY.	V_{CC} +15 Volts	
PACKAGE	16 DIP	
DESIGNER	Barrie Gilbert	
INSTRUMENT USAGE	7704A	7514
	A7704	7904
	R7704	7313
	7613	P7001950C
	7633	P7001953Q
	5403	7603
	5441	7603G
	7844	7603H
	5443	7603K
	7903	7J20
	7912	5440
	7504	P7001



NOTES:
 1. □ INDICATES PINCH RESISTOR
 NOMINAL VALUE 4k/□.

ENGR	M.H. McArthur	3-4-76	PROCESS	200n/□
OWN BY	J. Langley	2-12-76	PACKAGE	16 PIN DIP
CHK BY	Alvin Dary	3-10-76	DIE SIZE	50mil X 55mil
TYPE	MONOLITHIC	ANALOG TO DECIMAL CONVERTER		MO19D
INTEGRATED CIRCUIT ENG/MFG			TEKTRONIX, INC.	
BEAVERTON, OREGON, U.S.A.			PART NO. 155-0014-01	

DATA SWITCH

155-0015-01

M020F

DESCRIPTION

A current-steering switching circuit designed specifically for the know-readout system.

Accepts nine inputs at currents in the range 0 mA - 1 mA and selects one under the control of a BCD code. The output is from an NPN collector. The inputs are virtual grounds within ± 100 mV of ground potential for input range of ± 1 mA.

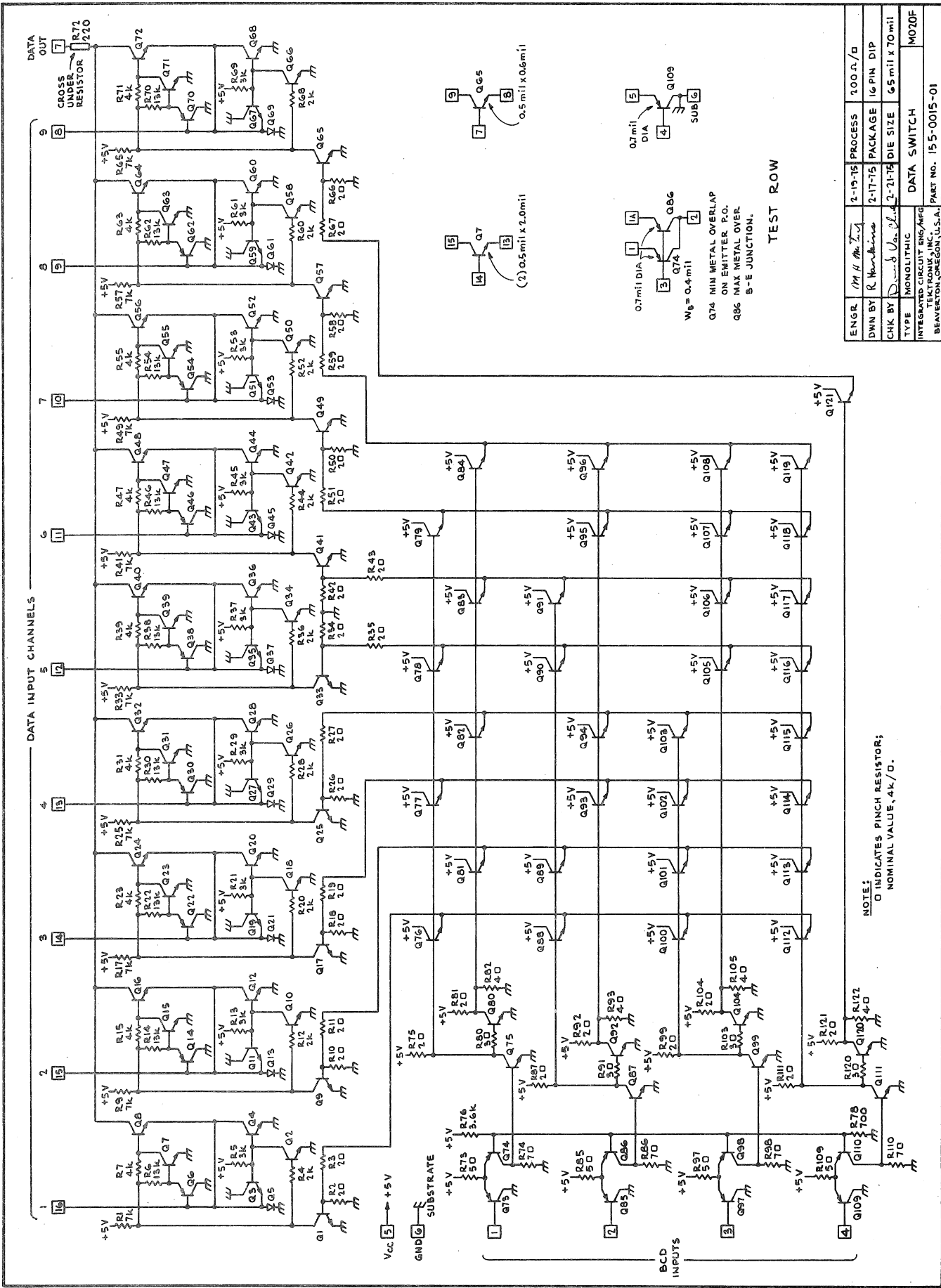
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Barrie Gilbert

INSTRUMENT USAGE 7704A 7904
 A7704 7504
 R7704 7514
 5403 7313
 5440 7613
 5441 7633
 5443 7603
 7844 7603G
 7913 7603H
 7903 7603K
 P7001



ENGR	M H M	2-19-75	PROCESS	100 A/D
DWN BY	R Handwritten	2-17-75	PACKAGE	16 PIN DIP
CHK BY	D Handwritten	2-21-75	DIE SIZE	65 mil x 70 mil
TYPE	MONOLITHIC		DATA SWITCH	
INTEGRATED CIRCUIT BNS/MFG		PART NO. 15-5-0015-01		
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

This circuit receives horizontal mode switch information, alternating signals, and chopping signals (.5 MHz), and produces an output to the horizontal switch as to which sweep should be received. This same output is used in the horizontal lockout logic and in both vertical alt. binaries.

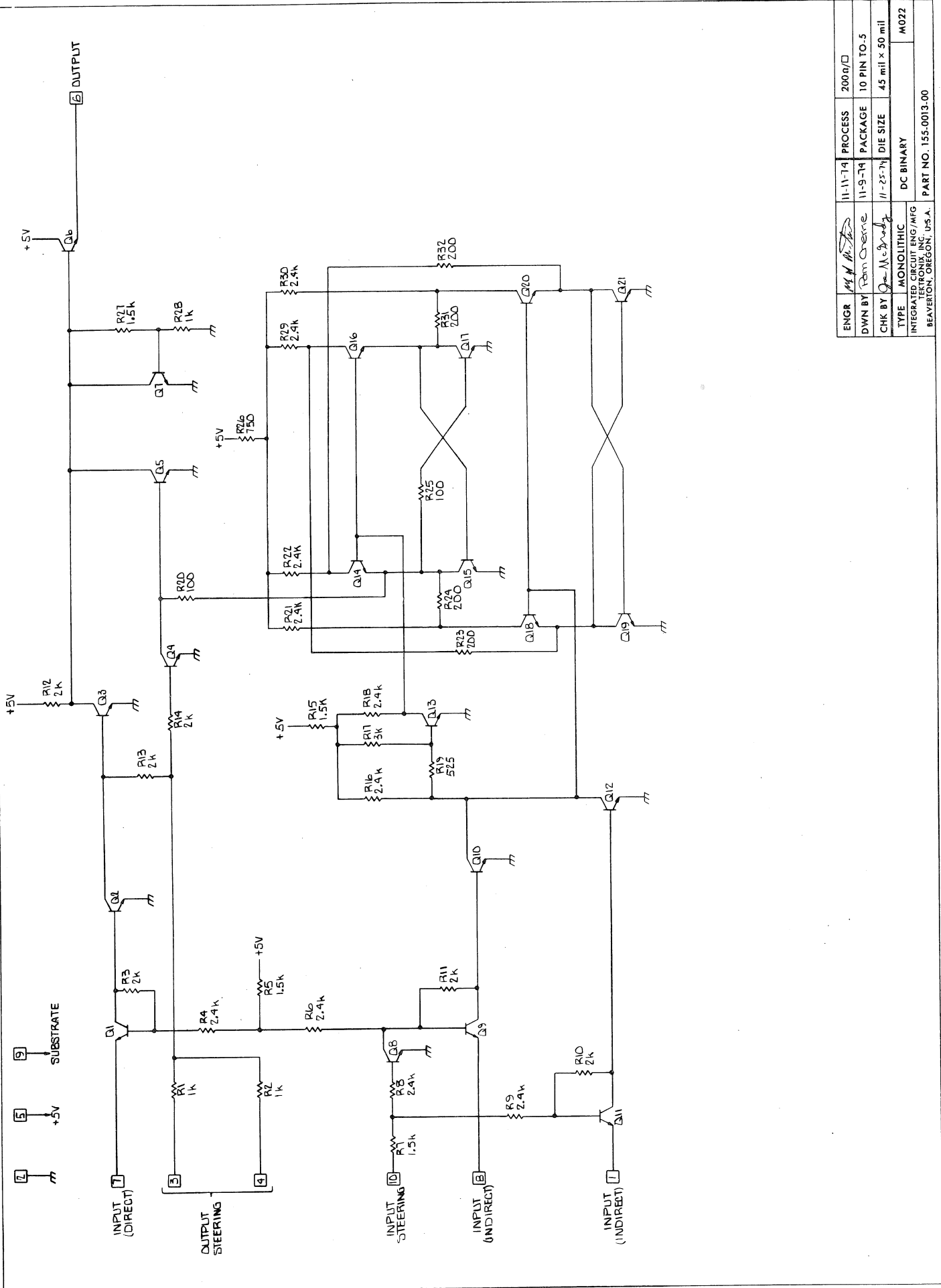
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 10 Lead T0-5

DESIGNER Les Larson

INSTRUMENT USAGE 7704A A7704
 R7704 7504
 7514 7904



ENGR	<i>M. H. ...</i>	11-11-74	PROCESS	200n/□
DWN BY	<i>Pam Overre</i>	11-9-74	PACKAGE	10 PIN TO-5
CHK BY	<i>John McBrady</i>	11-25-74	DIE SIZE	45 mil x 50 mil
TYPE	MONOLITHIC		DC BINARY	M022
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A. PART NO. 155-0013.00				

DECADE COUNTER

155-0017-00 M025

DESCRIPTION

The M025 is a decade counter having power-handling output capabilities, and all ten outputs brought out to pins. It features an auxiliary count output pin, a reset input and versatile operating modes. Count input rates up to 5 MHz are acceptable.

PROCESS 200 Ω /Sq

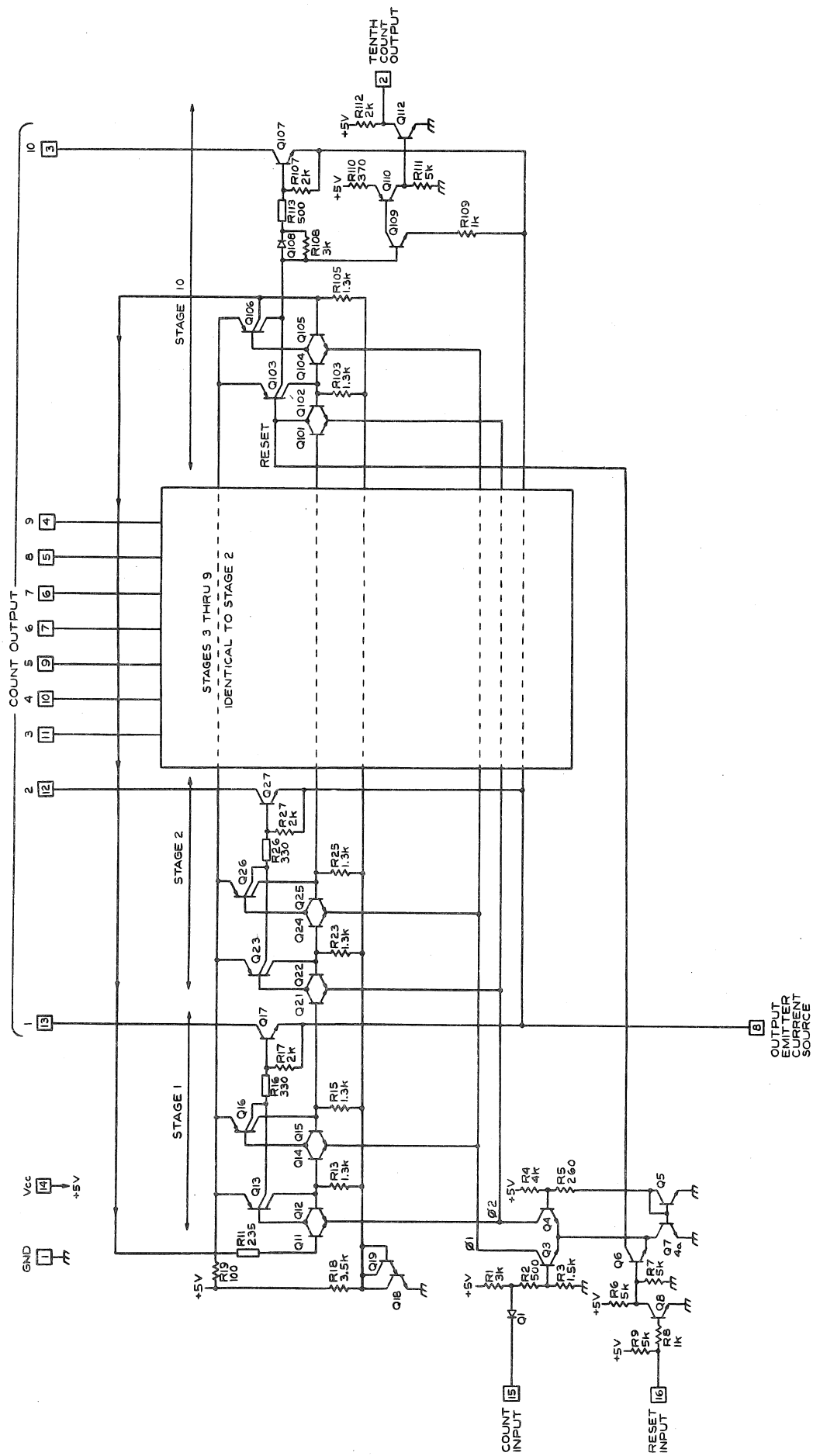
POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Barrie Gilbert

INSTRUMENT USAGE

7704A	7514
A7704	7904
R7704	7903
5403	7313
5440	7613
5441	7633
5443	7603
7844	7603G
7912	7603H
7504	7603K
P7001	



ENGR	M. J. Langley	3-19-75	PROCESS	200A/p
DWNB	J. Langley	3-17-75	PACKAGE	16 PIN DIP
CHKBY	David Usher	10-23-75	DIE SIZE	60 X 65 mil
TYPE	MONOLITHIC		DECADE COUNTER	M025D
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 155-0017-00				

ZERO LOGIC

155-0018-00 M026

DESCRIPTION

The M026 is a special-purpose circuit for use in the new generation knob-readout system. It comprises an input logic section, four memory cells, an output logic section and a binary-to-ternary conversion stage.

PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

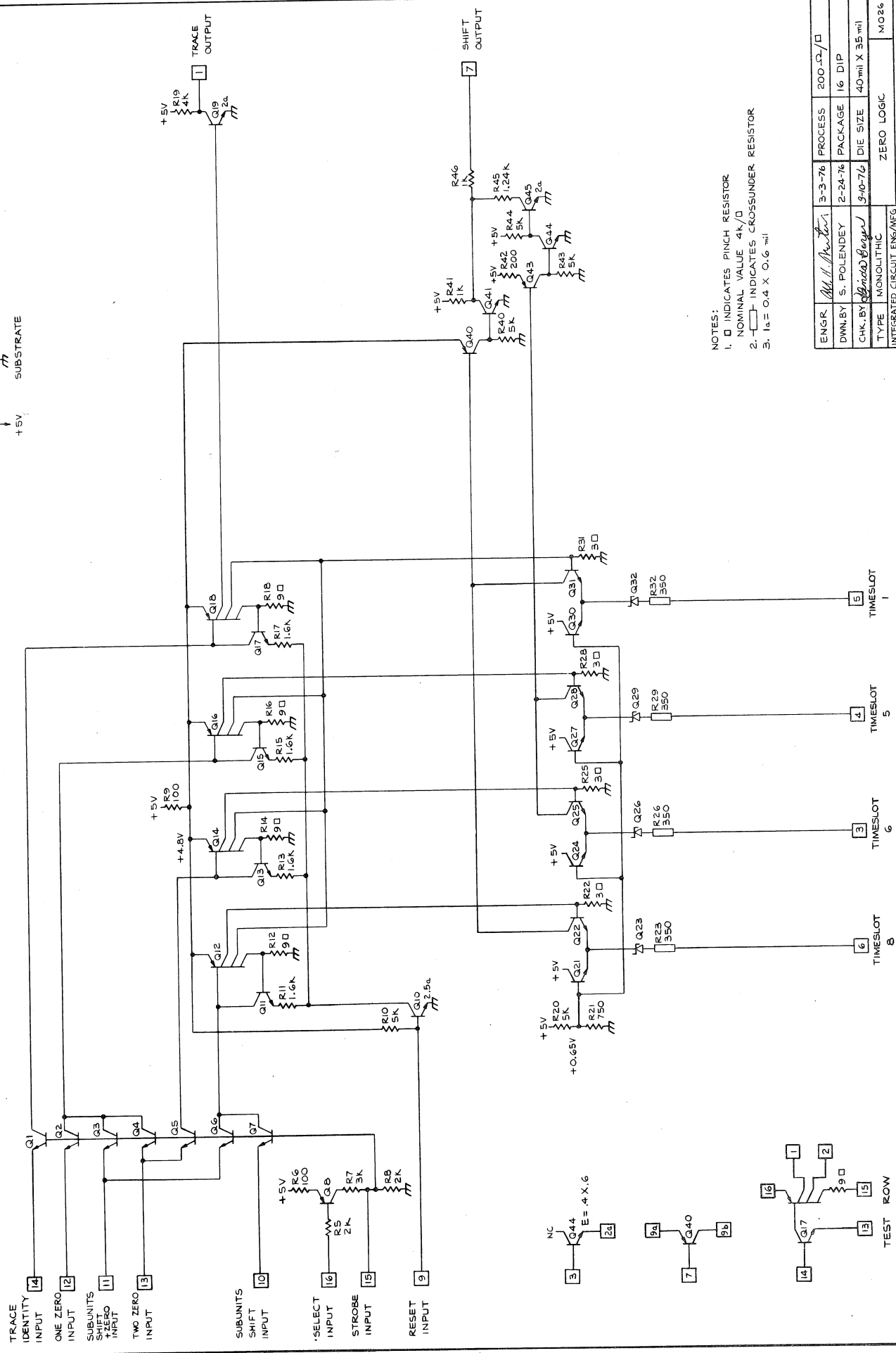
PACKAGE 16 DIP

DESIGNER Les Larson

INSTRUMENT USAGE

7704A	7514
A7704	7904
R7704	7903
5403	7313
5440	7613
5441	7633
5443	7603
7844	7603G
7912	7603H
7504	7603K
P7001	

YCC [2] +5V
 GND [6] SUBSTRATE



NOTES:
 1. □ INDICATES PINCH RESISTOR
 2. —□— INDICATES CROSSUNDER RESISTOR
 3. 1a = 0.4 X 0.6 mil

ENGR	<i>W. H. Newton</i>	3-3-76	PROCESS	200-□/□
DWNB	S. POLENDEY	2-24-76	PACKAGE	16 DIP
CHK. BY	<i>John G. Boyer</i>	3-10-76	DIE SIZE	40 mil X 35 mil
TYPE	MONOLITHIC		ZERO LOGIC	MO26
INTEGRATED CIRCUIT ENG/MFG				
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				
PART NO. 155-0018-00				

DESCRIPTION

The M027 is used to produce a positioning signal (10 level staircase) for the new generation readout system, and also to position the decimal point. This integrated circuit consists of a decade counter, digital-to-analog converter, and input logic.

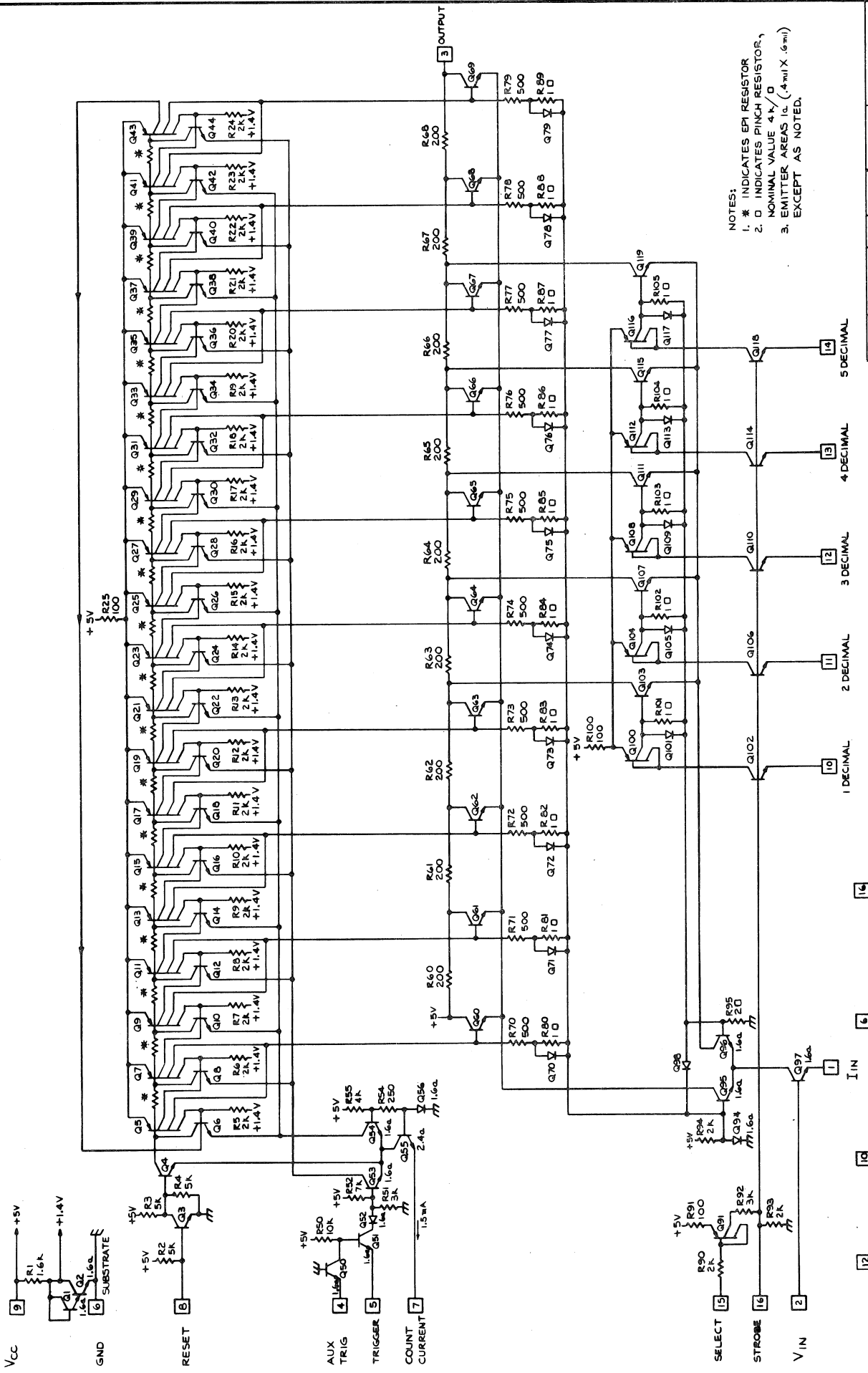
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Les Larson

INSTRUMENT USAGE	7704A	7904
	R7704	7903
	A7704	7313
	5403	7613
	5441	7633
	5443	7603
	7944	7603G
	7912	7603H
	7504	7603K
	7514	5440
	P7001	



NOTES:
 1. * INDICATES EPI RESISTOR
 2. D INDICATES PINCH RESISTOR,
 NOMINAL VALUE 4K/D
 3. EMITTER AREAS 10 (.4mil X .6mil)
 EXCEPT AS NOTED.

ENGR.	M. H. [Signature]	3-11-76	PROCESS	200 Ω / 0
DWN. BY	S. POLENDEY	3-8-76	PACKAGE	16 DIP
CHK. BY	[Signature]	6-17-76	DIE SIZE	50mil X 60mil
TYPE	MONOLITHIC		DECIMAL POINT & SPACING	MO278
INTEGRATED CIRCUITS/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				

TEST ROW

OUTPUT ASSEMBLER

155-0020-00 M028

DESCRIPTION

This integrated circuit produces a display format signal (X- and Y- waveforms) from binary and analog input signals. The M026 is part of the new generation readout system.

PROCESS 200 Ω /Sq

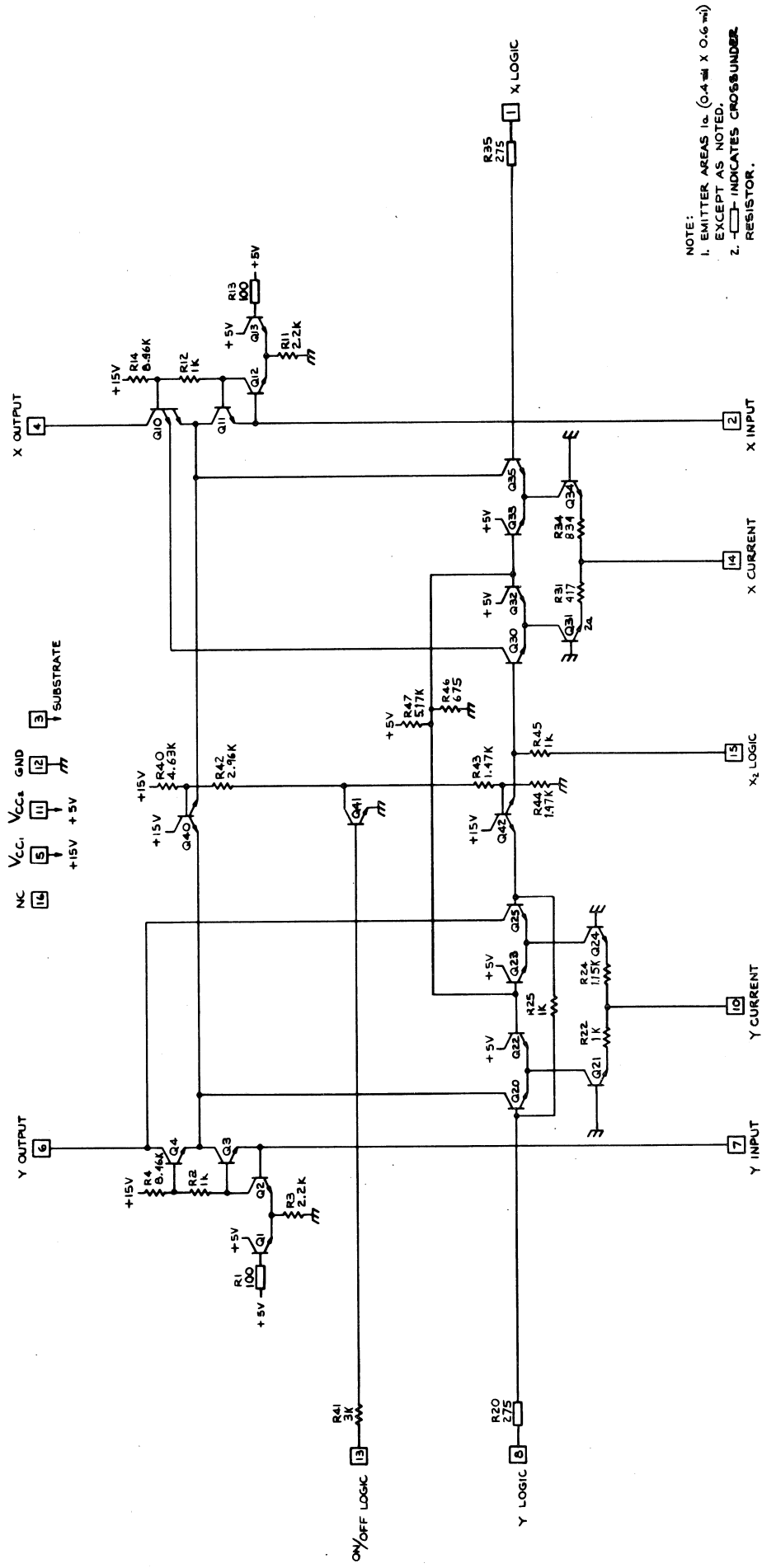
POWER SUPPLY. V_{CC} +5 Volts, +15 Volts

PACKAGE 16 DIP

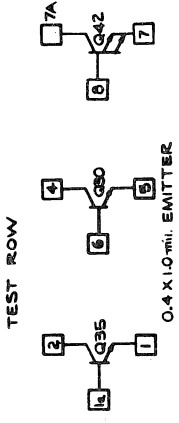
DESIGNER Les Larson

INSTRUMENT USAGE

7704A	7904
A7704	7903
R7704	7313
5403	7613
5441	7633
5443	7603
7844	7603G
7912	7603H
7504	7603K
7514	5440
P7001	



NOTE:
 1. EMITTER AREAS 1 μ (0.4 mil X 0.6 mil) EXCEPT AS NOTED.
 2. \square INDICATES CROSSUNDER RESISTOR.



ENGR	M.A. [Signature]	10/29/79	PROCESS	200 μ /D
DMN BY	JIM NAMIHE	10/29/79	PACKAGE	16 PIN DIP
CHK BY	BOB GAULT	10-30-79	DIE SIZE	40-mil X .45 mil
TYPE	MONOLITHIC		OUTPUT ASSEMBLER	H0288
	INTEGRATED CIRCUITS			
	TEKTRONIX, INC.			
	BEAVERTON, OREGON, U.S.A.			

PART NO. 155-0020-00

TIMING GENERATOR

155-0021-00

M029C

DESCRIPTION

This integrated circuit generates a timing clock, a shaped negative pulse for the M025 (155-0017-00), a scanning ramp for the M024, and X-Y on-off and intensity controls for the Z axis.

PROCESS 200 Ω /Sq

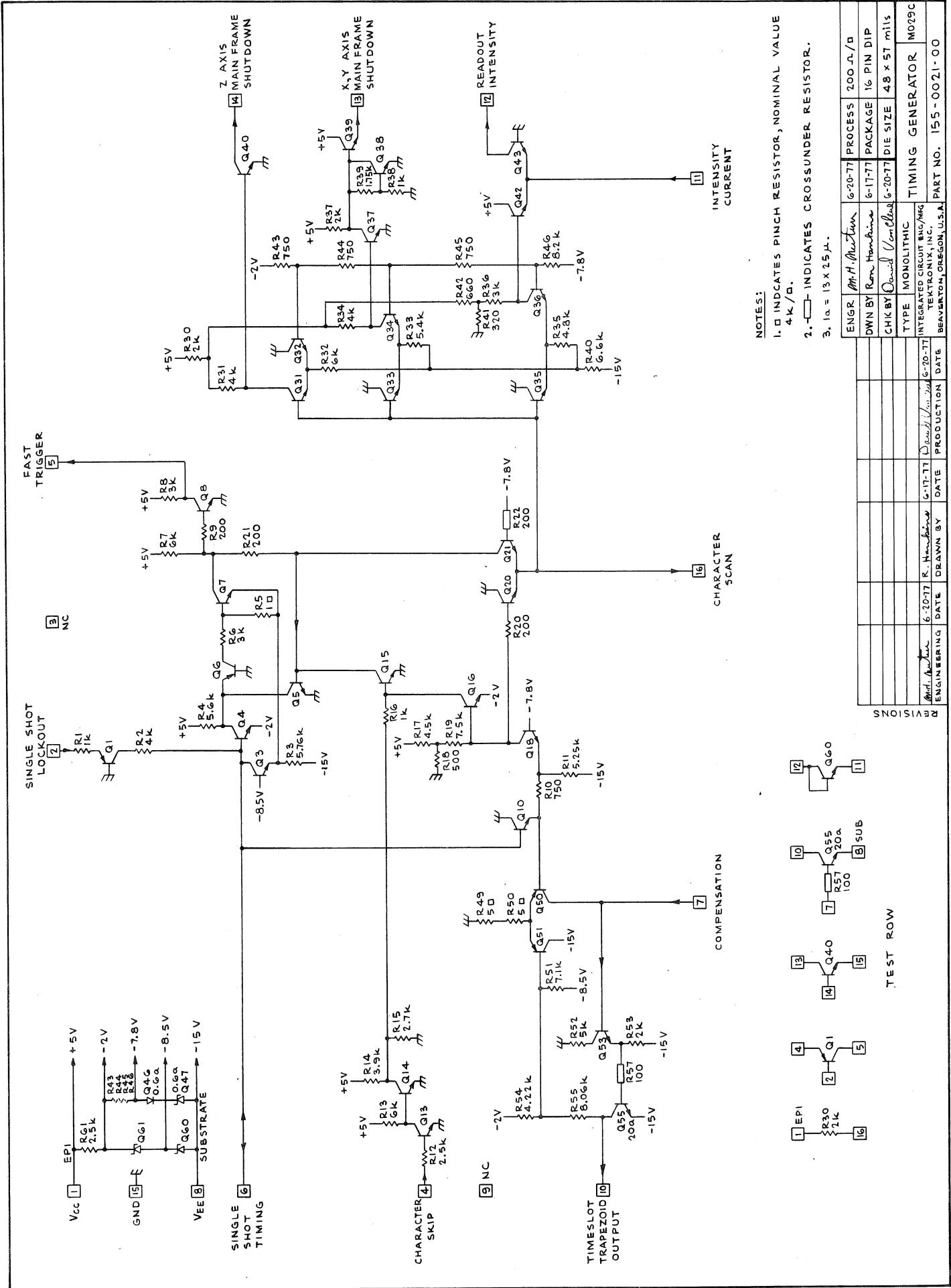
POWER SUPPLY. V_{CC} +5V, V_{EE} -15V

PACKAGE 16 DIP

DESIGNER Les Larson

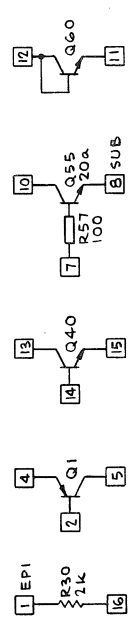
INSTRUMENT USAGE

7704A	7904
A7704	7903
R7704	7313
5403	7613
5441	7633
7844	7603G
7912	7603H
7504	7603K
7514	5440
P7001	



- NOTES:
- 1. □ INDICATES PINCH RESISTOR, NOMINAL VALUE 4 k. / □.
 - 2. —□— INDICATES CROSSUNDER RESISTOR.
 - 3. I_a = 13 x 25 μ.

ENGINEERING	DATE	DRAWN BY	DATE	PRODUCTION	DATE	REVISIONS
Phil. Anderson	6-20-77	R. Hamblaine	6-17-77	David Van Blarck	6-20-77	
ENGR	M.H. MacArthur	6-20-77	PROCESS	200-A-7/B		
DWN BY	Ron Hamblaine	6-17-77	PACKAGE	16 PIN DIP		
CHK BY	David Van Blarck	6-20-77	DIE SIZE	48 x 57 mils		
TYPE MONOLITHIC						TIMING GENERATOR M029C
INTEGRATED CIRCUIT ENG/MFG						
TEKTRONIX, INC.						
BEAVERTON, OREGON, U.S.A.						
PART NO. 155-0021-00						



TEST ROW

READOUT SYSTEM

155-0004-01 M33
155-0005-00 M34
155-0006-01 M35
155-0007-01 M38
155-0008-01 M39

DESCRIPTION

The 576 Readout System is comprised of four fiberoptic readout modules. Three of these modules are each driven by a M38 and M39 (155-0007-01 and 155-0008-01). The fourth module displays the ratio of vertical current/division to base step/division. This Beta/division readout is driven the M33, M34, and M35 (155-0004-01, 155-0005-00, and 155-0006-00). The integrated circuits are programmed from switch closures or external inputs and perform the required logic function to drive the lamps in the readout.

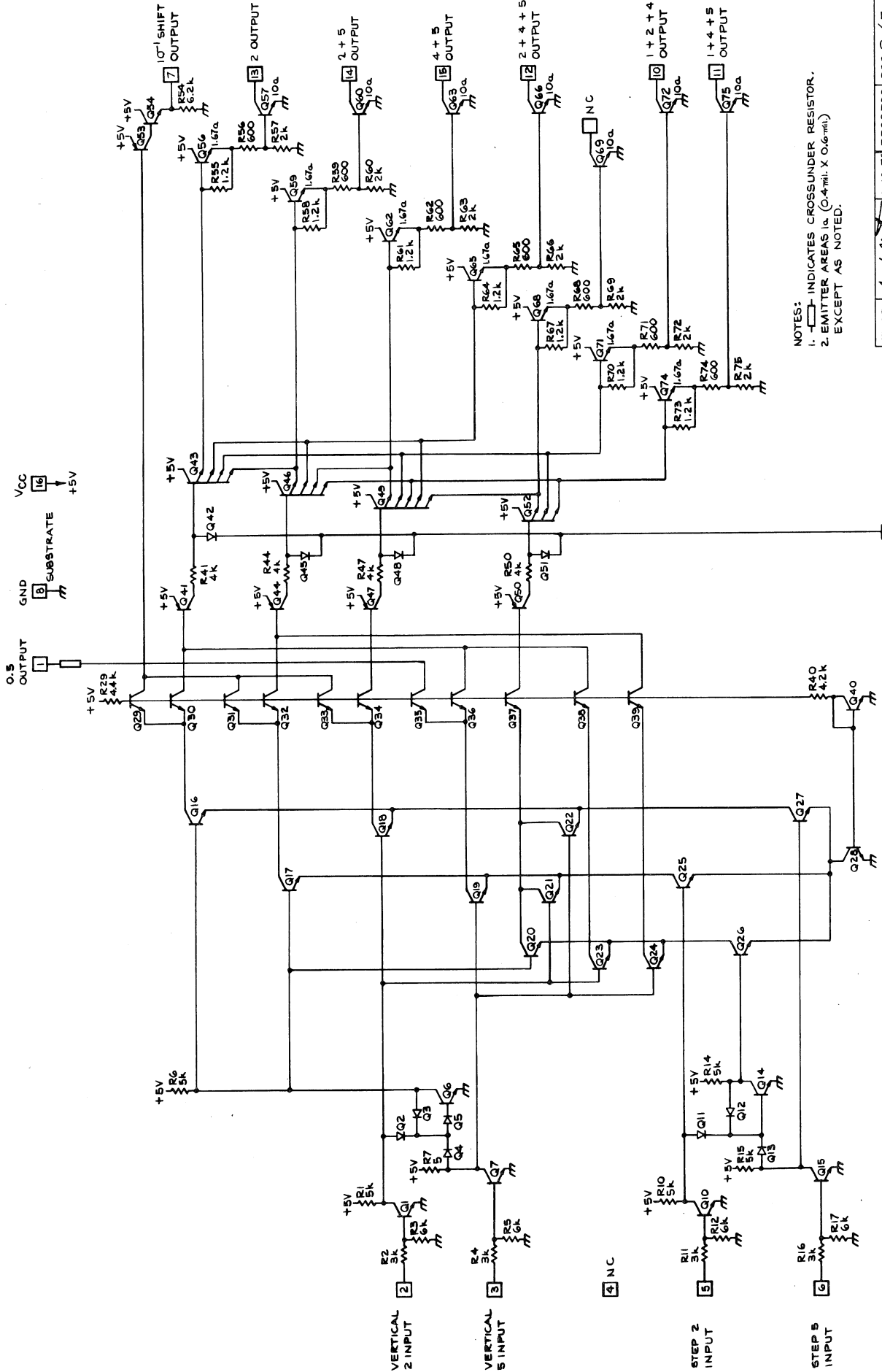
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

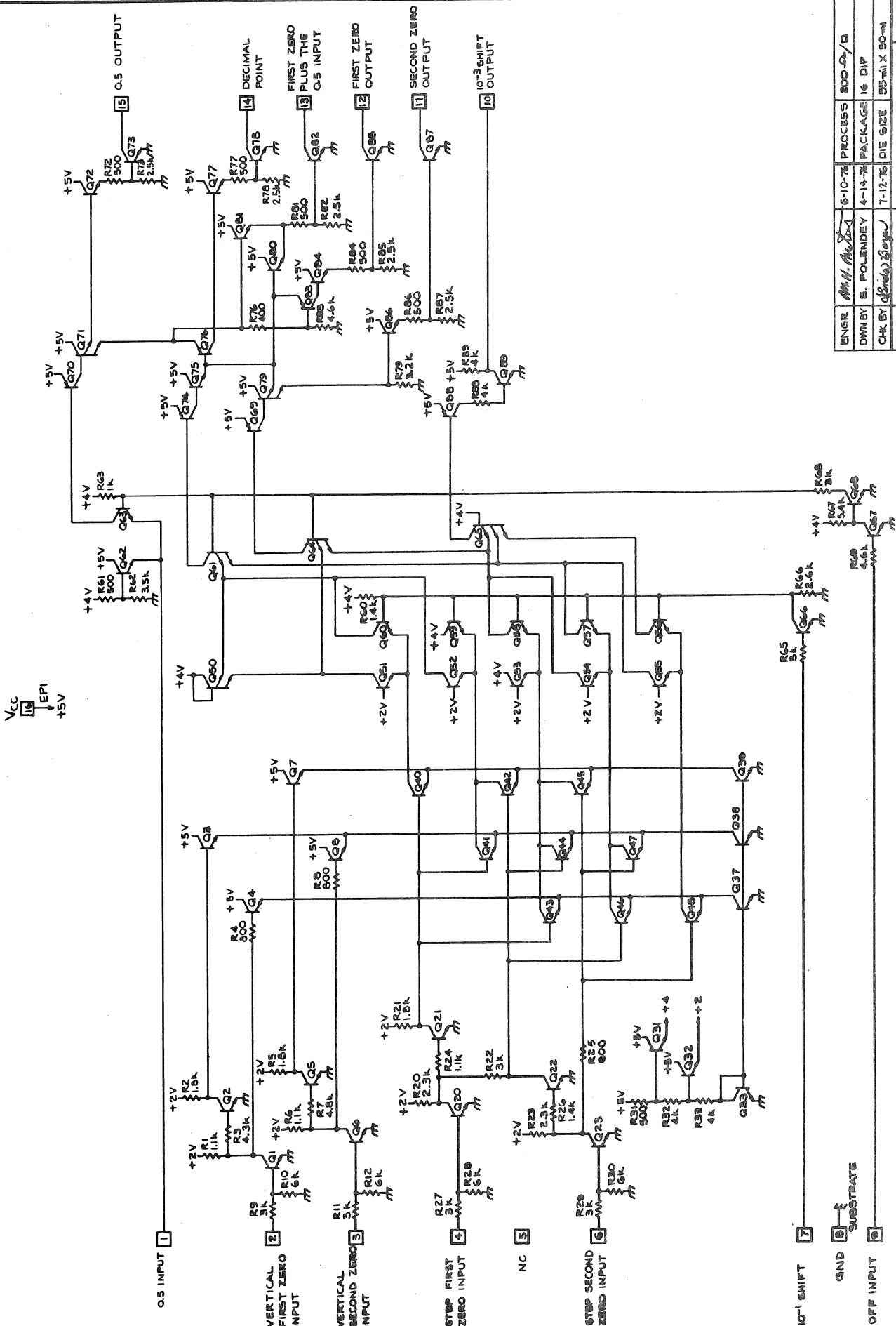
DESIGNER Mike Metcalf

INSTRUMENT USAGE 576



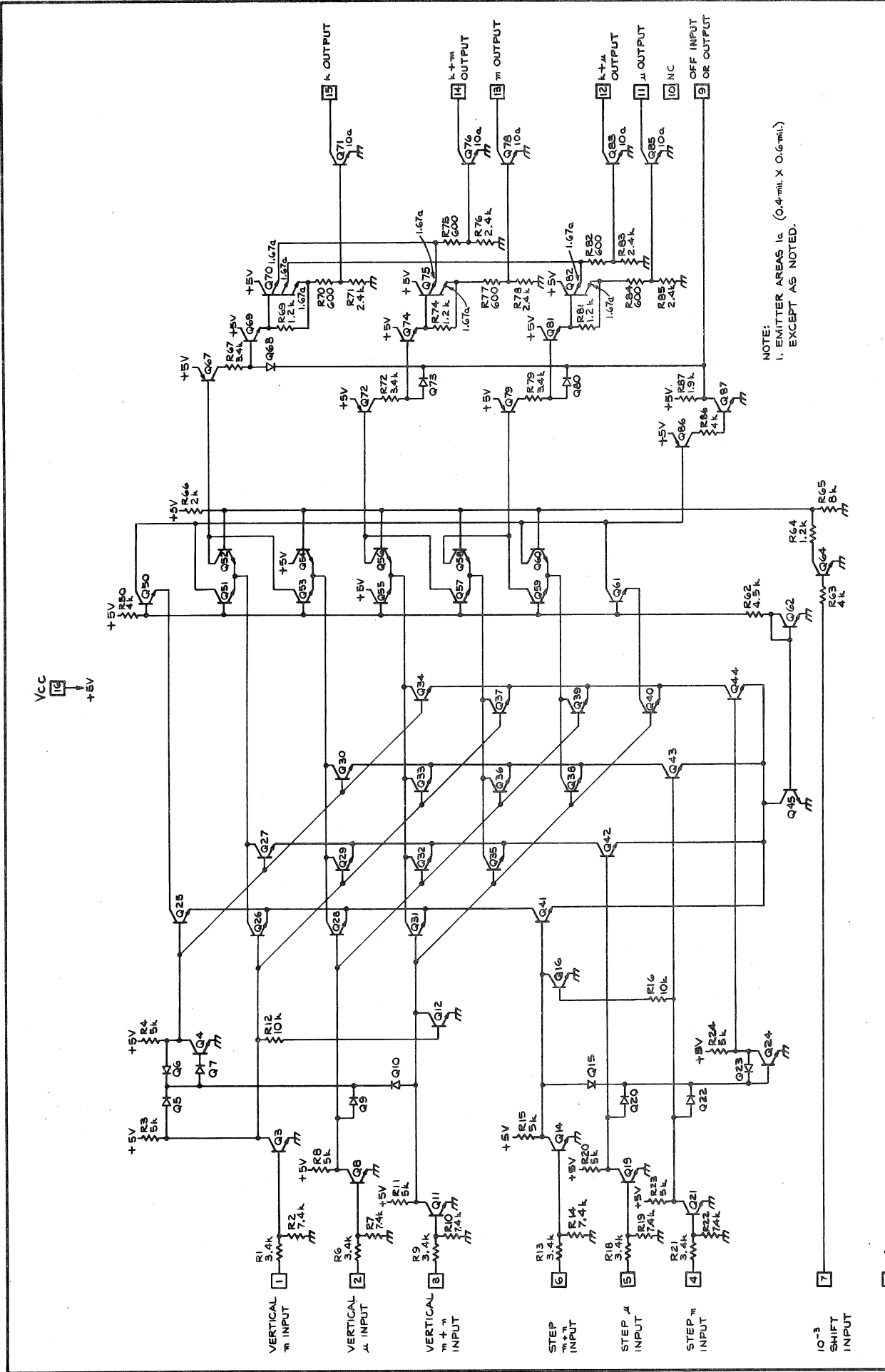
NOTES:
 1. INDICATES CROSSUNDER RESISTOR.
 2. EMITTER AREAS 1α (0.4 mil. X 0.6 mil.) EXCEPT AS NOTED.

ENGR	<i>M.H. M...</i>	6-10-76	PROCESS	200 Ω / \square
DWN BY	S. POLENDEY	5-19-76	PACKAGE	16 PIN DIP
CHK BY	<i>...</i>	7-24-76	DIE SIZE	85 mil. X 50 mil.
TYPE	MONOLITHIC		576 READOUT SYSTEM	M033
INTEGRATED CIRCUIT ENGINEERING TETRONIX, INC. BEAVERTON, OREGON, U.S.A. PART NO. 155-0004-00				



ENGR	John H. [Signature]	6-10-76	PROCESS	200-Ω/D
DWRBY	S. POLENDEY	4-14-76	PACKAGE	16 DIP
CHK BY	[Signature]	7-12-76	DIE SIZE	85 mil X 50 mil
TYPE		MONOLITHIC	576	READOUT SYSTEM
INTEGRATED CIRCUIT		EMG/MFG	MO3AC	
TEXT		TEKTRONIX, INC.	PART NO. 155-0006-00	
DRAWING		ORIGINATOR	BEAN/STON/OREGON/USA	

10 ⁻¹ SHIFT	7
GND	8
SUBSTRATE	9
OFF INPUT	10



NOTE:
1. EMITTER AREAS 1_g (0.4-mil. X 0.6-mil.)
EXCEPT AS NOTED.

ENGR	M.H. [Signature]	6-10-76	PROCESS	200 μ / \square
DWN BY	S. POLENDEY	5-25-76	PACKAGE	16 PIN DIP
CHK BY	[Signature]	7-15-76	DIE SIZE	55 mil. X 50 mil.
TYPE	MONOLITHIC	576	READOUT SYSTEM	M0358
INTEGRATED CIRCUIT FABRI- CATION CORPORATION		BEAVERTON, OREGON, U.S.A.		
		PART NO. 155-0006-01		

8 SUBSTRATE

9 10⁻³ SHIFT INPUT

10 GND

11 STEP m INPUT

12 STEP u INPUT

13 VERTICAL m + n INPUT

14 VERTICAL u INPUT

15 VERTICAL m INPUT

16 100 OUTPUT

17 100 OUTPUT

18 100 OUTPUT

19 100 OUTPUT

20 100 OUTPUT

21 100 OUTPUT

22 100 OUTPUT

23 100 OUTPUT

24 100 OUTPUT

25 100 OUTPUT

26 100 OUTPUT

27 100 OUTPUT

28 100 OUTPUT

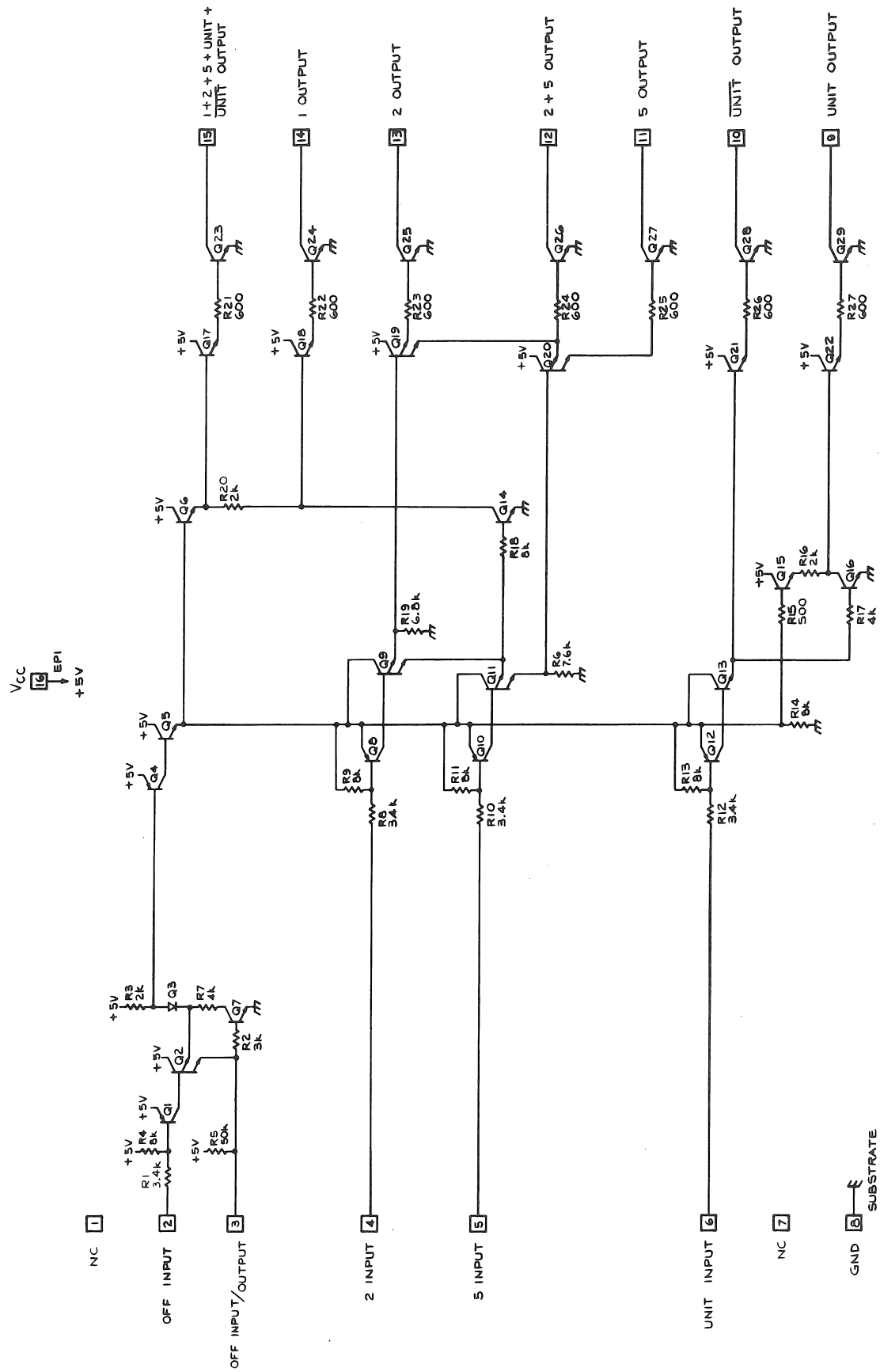
29 100 OUTPUT

30 100 OUTPUT

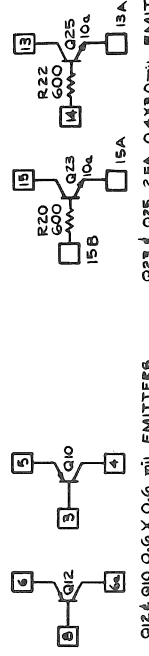
31 100 OUTPUT

32 100 OUTPUT

33 100 OUTPUT

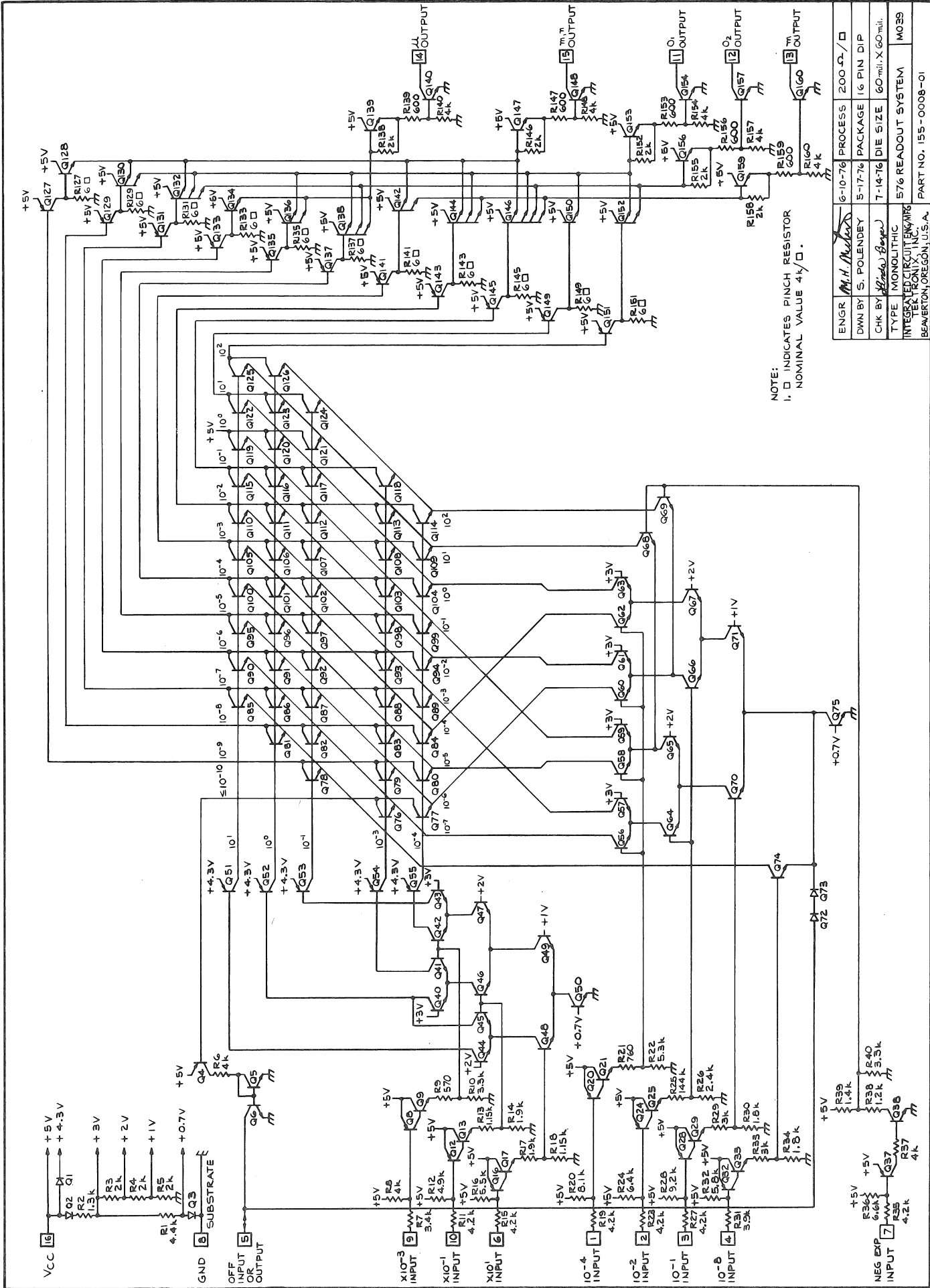


TEST ROW



ENGR	M. H. NIXON	6-10-76	PROCESS	200 Ω /□
DWN BY	S. POLENDY	5-5-76	PACKAGE	16 PIN DIP
CHK BY	S. POLENDY	1-13-76	DIE SIZE	50-mil X 50-mil.
TYPE	MONOLITHIC		57% READOUT SYSTEM	MOS36C
INTEGRATED CIRCUIT	ENK/MRS			
	TEKTRONIX, INC.			
	BEAVERTON, OREGON, USA			

PART NO. 155-0007-00



NOTE:
I, D INDICATES PINCH RESISTOR
NOMINAL VALUE 4/10.

ENGR	M.H. Nealey	6-10-76	PROCESS	200 μ / \square
DWN BY	S. POLENDEY	5-7-76	PACKAGE	16 PIN DIP
CHK BY	(Handwritten)	7-14-76	DIE SIZE	60 mil. X 60 mil.
TYPE	MONOLITHIC		576 READOUT SYSTEM	MO39
INTEGRATED CIRCUIT		BEAVERTON, OREGON, U.S.A.		
		PART NO. 155-0008-01		

CHANNEL SWITCH

155-0022-00
155-0022-01

M036E

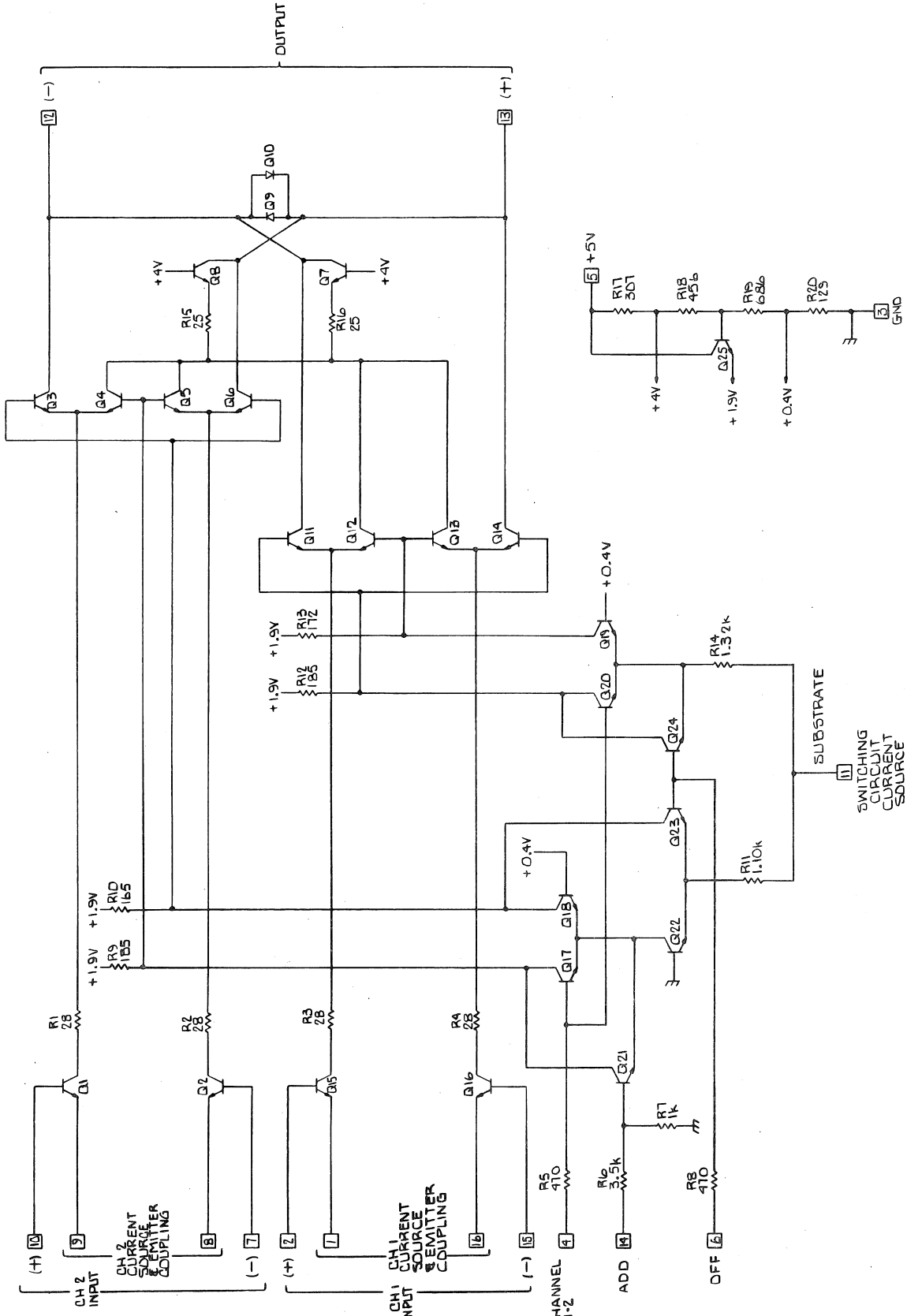
DESCRIPTION

This Integrated Circuit selects one or mixes two input analog signals in response to a digital input. In its simple application, it is double-pole, double-throw selector of one of two balance input signals. Its more sophisticated role is in providing signal steering in dual-trace vertical and horizontal amplifiers.

It is designed for two balanced input signals of 25 mV/division per side into 50 Ω per side (0.5 mA/division). The 50 Ω terminations to ground are external to the package. A current gain of "1" is intended. The gain setting resistors are external to the package. Total dynamic range is ± 15 divisions (± 7.5 mA).

The switch output is at or slightly above a +5 volt DC level. It is a current output into a resistance of 50 Ω per side. Side-to-side diodes are included inside the circuit for limiting the differential voltage swing of the output. The risetime of the switch is approximately 1 ns.

The CH1-CH2 input selects one or the other channel, and permits high speed switching between the two inputs for "CHOPPED" or "ALTERNATE" operation at frequencies up to 1 MHz or greater. The OFF input turns both inputs "off". The ADD input turns both inputs "on". The common mode current output of the signal channel is maintained and constant for the various modes.



ENGR	Simon Trec	10-24-74	PROCESS	50/450 n/o
DWN BY	Peter Chertie	10-23-74	PACKAGE	16 PIN DIP
CHK BY	Chertie	11-7-74	DIE SIZE	40 mil x 50 mil
TYPE	MONOLITHIC		CHANNEL SWITCH	M0366
INTEGRATED CIRCUIT ENG/MFG				
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				
			PART NO. 155-0022-00	

CHANNEL SWITCH

155-0022-00
155-0022-01

M036E (continued)

CHARACTERISTICS

Low Frequency α	0.94 Minimum
Output Impedance	>100 K Ω Nominal
Output Current Swing	\pm 7.5 mA Maximum
Input Capacitance Each Side	2.3 pF Nominal
Output Capacitance Each Side	5.2 pF Nominal
Switching Time	20 ns Maximum
Signal Risettime: $R_s = 100 R_e = 82 R_L < 50$	1.0 ns Maximum
Differential DC Offset Between Modes:	20 mV Maximum
Gain Difference Between Modes: $A_I = 1$	
Output Current Swing.	0.5% Maximum, $< \pm 2.5$ mA
Low Frequency Opposite Channel Isolation	750:1 Minimum, $F < 10$ kc
100 MHz Opposite Channel Isolation	100:1 Nominal

Other characteristics are described in the listing of the terminals.

PROCESS 50/450

POWER SUPPLY. +5 Volts, Ground

PACKAGE 16 DIP

DESIGNER Gene Andrews

INSTRUMENT USAGE	7603K	7603H	7603G
	7603N11S	R7603	1430
	147	148	7313
	7603	7613	5A38
	4503	335K	1461
	1441	7704A	7912
	5403	7903	7403
	7D12	7844	5441
	7D11	5440	7504
	7514	R7704	P7001
	7704A	5443	7A18
	7623A	149	5443
	7A18	7904	7633
	A7704	7012	

DESCRIPTION

This single package control system is intended for use in conjunction with the Miller Integrator and Delay Pickoff (M018). Logic inputs are RTL.

Functions

Trigger slope selection and pulse forming.
 Sawtooth start/stop.
 Holdoff and single-sweep lockout.
 Bright baseline generation.

Triggering

Minimum Input (<10 MHz) 0.2 mA Peak-to-Peak
 Maximum Usable Frequency 40 MHz
 Triggering Delay 50 nS

The maximum usable frequency may be increased by connecting the ex-T.D trigger processing.

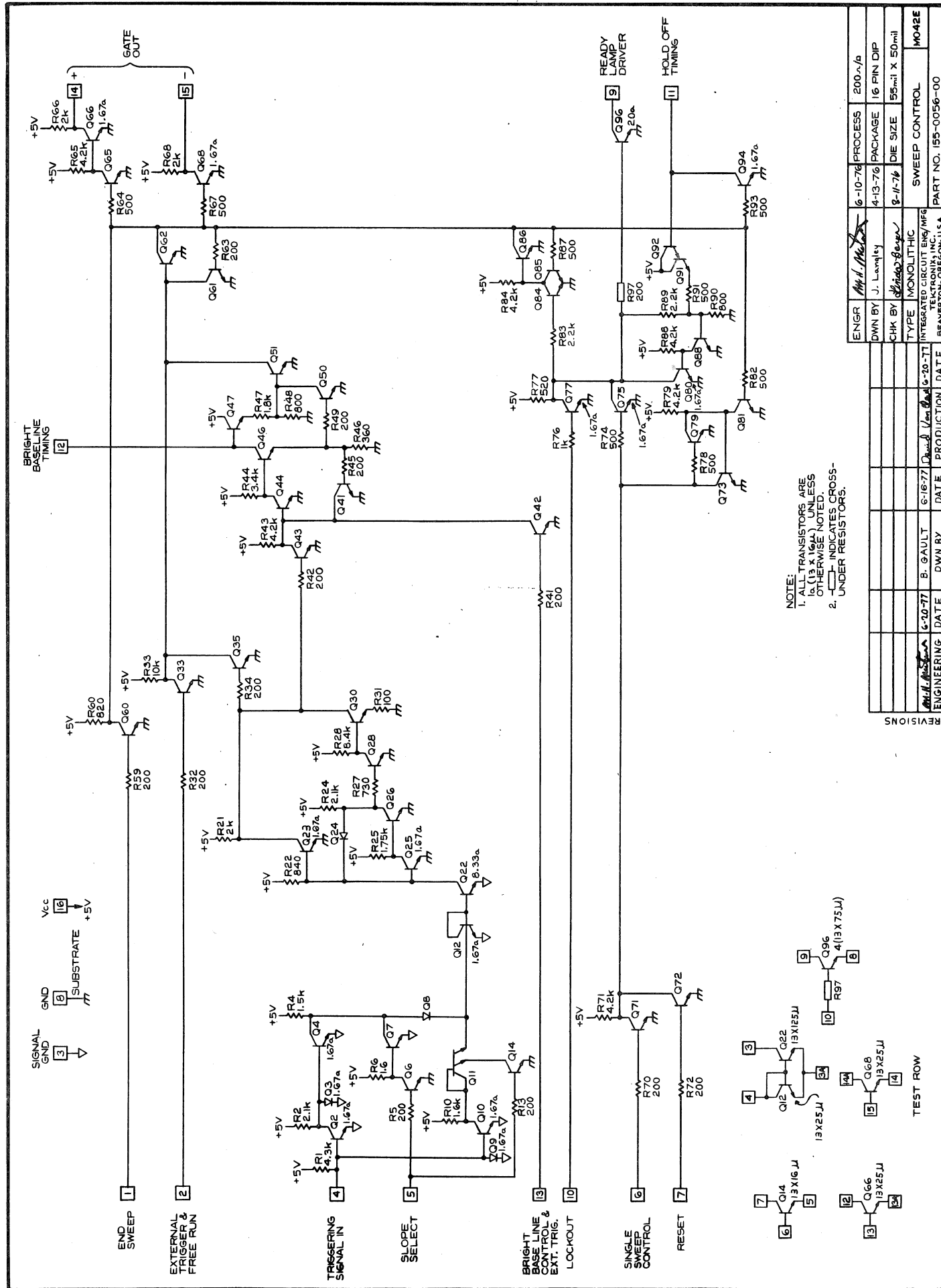
PROCESS 200 Ω/Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Val Garuts

INSTRUMENT USAGE 26G1 26G2
 26G3 314K
 4701 5B10N
 5B12N 5S14N
 7L5 7L12
 7L13 7S14
 RG501



NOTE:
 1. ALL TRANSISTORS ARE 1.3 X 1.6mm UNLESS OTHERWISE NOTED.
 2. UNDER RESISTORS - INDICATES CROSS-

ENGR	DWN BY	CHK BY	TYPE	INTEGRATED CIRCUIT ENG/MFG	DATE	PRODUCTION DATE	REVISIONS
<i>M.H. Meyer</i>	J. Leamply	<i>J. Leamply</i>	MONOLITHIC	BEAVERTON, OREGON, U.S.A.	6-16-77		

ENGINEERING DATE	DWN BY	DATE	PRODUCTION DATE	REVISIONS
6-20-77	B. GAULT			

ENGINEERING DATE	DWN BY	DATE	PRODUCTION DATE	REVISIONS
6-10-76				

PROCESS	PACKAGE	DIE SIZE	SWEEP CONTROL	PART NO.
6-10-76	16 PIN DIP	55mil X 50mil		155-0056-00

TEST ROW

1	Q14	13X25J	3	Q06	13X25J
2			4		
3			5		
4	Q12	13X125JJ	6		
5			7		
6			8		
7			9		
8	Q22	13X125JJ	10		
9			11		
10			12		
11			13		
12			14		
13			15		
14			16		

D/A CONVERTER

155-0038-01
155-0038-02 M45D

DESCRIPTION

The M045 is a 5-bit precision current source digital to analog converter. The current ratios are set by external resistors. The range of the MSB is 5 mA to 30 mA. Two packages may be used together for a 10-bit D/A with $\pm 1/2$ LSB accuracy.

The output is designed to sum into \emptyset volts. The logic inputs are T²L level compatible with a low state being true.

PROCESS 200 Ω /Sq

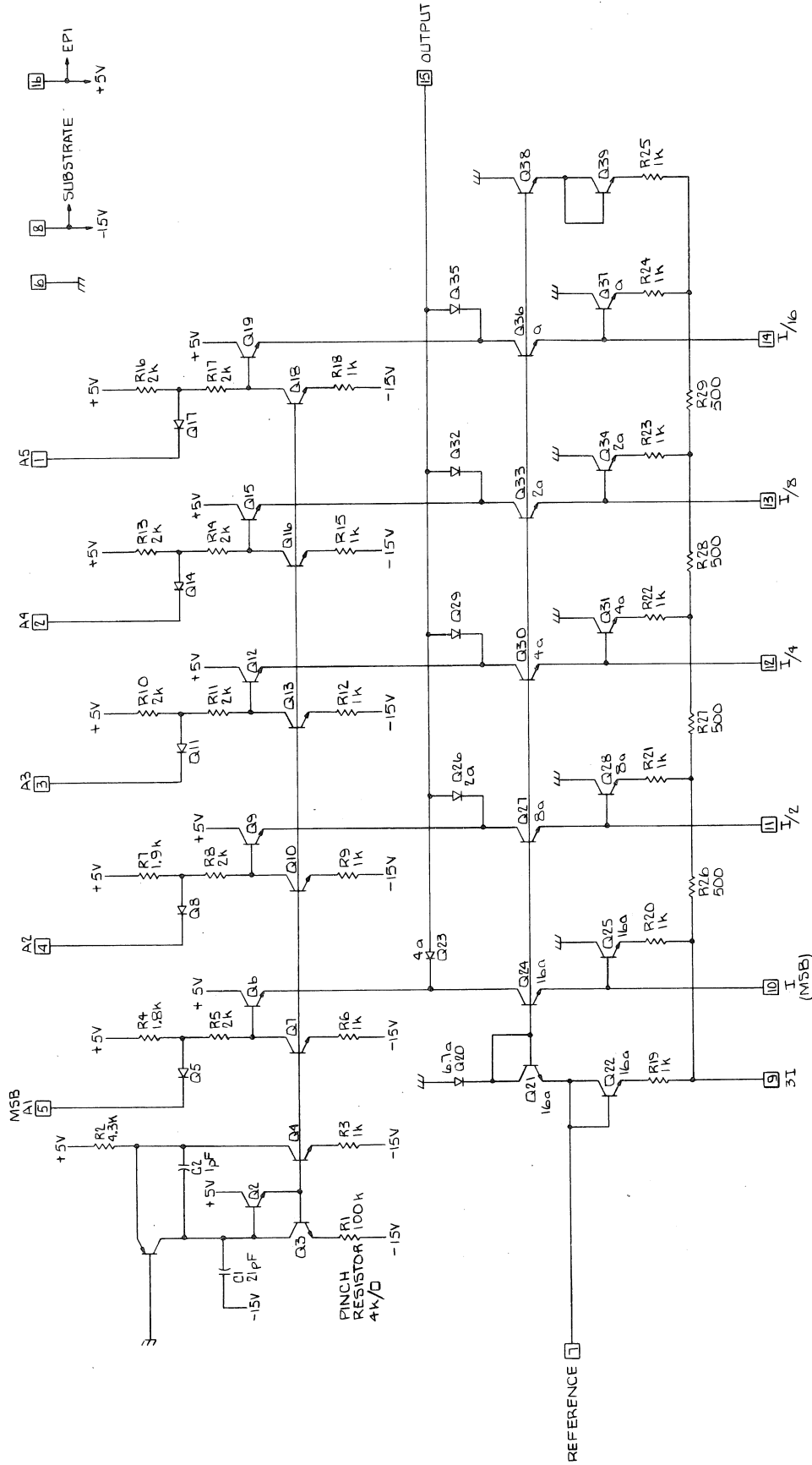
POWER SUPPLY. V_{CC} +5V, V_{EE} -5V to -15V

PACKAGE 16 Pin DIP

DESIGNER Mike Metcalf

INSTRUMENT USAGE 7D13 P7001950C
7D14 P7701953Q
7M13 P7001
7S12 1461
S6

— LOGIC INPUTS —



ENGR	M.H. <i>H. H. Lee</i>	11-13-74	PROCESS	2009/□
DWN BY	Pam Christie	11-1-74	PACKAGE	16 PIN DIP
CHK BY	Joe M. <i>Smith</i>	11-25-74	DIE SIZE	50 mil x 50 mil
TYPE	MONOLITHIC		D.A. CONVERTER	MO45D
INTEGRATED CIRCUIT ENG/MHG BEAVERTON OREGON U.S.A.				
PART NO. 155-0038.01/02				

DESCRIPTION

This Integrated Circuit generates four separate and independent timing intervals. The input is RTL, with current limiting required. During the timing interval, the output is at 5 volts through 5 K Ω . During the off period, the output will sink 5 mA below 0.4 volts.

The resistor should supply no more than 750 μ A. Allow 5 μ A for the operation of the circuit. For narrow input pulses (less than 0.5 ms per μ F of capacitance), the timing ramp will occur from 1 volt to 3.6 volts. Wider input pulses will change the ramp to 0 volts to 3.6 volts.

The circuit is a pulse stretcher in operation. The output will remain positive for a time set by the width of the input pulse plus a timing interval set by an RC.

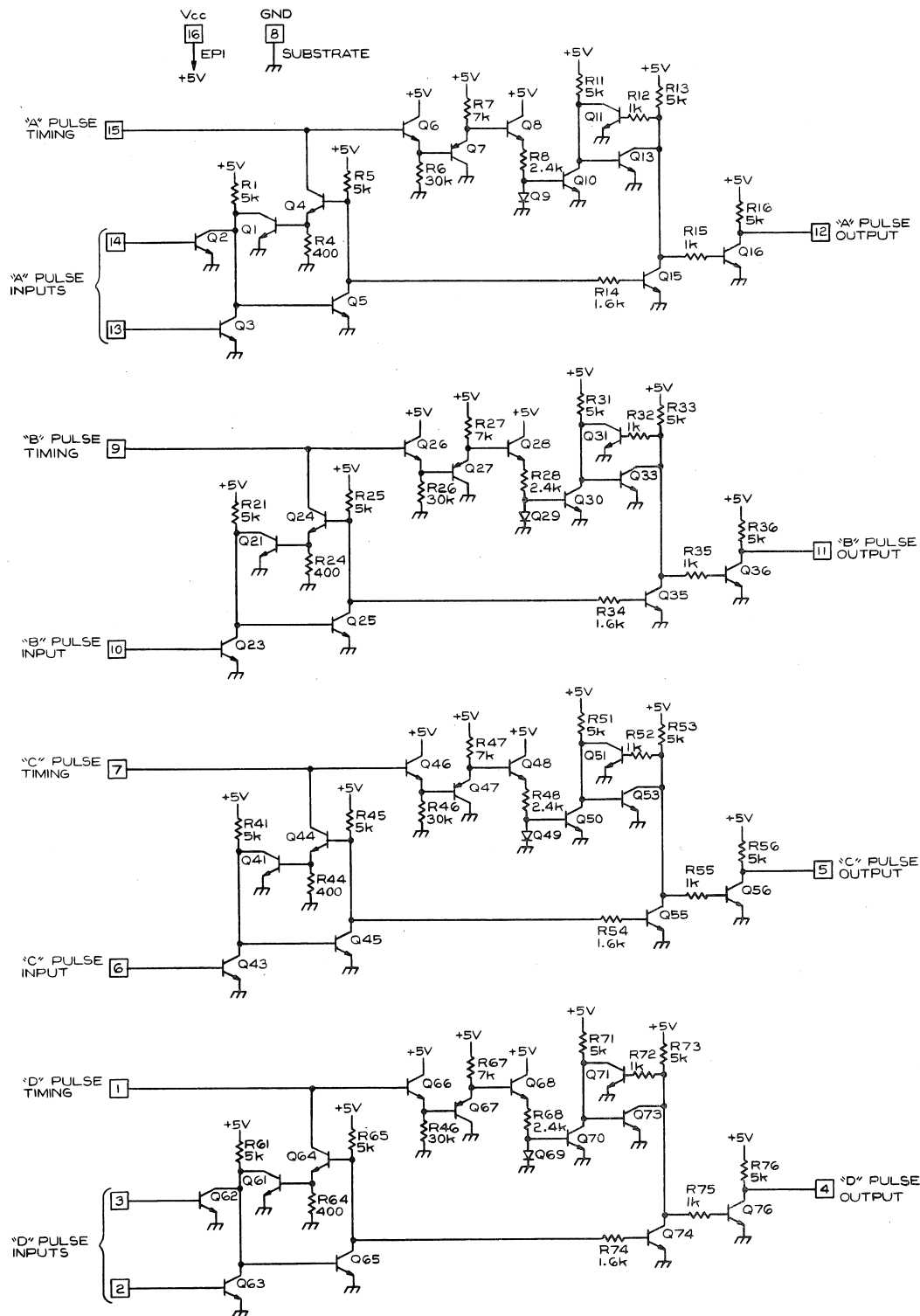
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 DIP

DESIGNER Mike Nash

INSTRUMENT USAGE None



ENGR	<i>M. H. Austin</i>	12-10-76	PROCESS	200- μ B
DWN BY	J. Langley	4-19-76	PACKAGE	16 PIN DIP
CHK BY	<i>David VanCleave</i>	3-22-77	DIE SIZE	50 mil x 50 mil
TYPE	MONOLITHIC	QUAD TIMING UNIT		M047
INTEGRATED CIRCUIT ENG/MFG			PART NO. 155-0031-01	
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

This circuit provides +7 volts and -10 volts from ± 12 volts to ± 15 volts input voltages with an output impedance of less than 10Ω and temperature coefficient of less than two millivolts per centigrade. The supplies can deliver upwards from 100 mW, depending on heatsinking and ambient temperature requirements.

The circuit also provides constant current sources of:

+2 mA at $V_6 < +10$ Volts and -2 mA at $V_4 < -10$ Volts

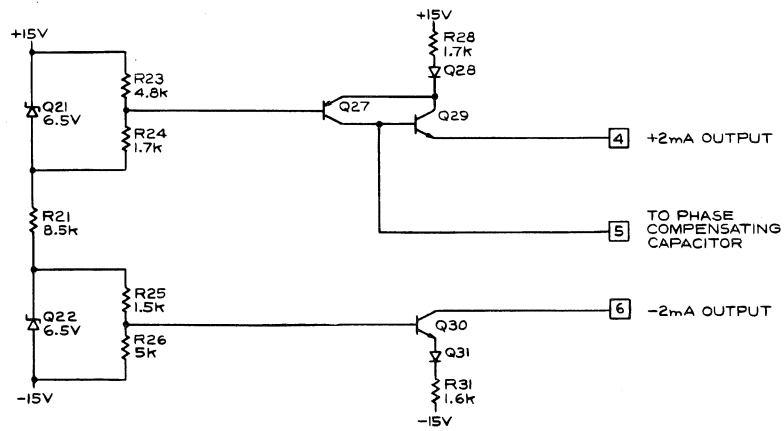
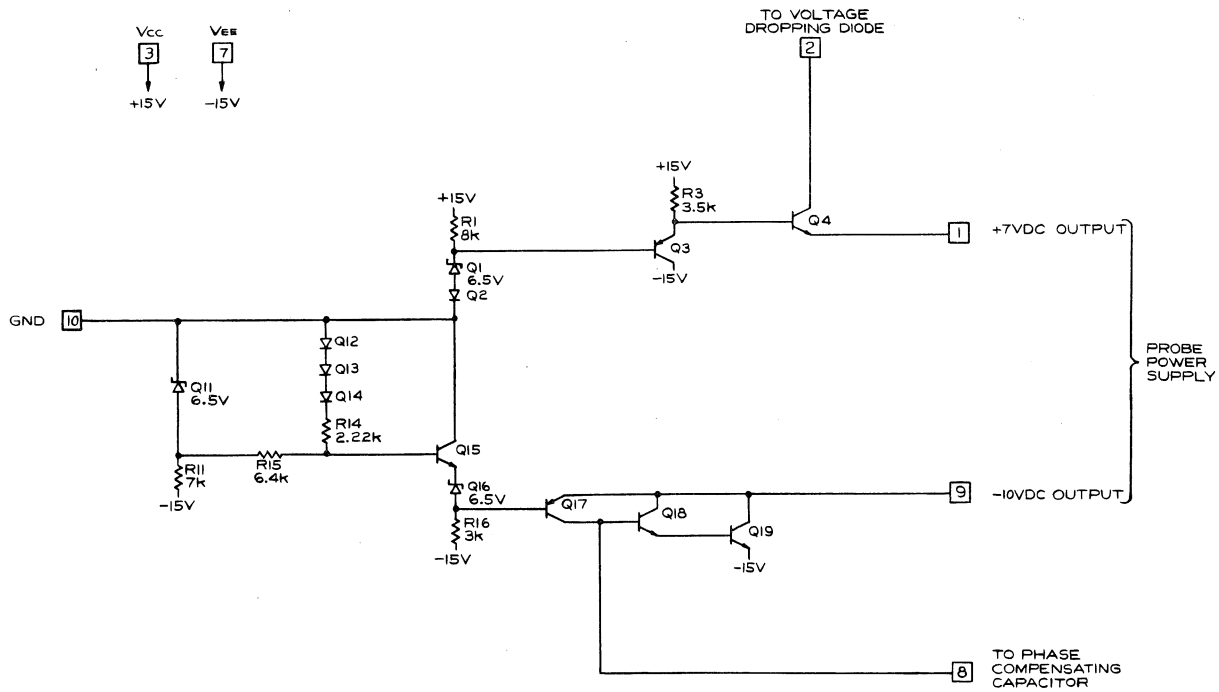
PROCESS 200 Ω /Sq

POWER SUPPLY. $V_{CC} +15V, V_{EE} -15V$

PACKAGE T0-5

DESIGNER Glenn Bateman

INSTRUMENT USAGE 010-0227-00



ENGR	E. T. Lee	2-24-75	PROCESS	200A/D
DWN BY	J. Langley	2-11-75	PACKAGE	10 LEAD TO-5
CHK BY	David VanDusen	10-23-75	DIE SIZE	35mil X 50mil
TYPE	MONOLITHIC	PROBE POWER SUPPLY		M048
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				PART NO. 155-0033-00

DESCRIPTION

Two variable gain amplifiers on a single chip. The input is a single-ended voltage and the output a differential current. Intended to be used as mini-scope output amplifiers.

Characteristics

Gain (Current Output Adjustable From 0.5 to 5 mA/Volt
Bandwidth. Determined by Load and Source
Impedances
Input Impedance. 20 K Ω

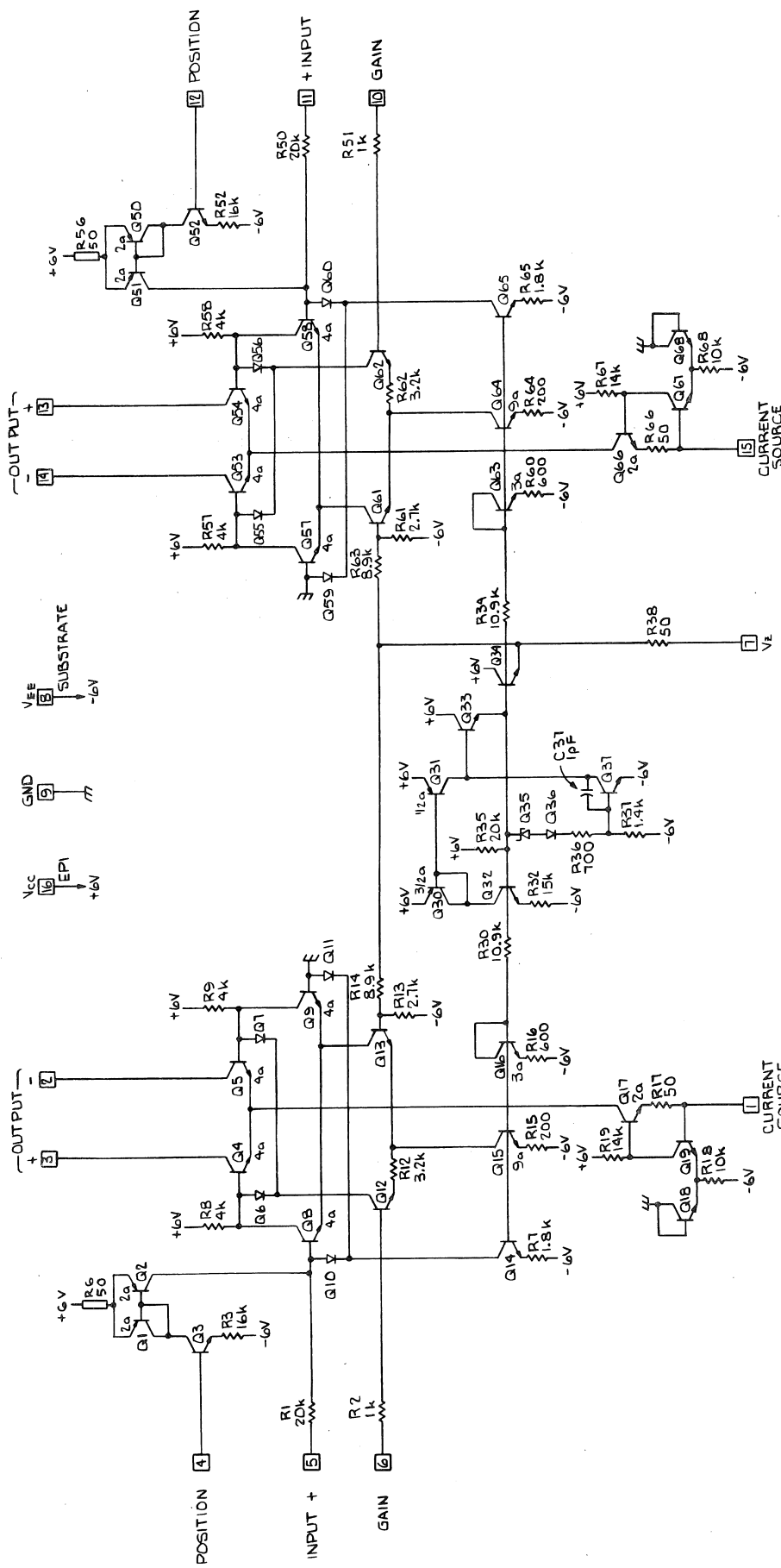
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +6 Volts, V_{EE} -6 Volts

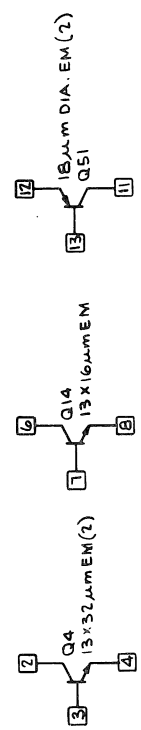
PACKAGE 16 DIP

DESIGNER David Allen

INTRUMENT USAGE. 211
212
214



NOTES
 1. INDICATES CROSS UNDER.



TEST METAL

ENGR	<i>[Signature]</i>	12-16-75	PROCESS	200A/0
DWNN BY	PAM CHERRIE	12-10-75	PACKAGE	16 PIN MINIPAC
CHK BY	<i>[Signature]</i>	3-25-76	DIE SIZE	51 mil X 51 mil
TYPE	MONOLITHIC		DUAL OUTPUT AMPLIFIER	MOSOC
	INTEGRATED CIRCUIT ENG/MFG			
	TEKTRONIX, INC.			
	BEAVERTON, OREGON, U.S.A.			
			PART NO.	155-0047-00

TRIGGER AND SWEEP

155-0048-01 M052F
155-0055-00

DESCRIPTION

This Integrated Circuit includes all functions for Trigger and Sweep.

Trigger

Input FET Input: 50 mV to 1 Volt Peak-to-Peak
Level Single Control for Level and +Slope or -Slope
Frequency DC to 5 MHz.

Sweep

Ramp Output -Slope From +2 Volts to -2 Volts,
External Adjustment \pm 0.5 Volts
Maximum dV/dT. 1 V/ μ Sec
Timing Resistor Voltage +2.5 Volts \pm 0.5 Volts
Holdoff. External "C", Internal 0.25 mA Timing "I"
Automatic Free-Run External RC
Unblank Output +2 Volts During Sweep

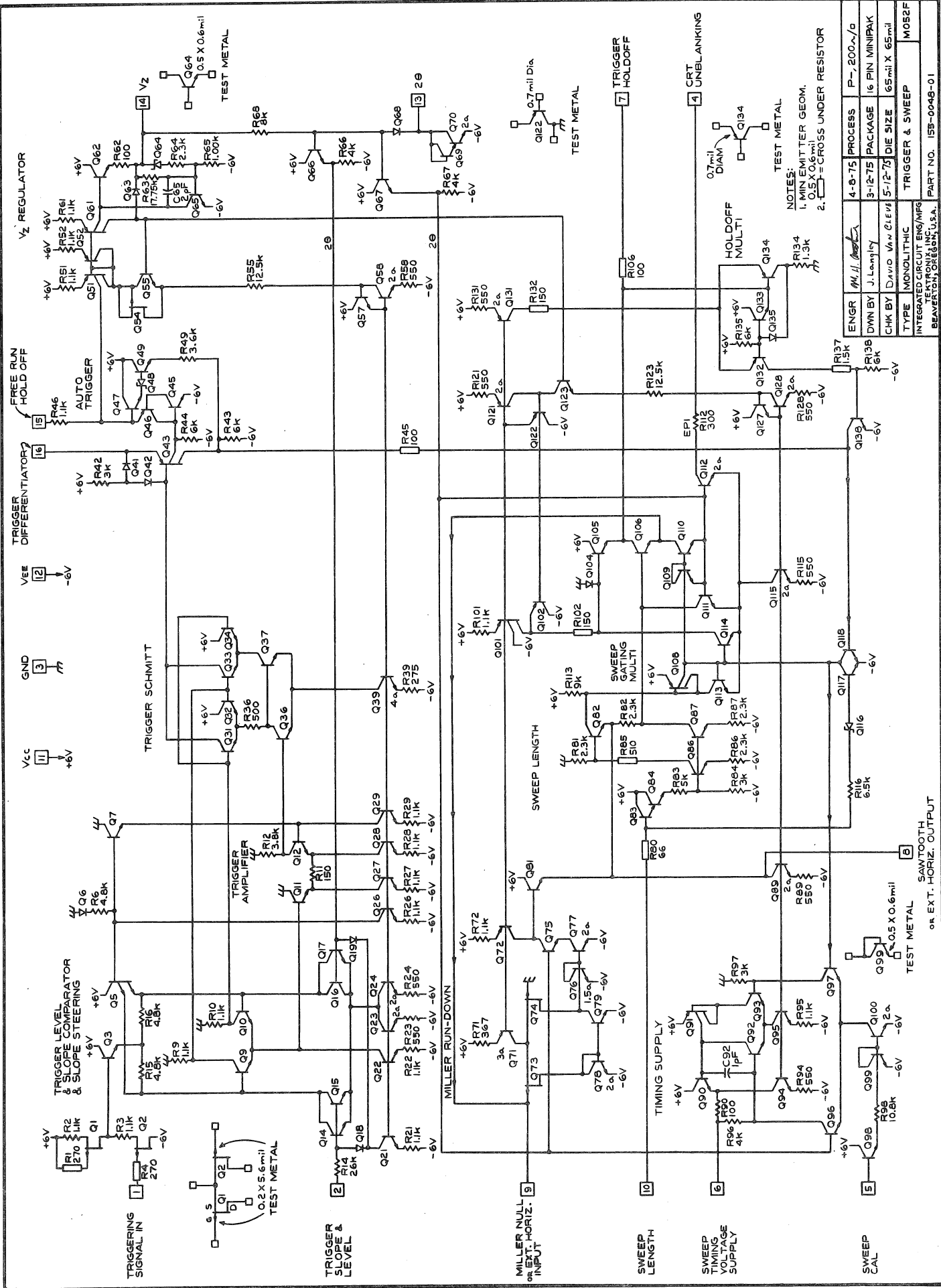
PROCESS. P- 200 Ω /Sq

POWER SUPPLY \pm 5 Volts to \pm 10 Volts at 8 mA

PACKAGE. 155-0048-01 (16 Minipac), 155-0055-00 (16 DIP)

DESIGNER Dave Allen

INSTRUMENT USAGE. 211 5B12N 603950H
212 5B13N 604950H
213 5B13NH 605950H
214 5L4N 5C501



NOTES:
 1. MIN EMITTER GEOM.
 0.5 X 0.6 mil
 2. \square = CROSS UNDER RESISTOR

ENGR	M.H. [Signature]	4-8-75	PROCESS	P-200A/D
DWN BY	J. Langley	3-12-75	PACKAGE	16 PIN MINIPAK
CHK BY	DAVID VAN CLEVE	5-12-75	DIE SIZE	65 mil X 65 mil
TYPE	MONOLITHIC	TRIGGER & SWEEP		MO52F
INTEGRATED CIRCUIT ENGINEERING BEAVERTON, OREGON, U.S.A.				

OR EXT. HORIZ. OUTPUT

QUAD OPERATIONAL AMPLIFIER

155-0035-00
155-0116-00

M053B

DESCRIPTION

Four operational amplifiers on a chip with the following specifications:

Maximum Power Dissipation	500 mW at 25°C Derate 5 mW/°C to 125°C
Power Supplies	± 5 to ± 15 V
Open Loop Gain	> 1500
Gain Bandwidth	> 80 MHz
Input Offset	< 5 mV
Output Swing	- 0.7 w.r.t. Input Level To +V _{CC} -1.5V
Maximum Output Current	20 mA (Limited By Package Dissipation)

The amplifier is stable in all modes without external compensation if $C_L \leq 10$ pF.

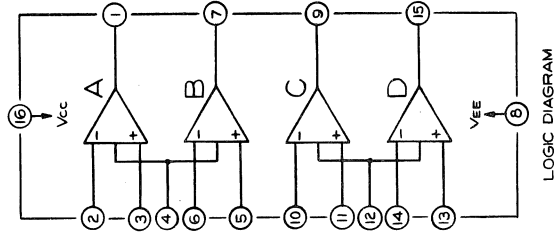
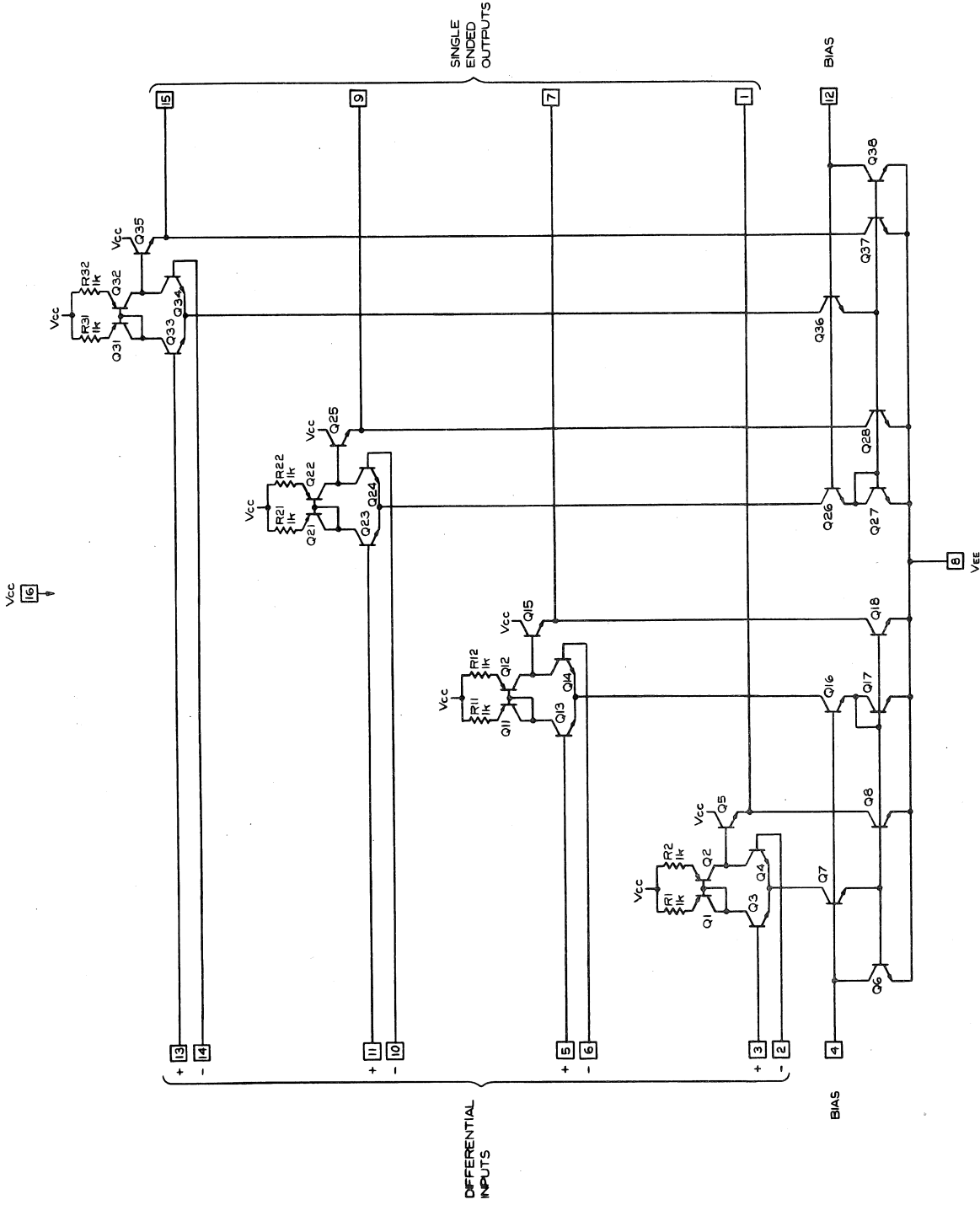
PROCESS 200 Ω/Sq

POWER SUPPLY.

PACKAGE	155-0035-00 (16 DIP Plastic)
	155-0116-00 (16 DIP Ceramic)

DESIGNER Mike Metcalf

INSTRUMENT USAGE	3110	7L5	4010
	7L12	4011	7L13
	4012	7S12	4013
	7T11	4602	S6
	613	P7001	653
	1461		



ENGR	M. H. Masterson	6-30-75	PROCESS	200A/P
DWN BY	J. Langley	6-18-75	PACKAGE	16 PIN DIP
CHK BY	C. WESTON	10-9-75	DIE SIZE	40-mil X 40-mil
TYPE	MONOLITHIC		QUAD OPERATIONAL	
	INTEGRATED CIRCUIT ENG/MFG		AMPLIFIER	
	FACTORY INC			
	BEAVERTON, OREGON, U.S.A.			
			PART NO. 155-0035-00/155-0116-00	
				M053B

DESCRIPTION

This is a variation of the Quad-Op-Amp chip (155-0035-00/155-0116-00) connection is such a fashion that Amplifiers "A" and "B" are operative as amplifiers, while "C" and "D" pin-outs are arranged in such a fashion as to become a constant current source rather than operating as amplifiers. The magnitude of constant current available is approximately four times the bias current as measured at Pin 11 when the output is taken from Pins 8, 9, 10, 12, 13, and 14 all connected together.

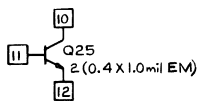
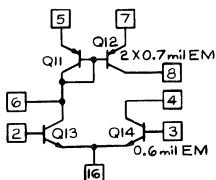
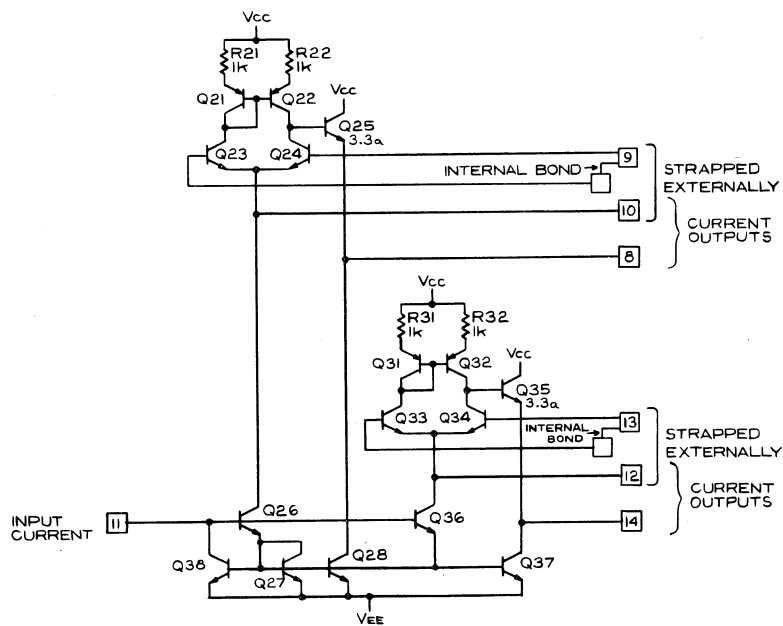
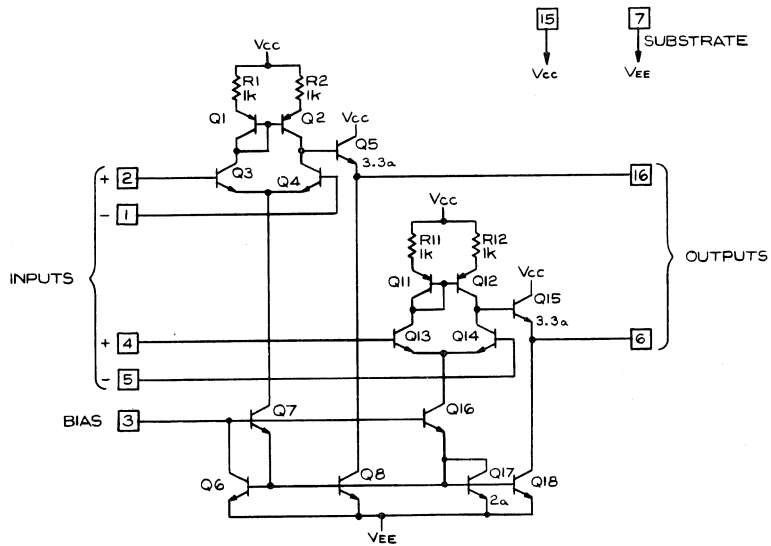
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} : +5 to +15
 V_{EE} : -5 to -15

PACKAGE Minipac

DESIGNER Dave Allen

INSTRUMENT USAGE 211



TEST ROW

ENGR	<i>M. H. Austin</i>	6-10-76	PROCESS	200 μ /D
DWN BY	J. Langley	4-5-76	PACKAGE	16 PIN MINIPAC
CHK BY	<i>Ando</i>	7-13-76	DIE SIZE	40mil X 40mil
TYPE	MONOLITHIC		2 OP AMPS/ 2 CURRENT SOURCES	M053B
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				PART NO. 155-0057-00

INPUT AMPLIFIER

155-0032-00 M55D
155-0032-01

DESCRIPTION

This circuit is a single channel amplifier designed for the dual channel 7A12. Pins #1, #2, #15, and #16 are connected to external current sources to provide gain changes. The differential input is connected to Pins #3 and #14. Current at Pin #10 controls the ratio of the current from Pin #6 to Pins #8 and #9 for output position. Current at Pin #12 controls Pin #5 currents to provide current gain continuously variable between +1 and -1.

PROCESS 50/450

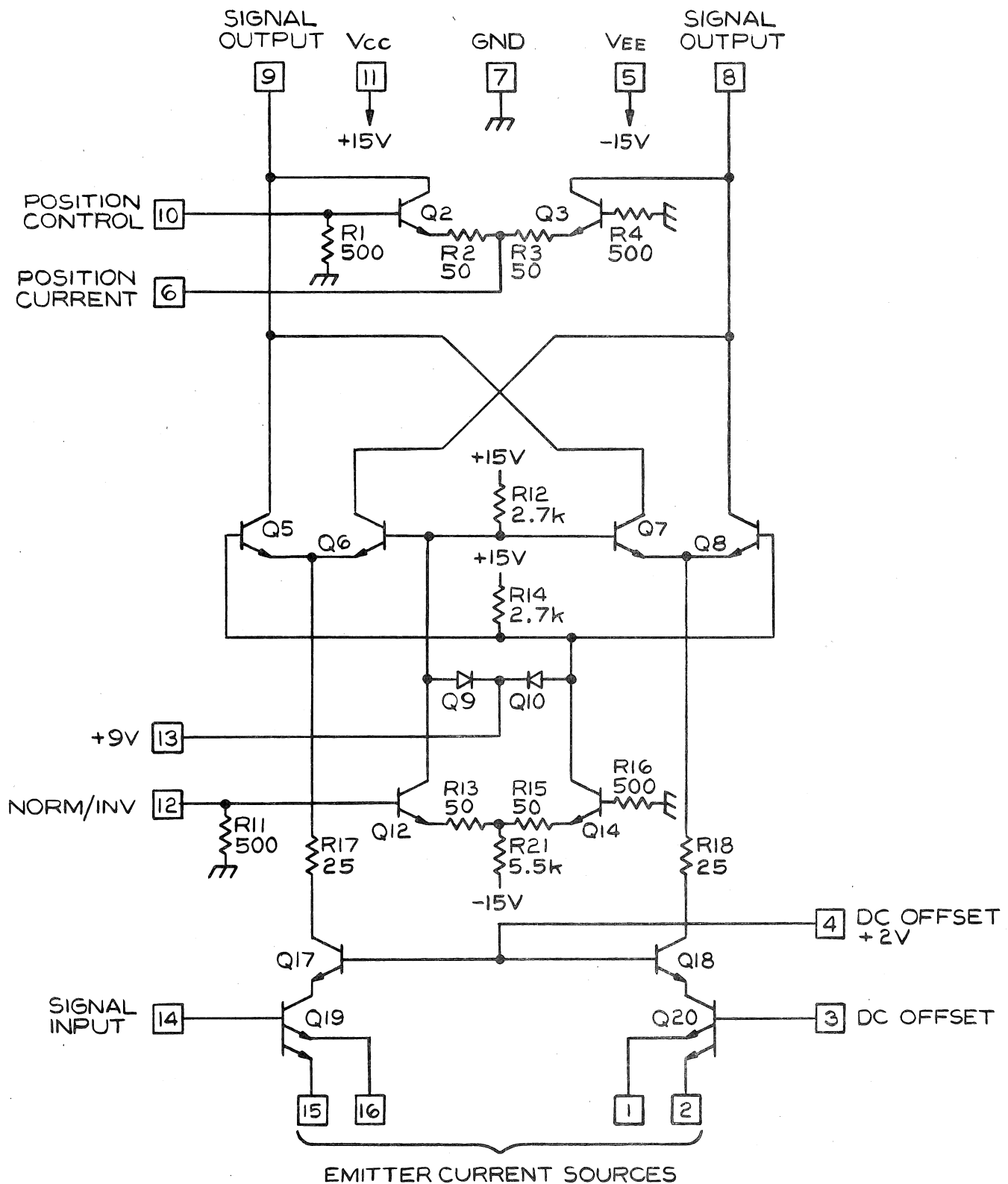
POWER SUPPLY. +15V, +9V, GND -15V

PACKAGE 16 Pin DIP

DESIGNER Roy Hayes

INSTRUMENT USAGE 1478 671
465 1460
475 670
464 466
1440 355

Some 475 Mods



ENGR	<i>Evan Tule</i>	7-1-76	PROCESS	50-450
DWN BY	J. Langley	6-29-76	PACKAGE	16 PIN DIP
CHK BY	<i>Linda Boyer</i>	7-13-76	DIE SIZE	60mil X 40mil
TYPE	MONOLITHIC		INPUT AMPLIFIER	M055
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.			PART NO. 155-0032-00	

DUAL DIODE

155-0034-00 M061

DESCRIPTION

Diode Pair - matched for V_{BE} and specific thermal tracking with temperature.

NOTE: Foot of "T" stamped on side of case is the cathode.

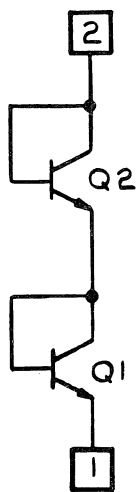
PROCESS 200 Ω /Sq

POWER SUPPLY.

PACKAGE Micro T

DESIGNER Carlos Medina

INSTRUMENT USAGE 010-0227-00



ENGR	C. MADINA	9-25-75	PROCESS	200 μ /D
DWN BY	J. Langley	2-12-75	PACKAGE	MICRO T
CHK BY	David Van Allen	10-23-75	DIE SIZE	60 mil X 50 mil
TYPE	MONOLITHIC	DUAL DIODE		M061
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.			PART NO. 155-0034-00	

VERTICAL PREAMPLIFIER

155-0050-01 M065

DESCRIPTION

The M065 is a Vertical Preamplifier for the 432 and 434 Portable scopes. This circuit has provisions for gain-switching and gain adjustment. In addition, basic sensitivity is set by an external resistor.

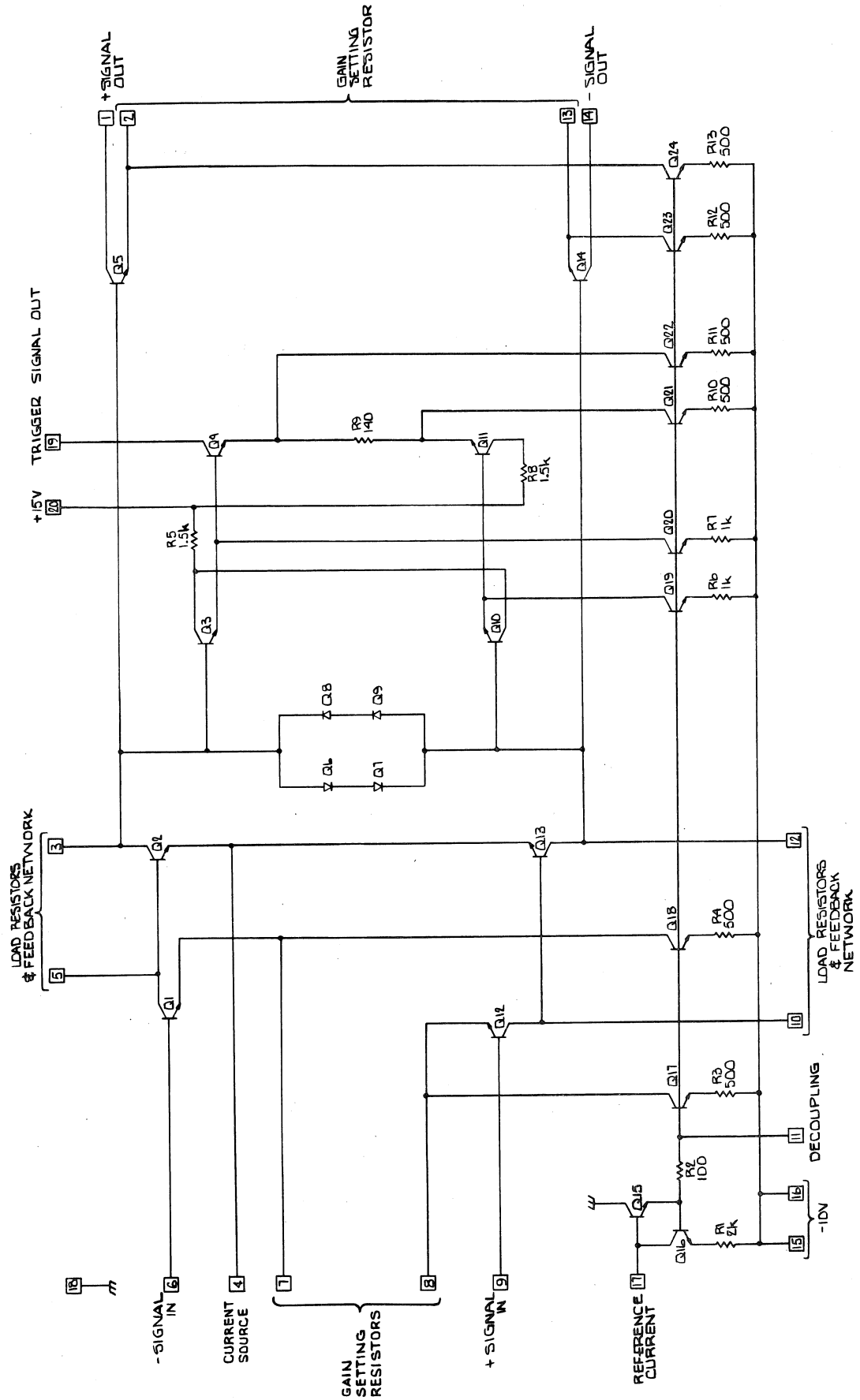
PROCESS 200 Ω /Sq

POWER SUPPLY. +15V, GND, -10V

PACKAGE 20 Pin DIP

DESIGNER Bert TenKate

INSTRUMENT USAGE 314K
432
434



ENGR	Ed	T-2	9-30-75	PROCESS	200 ~/b
DWN BY	PAM	CHERRIE	11-12-74	PACKAGE	20 PIN DIP
CHK BY	Daniel	Van	12-10-76	DIE SIZE	45mil X 35mil
TYPE	MONOLITHIC		VERTICAL PREAMP		MOGS
INTEGRATED CIRCUIT ENGINEERING BERVINGTON, OREGON, U.S.A. PART NO. 155-0050-01					

DESCRIPTION

This integrated circuit comprises two separate circuits, a HV Regulator Amplifier and the Z-Axis Amplifier.

The HV Regulator is a high gain non-inverting amplifier using a triple Darlington input for low bias current. A reference supply, also using a triple Darlington, establishes a differential input voltage.

The Z-Axis Amplifier is used in a feed-back mode with external circuitry. The current into the summing node is determined by three current inputs at -5 volts. This current is switched through hot carrier diodes by the unblanking current input.

PROCESS 200 Ω -cm With Schottky

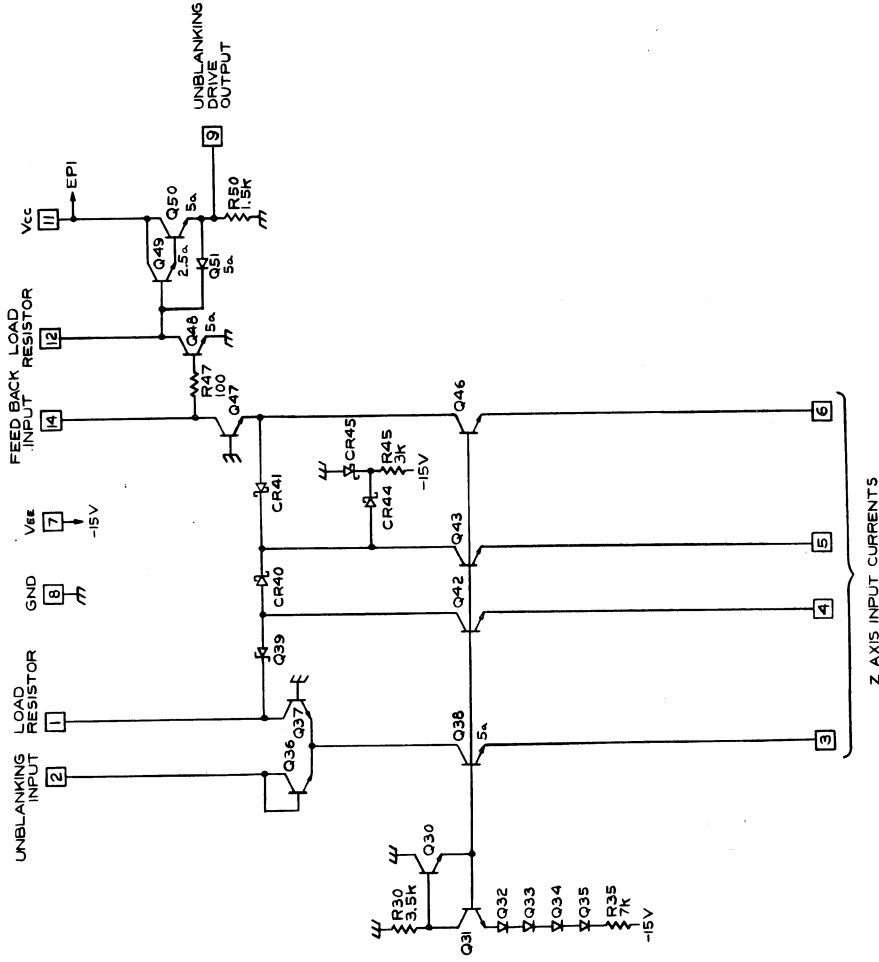
POWER SUPPLY. V_{CC} +15V, V_{EE} -15V

PACKAGE 20 DIP

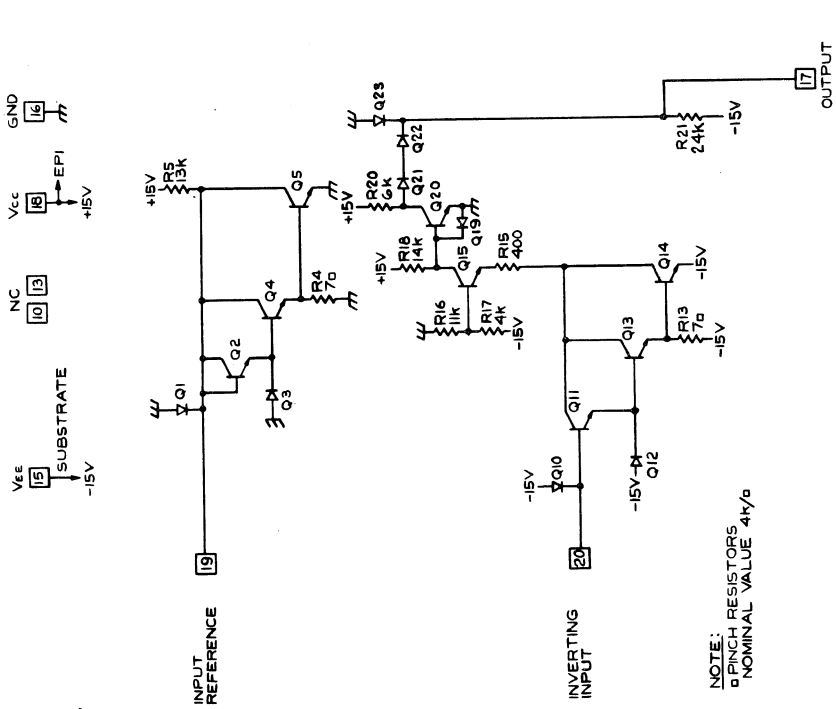
DESIGNER Frank Churchill

INSTRUMENT USAGE 432
434

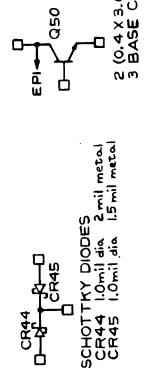
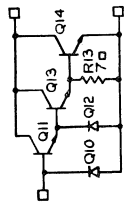
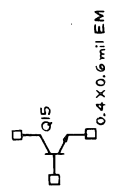
Z AXIS AMP



HV REG



NOTE:
PINCH RESISTORS
NOMINAL VALUE 4K/Ω



TEST METAL

ENGR	M. H. Anderson	4-4-75	PROCESS	STD. LA-CR BY RESISTOR
DWN BY	J. Langley	3-4-75	PACKAGE	20 PIN DIP
CHK BY	D. M. Booth	6-20-73	DIE SIZE	45 mil X 45 mil
TYPE		MONOLITHIC		
INTEGRATED CIRCUIT ENS/MFG		TEKTRONIX, INC.		
BEAVERTON, OREGON, U.S.A.		PART NO. 155-0051-00		

GAIN TRIM AMPLIFIER

155-0059-00 M077A

DESCRIPTION

The M077A is a f_T Doubler with Nichrome emitter resistors, emitter Emitter peaking with MOS capacitors, grounded base output transistors connected similar to a multiplier for gain trim.

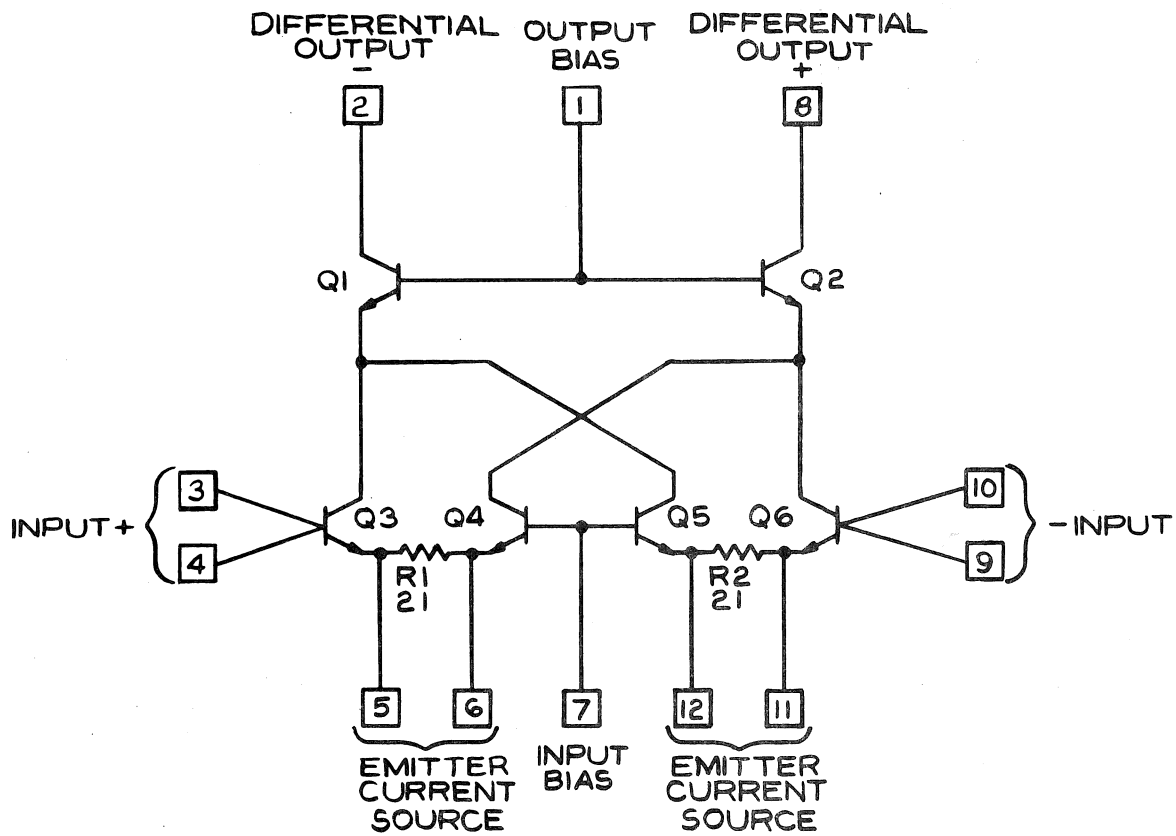
PROCESS SHF II

POWER SUPPLY.

PACKAGE 12 Lead Small T0-8

DESIGNER Thor Hallen

INSTRUMENT USAGE 7904
7844
7903
7912



NOTE:

1. SUBSTRATE WIRE BONDED TO CASE.

ENGR	<i>Joe Tree</i>	7-1-76	PROCESS	SHF II
OWN BY	J. Langley	6-30-76	PACKAGE	12 LEAD SMALL PATTERN TO-8
CHK BY	<i>Alinda Boyer</i>	7-14-76	DIE SIZE	45mil X 40mil
TYPE	MONOLITHIC	GAIN TRIM AMPLIFIER		M077
INTEGRATED CIRCUIT ENG/MFG		PART NO. 15B-0059-00		
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				

SWEEP CONTROL

155-0049-02 M079G

DESCRIPTION

This Integrated Circuit contains bright baseline auto circuit, single sweep circuit, and holdoff circuit with terminals for S.S Reset Ready light, triggered light, auto timing, H.O timing, and two pins for new general logic (ie, lockout and main frame delay mode control).

PROCESS 200 Ω /Sq

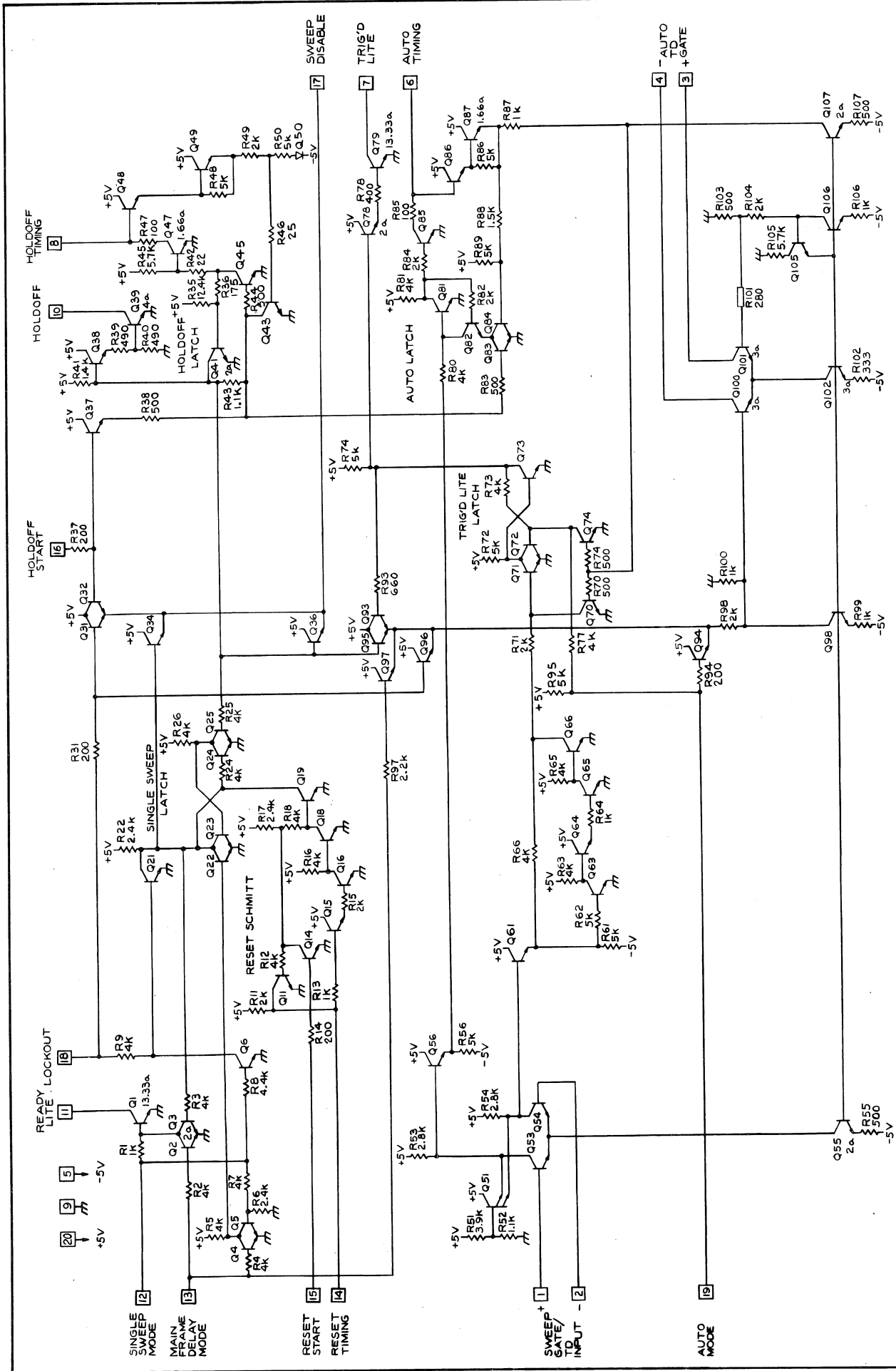
POWER SUPPLY. V_{CC} +5V, V_{EE} -5V

PACKAGE 20 DIP

DESIGNER Bill DeVey

INSTRUMENT USAGE 7B92 485
335K 464
465 466
475 7B80
485 5B31
5B40 5B52
5B42G 5B44
7B85 7B53
4851 4852
SC502 7B502

Some 475 Mods



NOTE:
 1. - CROSS UNDER RESISTOR.
 2. - ALL EMITTER AREAS ARE 1 ϕ , (0.5mil X 0.6mil) UNLESS OTHERWISE INDICATED.

ENGR	Art H. [Signature]	19 NOV 76	PROCESS	200 J-10
DWN BY	J. Langley	3 NOV 76	PACKAGE	20 PIN DIP
CHK BY	C. Weston	19 JAN 77	DIE SIZE	60 mil X 60 mil
TYPE	MONOLITHIC		SWEEP CONTROL	M0796
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A. PART NO. 155-0049-02				

HF OUTPUT AMPLIFIER

203-0080-90 M80C

DESCRIPTION

The M080 is fabricated by the SHF II process, and has two MOS capacitors across the Nichrome resistors. It is capable of delivering 200 mA to the output. Th M80C is used in the 155-0064-01 (H074A) and the 155-0065-00 (H074) hybrids.

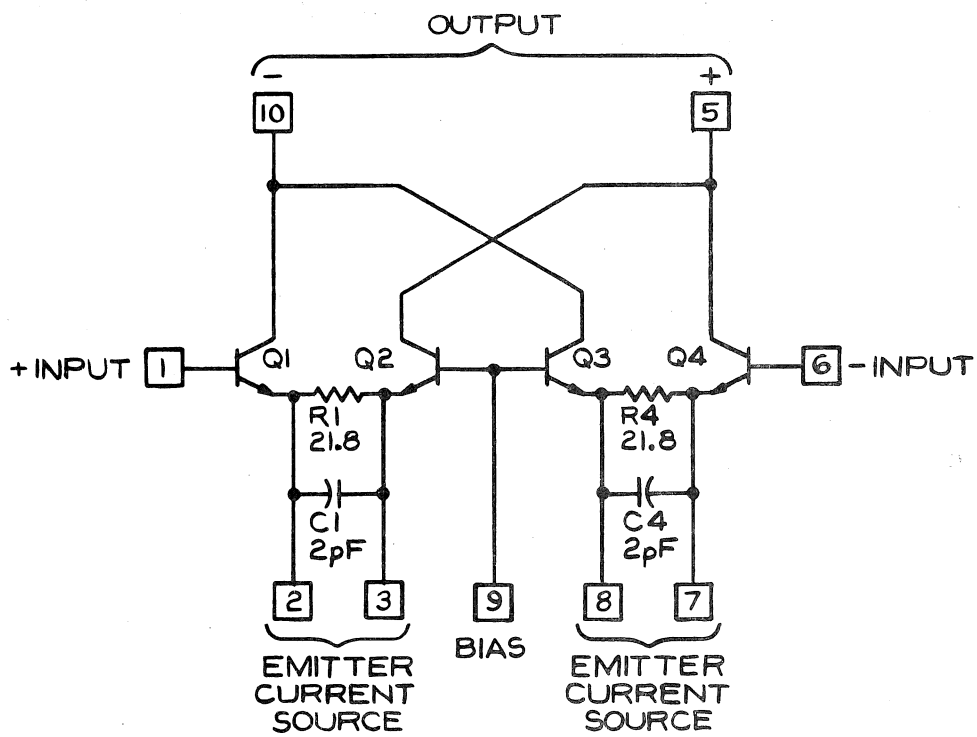
PROCESS SHF II

POWER SUPPLY.

PACKAGE 12 Pin T0-8

DESIGNER Thor Hallen

INSTRUMENT USAGE 485 7844
4851 7903
4852 7904
7912



ENGR	<i>E. Trax</i>	7-8-76	PROCESS	SHF II
DWN BY	J. Langley	7-6-76	PACKAGE	12 LEAD LARGE PATTERN TO-8
CHK BY	<i>Wido Boyer</i>	7-14-76	DIE SIZE	30mil X 40mil
TYPE	MONOLITHIC		HF OUTPUT AMPLIFIER	MO80C
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.			PART NO. 203-0080-90	

FT DOUBLER AMPLIFIER

155-0061-00 M083

DESCRIPTION

f_T Doubler Amplifier designed for the 7904 channel switch and built with the SHF II process. Equal size output transistors allow it to be used for variable and invert operations. Output transistors are designed for linear operation to 75 mA.

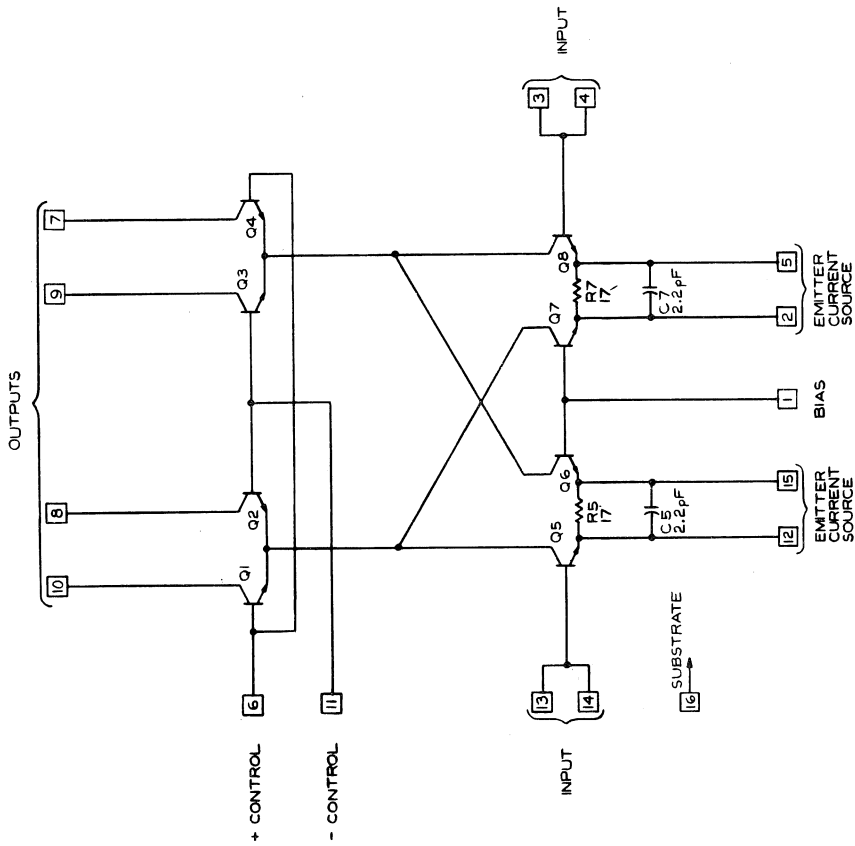
PROCESS SHF II

POWER SUPPLY.

PACKAGE 16 DIP

DESIGNER Hans Springer

INSTRUMENT USAGE 7B92A



ENGR	<i>Handwritten</i>	10-28-75	PROCESS	SH II
DWNB	J. Langley	10-22-75	PACKAGE	16 DIP
CHK BY	C. WESTON	10-28-75	DIE SIZE	50-mil X 45-mil
TYPE	MONOLITHIC	f_T	DOUBLER AMPLIFIER	MO83
INTEGRATED CIRCUIT ENG/MFG				
WESTON ELECTRONICS, INC.				
BEAVERTON, OREGON, U.S.A.				
PART NO. 155-0061-00				

DESCRIPTION

A differential amplifier designed for the 485 Vertical. The cascode outputs can provide gain adjust or invert functions by using the proper control voltage. All transistors have been designed to carry a maximum of 90 mA while maintaining their f_T .

PROCESS SHF II

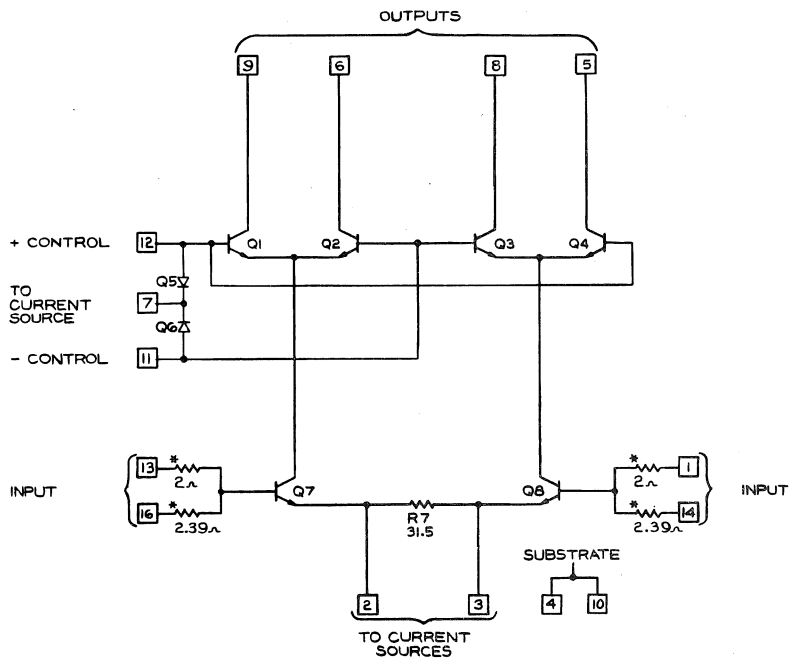
POWER SUPPLY.

PACKAGE Minipac

DESIGNER John Addis

INSTRUMENT USAGE	475G	475H	475K
	485	4851	4852
	7A24	7A26	7A26H
	7A16	7A16A	7844
	7903	7904	475
	7912	7834	7A26G
	7A26K	P6502	AM503

067-0587-01



NOTE:
 1. RESISTORS MARKED WITH *
 ARE METAL RUNS.

ENGR	<i>J. Langley</i>	10-10-75	PROCESS	SH II
OWN BY	J. Langley	10-9-75	PACKAGE	16 PIN MINIPAC
CHK BY	C. WESTON	10-27-75	DIE SIZE	50mil X 42mil
TYPE	MONOLITHIC	485 VERTICAL AMPLIFIER		MO84E
INTEGRATED CIRCUIT DES/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.		PART NO. 155-0078-00		

DESCRIPTION

This circuit consists of three cascode stages. The first stage serves as high frequency compensation and termination for the delay line. The second stage will do gain peaking at high frequencies to compensate for the R-C roll-off at the CRT, in addition to low-frequency gain. The last stage has a fixed gain, and has terminals brought out for thermal distortion compensation, and also for external long-tails. The common base devices of the last cascode remain discrete in order to have enough breakdown voltage for a CRT. Bandwidth of the integrated circuit into a low impedance load is 600 MHz.

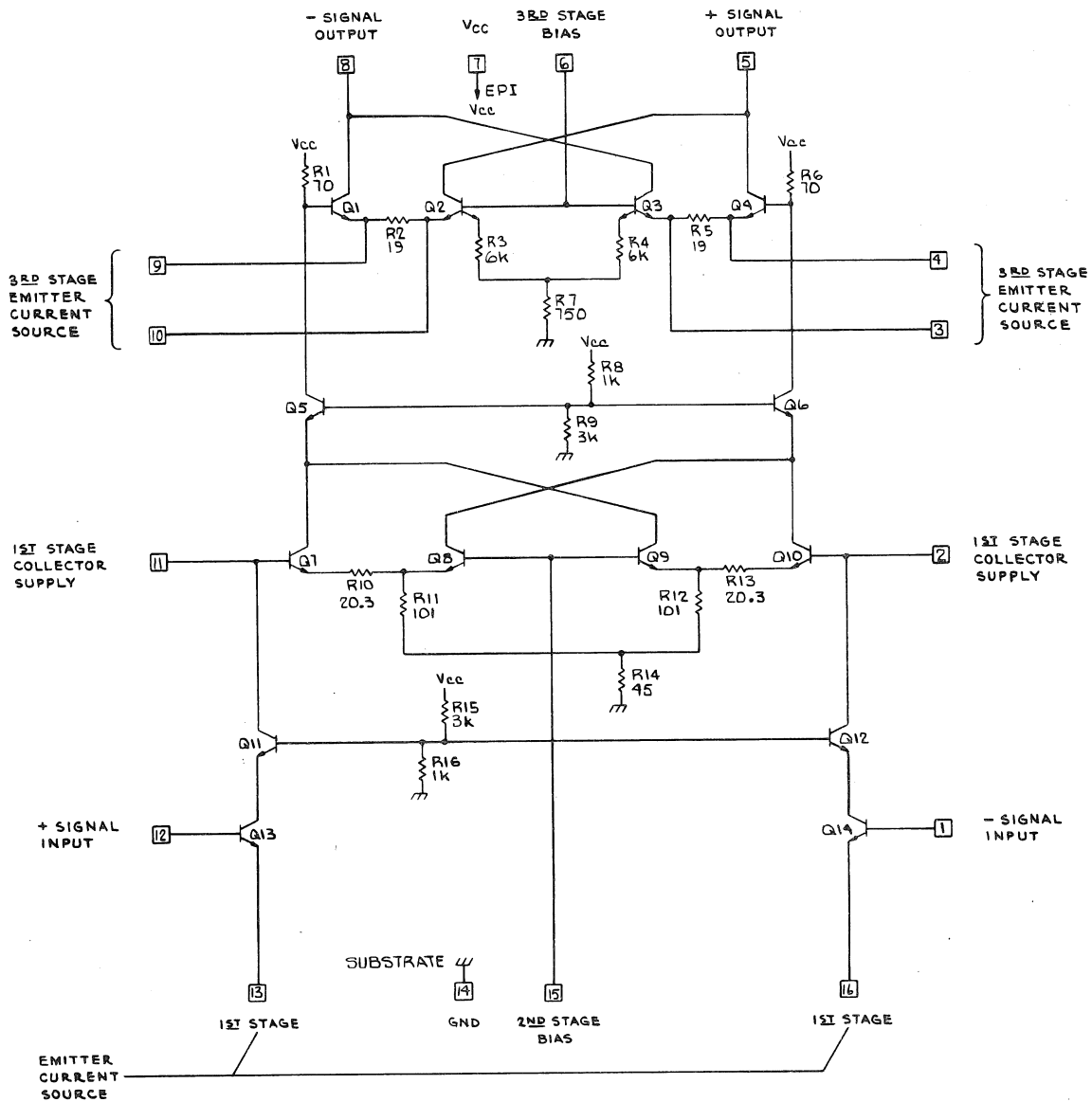
PROCESS SHF II With Nichrome

POWER SUPPLY. 15 Volts

PACKAGE T0-8 With Stud

DESIGNER Jim Cavoretto/Einar Traa

INSTRUMENT USAGE 465G 465H
 465K 7704A
 335K D7704G
 464 D7704H
 466



ENGR	Shw Trea	10-15-74	PROCESS	SH II
DWNBY	RmChernie	8-8-74	PACKAGE	WAFER FORM
CHK BY	RY M.../K	11-1-74	DIE SIZE	50mil x 55mil
TYPE	MONOLITHIC	VERTICAL OUTPUT AMPLIFIER		MO89A
INTEGRATED CIRCUIT ENG/MFG			PART NO. 203-0089-90	
TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

Designed to control DC to DC inverter supplies, it provides the necessary circuitry to do all regulation and protection of the inverter system.

Inputs are provided to:

1. Sense and Control Secondary Voltage Faults (detected by a bi-directional, ground-reference node, Pin 2).
2. Sense and Limit Maximum Inverter Current (Pin 13).
3. Sense Line Voltage (Pin 3), Present (Pin 3).
4. Sense Inverter Current Phase (Pins 10 and 11).

Outputs (Pins 8 and 9) control the inverter base drive circuitry.

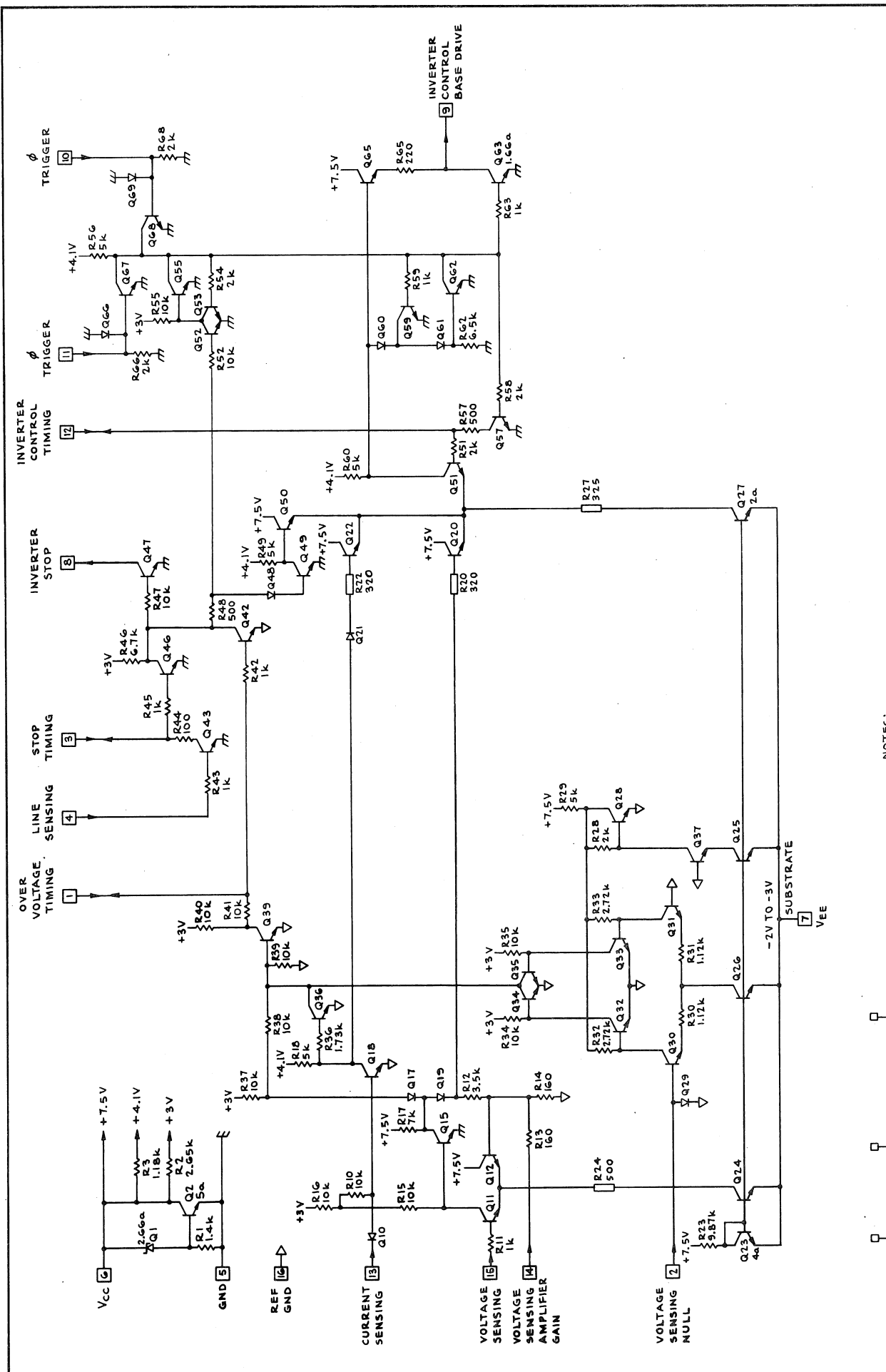
PROCESS 200 Ω /Sq

POWER SUPPLIES V_{CC} : Requires a current source, internally regulated at 7.5V
 V_{EE} : -2 Volts

PACKAGE 16 DIP

DESIGNERS. Joe Burger/Gene Andrews

INSTRUMENT USAGE 485 7844
 7904 7903
 7904A 7912
 4851 P7001
 4852 434
 A7704 7704A



NOTES:
 1. INDICATES CROSS UNDER RESISTOR.

TEST ROW

ENGR	<i>M.L. M...</i>	3-25-75	PROCESS	200.0/1
DWYBY	Bob H...	3-7-75	PACKAGE	16 PIN DIP
CHK BY	C WESTON	9-24-75	DIE SIZE	55 x 55 mils
TYPE	MONOLITHIC	POWER SUPPLY		M091B
INTEGRATED CIRCUIT ENG/MFG				REGULATOR
TEKTRONIX, INC.				PART NO. 155-00GT-02
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

The M94 controls the 50 Ω, 1 MΩ mode of the 485 Oscilloscope. It provides input protection and controls a "Mode Switch" lamp and lights a "Reset" lamp during overload. This device also performs an approximate RMS conversion on the input signal voltage and, with an external capacitor, integrates the result to obtain a signal proportional to heat generated in a 50 Ω attenuator. Excess signal trips a relay which can be used to open the input signal and protect the input (50 Ω) attenuator.

As a secondary feature, the M094 also provides a X1, X10, X100, and trace identify functions for readout from a readout coded BNC. Lights appropriate LED and extinguishes all LED's during ID mode.

PROCESS 200 Ω/Sq

POWER SUPPLY. V_{CC} +5V, V_{EE} -5V

PACKAGE Minipac

DESIGNER John Addis

INSTRUMENT USAGE 4851
 4852
 485

CHANNEL SWITCH

155-0091-00 M095A

DESCRIPTION

Consists of one FT-Doubler cascode stage per channel, with parallel outputs. The channel switching is done by switching the dual common base transistors in these cascode stages. The circuit also has provisions for trigger pick-offs from each channel.

The input is 20 mV/DIV into built-in 50 ohm terminations, at a DC level of -5 V. The output is 1 mA/DIV into reverse terminated 50 ohm line (ie., $20 \Omega \times 1 \text{ mA} = 25 \text{ mV/DIV}$ at ground DC level).

Dissipation is 1 watt.

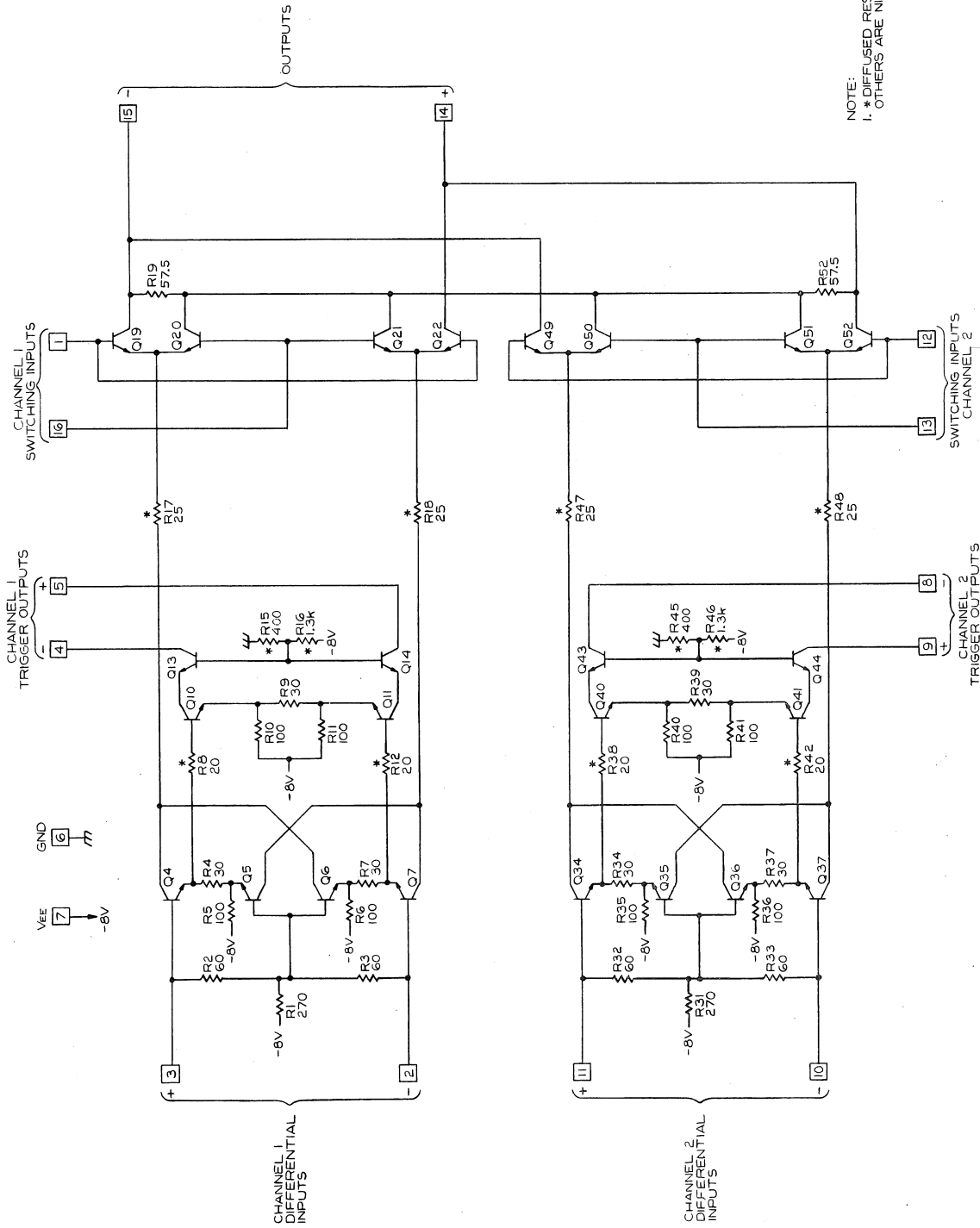
PROCESS SHF II

POWER SUPPLY. -8 Volts, Ground

PACKAGE 16 Lead Large Pattern T0-8
With Brazed Molyshim

DESIGNERS. Einar Traa/Jim Woo

INSTRUMENT USAGE None



NOTE:
 1. * DIFFUSED RESISTORS,
 OTHERS ARE NICHROME.

ENGR	<i>J. Langley</i>	3-5-76	PROCESS	SHF II
DWN BY	J. Langley	2-3-76	PACKAGE	16 PIN TO-8 LG.
CHK BY	<i>Blind Bay</i>	3-10-76	DIE SIZE	60mil X 60mil
TYPE	MONOLITHIC		CHANNEL SWITCH	MO95A
INTEGRATED CIRCUIT ENG/MFR:				
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				
			PART NO.	155-0091-00

DESCRIPTION

The M101B is a programmable function generator constructed as an integrated circuit. It produces an output voltage or current which is a programmable function of an input voltage or current at 19 evenly spaced values of the input voltage or current. For values of the input signal between 19 points, the output is a linear interpolation between the output values at the nearest points. The programming of each point is independent of all other points, and the output at any point can be established by the ratio of two resistors.

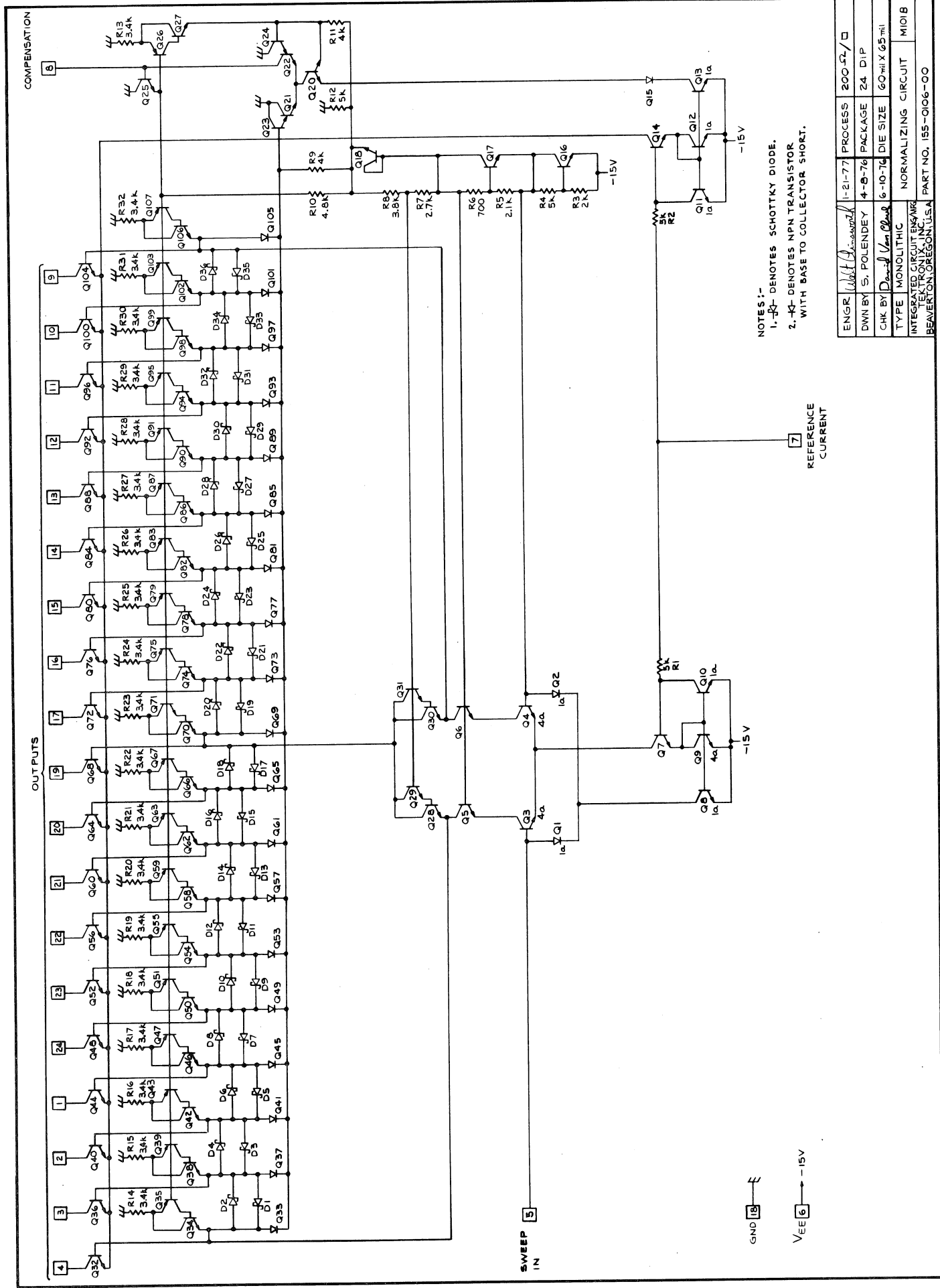
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} 0V, V_{EE} -15V

PACKAGE 24 DIP

DESIGNER John Pace

INSTRUMENT USAGE J20



NOTES:-
 1. ∇ DENOTES SCHOTTKY DIODE.
 2. ∇ DENOTES NPN TRANSISTOR WITH BASE TO COLLECTOR SHORT.

7 REFERENCE CURRENT

GND 8
 VEE 6 → -15V

ENGR	W. J. ...	1-21-77	PROCESS	200 52 / □
DWN BY	S. POLENDEY	4-8-76	PACKAGE	24 DIP
CHK BY	D. ...	6-10-76	DIE SIZE	60 mil X 65 mil
TYPE	MONOLITHIC		NORMALIZING CIRCUIT	MI01B
INTEGRATED CIRCUIT ENGINEERING TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A. PART NO. 155-0106-00				

VERTICAL OUTPUT AMPLIFIER

203-0102-90 M102

DESCRIPTION

This circuit is similiar to the M89 (203-0089-90) except for a 98 Ω Nichrome resistor added between the Input Emitters as an integral part of the chip.

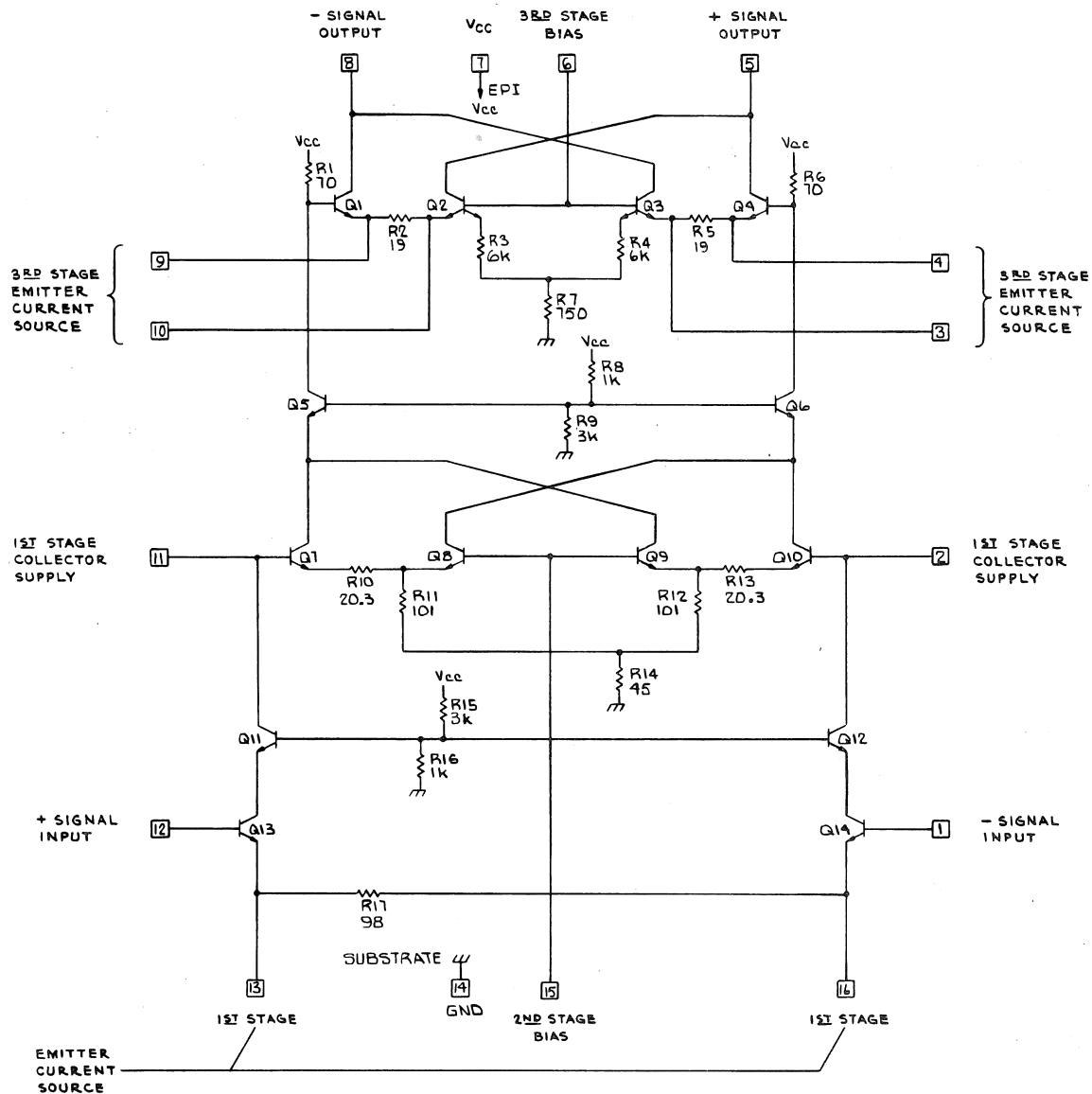
PROCESS SHF II With Nichrome

POWER SUPPLY. 15 Volts

PACKAGE T0-8 With Stud

DESIGNER Einar Traa

INSTRUMENT USAGE 475



ENGR	<i>Earl T. ...</i>	10-28-74	PROCESS	5H II
DWN BY	<i>Ron Cherie</i>	8-8-74	PACKAGE	WAFER FORM
CHK BY	<i>D. K. ...</i>	11-1-74	DIE SIZE	50mil x 55mil
TYPE	MONOLITHIC	VERTICAL OUTPUT AMPLIFIER		M102A
INTEGRATED CIRCUIT ENG/MFG			PART NO. 203-0102-90	
TEKTRONIX, INC.				
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

A variation of the "Quad Op-Amp" (M053) with internal "pin-out" such that the two of the Op-Amps that have separate outputs share a common reference current source determining their current operating level while the other two Op-Amps share a common output but are connected so as to have separate reference current sources so they can be operated on an either/or basis. This unit was originally designed as Dual Input Amplifier and Channel Switch.

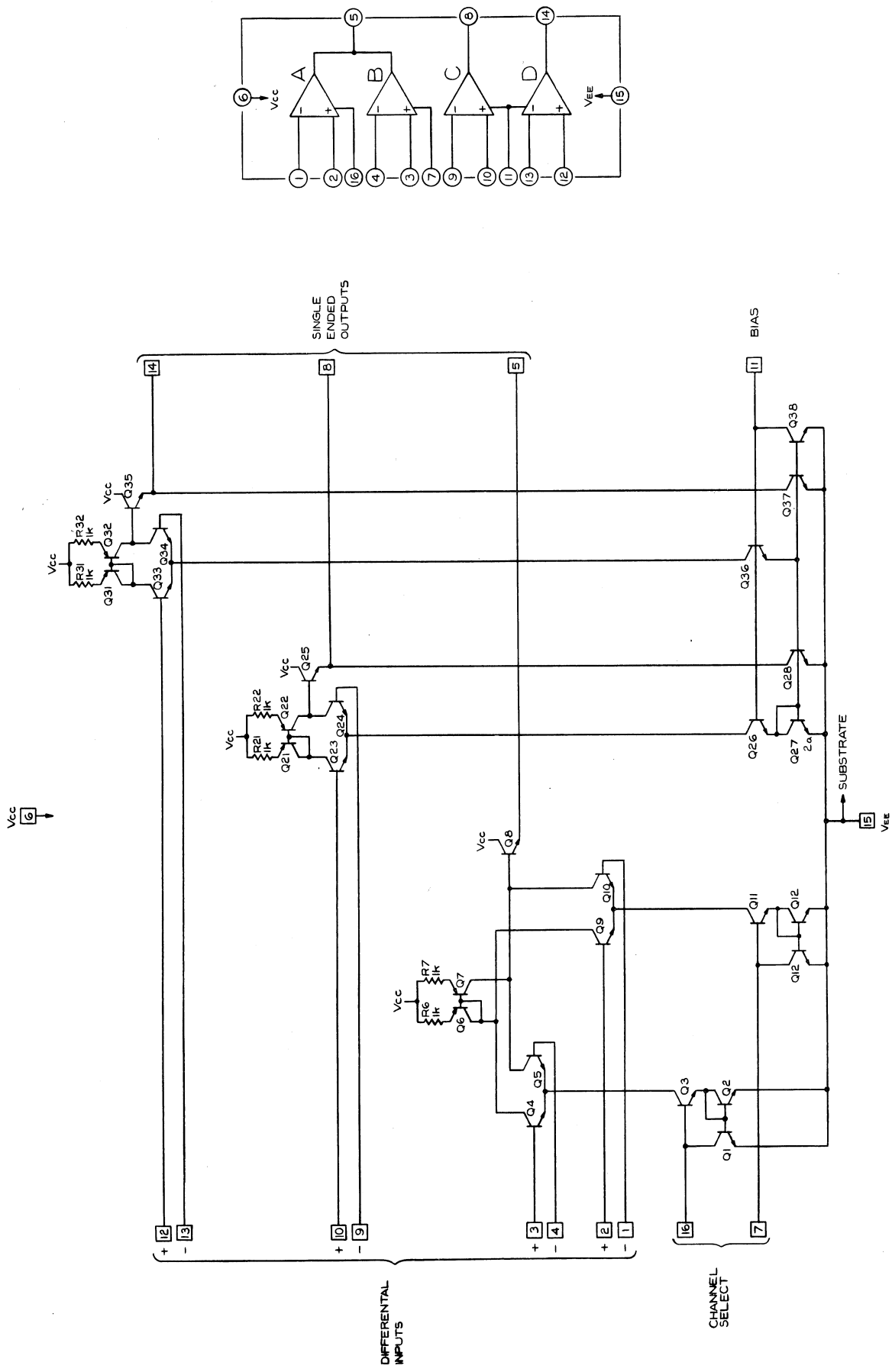
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5V to -15V
 V_{EE} -5V to -15V

PACKAGE 16 Minipac

DESIGNER Dave Allen

INSTRUMENT USAGE 212
 214



ENGR	M. J. <i>McIntyre</i>	2-5-76	PROCESS	200A/p
DWN BY	J. Langley	1-26-76	PACKAGE	16 MINIPAC
CHK BY	<i>David Bergel</i>	2-20-76	DIE SIZE	40mil X 40mil
TYPE	MONOLITHIC		QUAD OPERATIONAL	MI05
	INTEGRATED CIRCUIT ENG/MFR		AMPLIFIER	
	TEKTRONIX, INC.			
	BEAVERTON, OREGON, U.S.A.			
			PART NO.	155-0083-00

DESCRIPTION

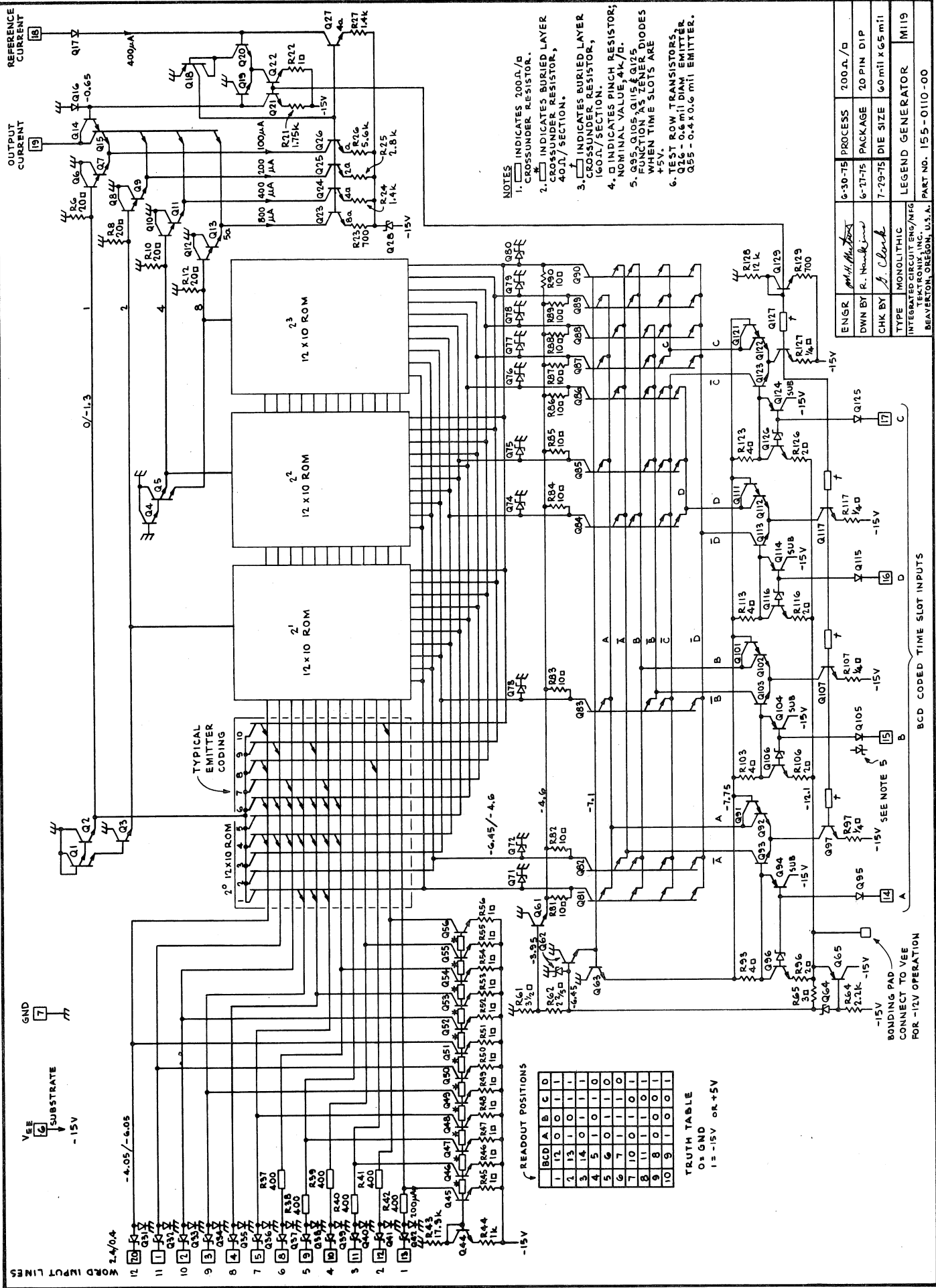
This integrated circuit is identical to the M092 with a different metal mask to change the time slot coding.

ROM PROGRAMMING - TIME SLOT

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

NOTE: The number in the square is in terms of tenths of mA of output current. Crossed out area is not used.

- PROCESS 200 Ω/Sq
- POWER SUPPLY. $V_{CC} \emptyset V, V_{EE} -15V$
- PACKAGE 20 DIP
- DESIGNERS. Roger McCoy/Mike Metcalf
- INSTRUMENT USAGE 7L5 (R1)



- NOTES
1. □ INDICATES 200.0/0 CROSSUNDER RESISTOR.
 2. □ INDICATES BURIED LAYER CROSSUNDER RESISTOR, 400Ω SECTION.
 3. □ INDICATES BURIED LAYER CROSSUNDER RESISTOR, 160Ω SECTION.
 4. □ INDICATES PINCH RESISTOR; NOMINAL VALUE .4k/0.
 5. Q95, Q105, Q115 & Q125 FUNCTION AS ZENER DIODES WHEN TIME SLOTS ARE +5V.
 6. TEST ROW TRANSISTORS Q55 - Q58 MUST HAVE EMITTERS.

READOUT POSITIONS

BCD	A	B	C	D
1	1	2	0	0
2	1	3	0	1
3	1	4	0	1
4	1	5	1	0
5	1	6	1	0
6	1	7	1	1
7	1	8	1	1
8	1	9	1	0
9	1	0	1	0
10	1	0	0	1

TRUTH TABLE
 0 = GND
 1 = -15V OR +5V

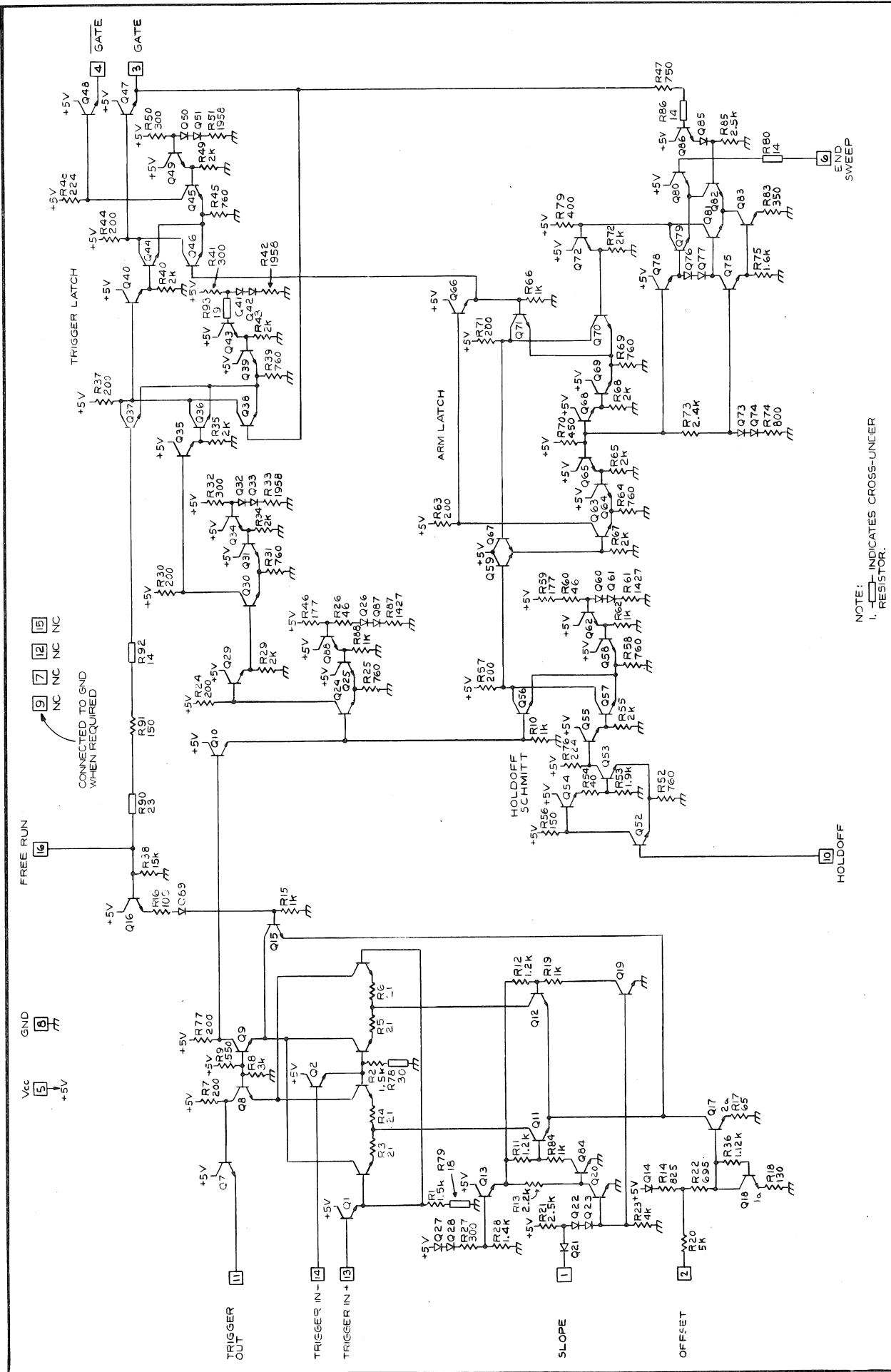
ENGR. *M.H. ...* PROCESS 200.0/0
 DWN BY *R. ...* PACKAGE 20 PIN DIP
 CHK BY *L. ...* DIE SIZE 60 mil x 65 mil
 TYPE MONOLITHIC LEGEND GENERATOR MI19
 INTEGRATED CIRCUIT ENG/NEG
 TEKTRONIX, INC.
 BEAVERTON, OREGON, U.S.A. PART NO. 155-0110-00

BCD CODED TIME SLOT INPUTS
 BONDING PAD CONNECT TO VEE FOR -15V OPERATION

DESCRIPTION

This circuit is intended for use in instruments in the medium to high frequency range. It employs SHF II processing, ECL circuitry, requires one power supply and dissipates about 500 mW. The circuit should be driven differentially. Hysteresis at low frequencies is 40 mV and increases by a factor of 3 at 400 MHz. DC trigger input levels are at about 3.8 volts. A slope select control is included. Input signal conditioning (ie. preamplification and source selection) is done external to the Integrated Circuit. Another Integrated Circuit, the M121 (155-0126-00), has been designed to accomplish this. Other inputs are hold-off and end-sweep (tied together in typical application). A free run input is also provided. Gate out is at an ECL level.

PROCESS	SHF II	
POWER SUPPLY.	V_{CC} +5 Volts	
PACKAGE	16 DIP (Kovar-Copper-Kovar)	
DESIGNER	Gary Vance	
INSTRUMENT USAGE	5B31	7B81P
	5B40	7B80
	5B44	7B85
	SC502	7B50A
	5S14N	7S14



ENGR	David A. ...	9-26-75	PROCESS	SH II
DWNB	J. Langley	1-17-75	PACKAGE	16 PIN DIP
CHK BY	C. WESTON	7-30-76	DIE SIZE	65 mil x 65 mil
TYPE	MONOLITHIC	TRIGGER		MI20B
INTEGRATED CIRCUIT ENG/MFS BEAVERTON, OREGON, U.S.A.				
PART NO. 155-0109-01				

NOTE:
I. RESISTOR.
INDICATES CROSS-UNCER

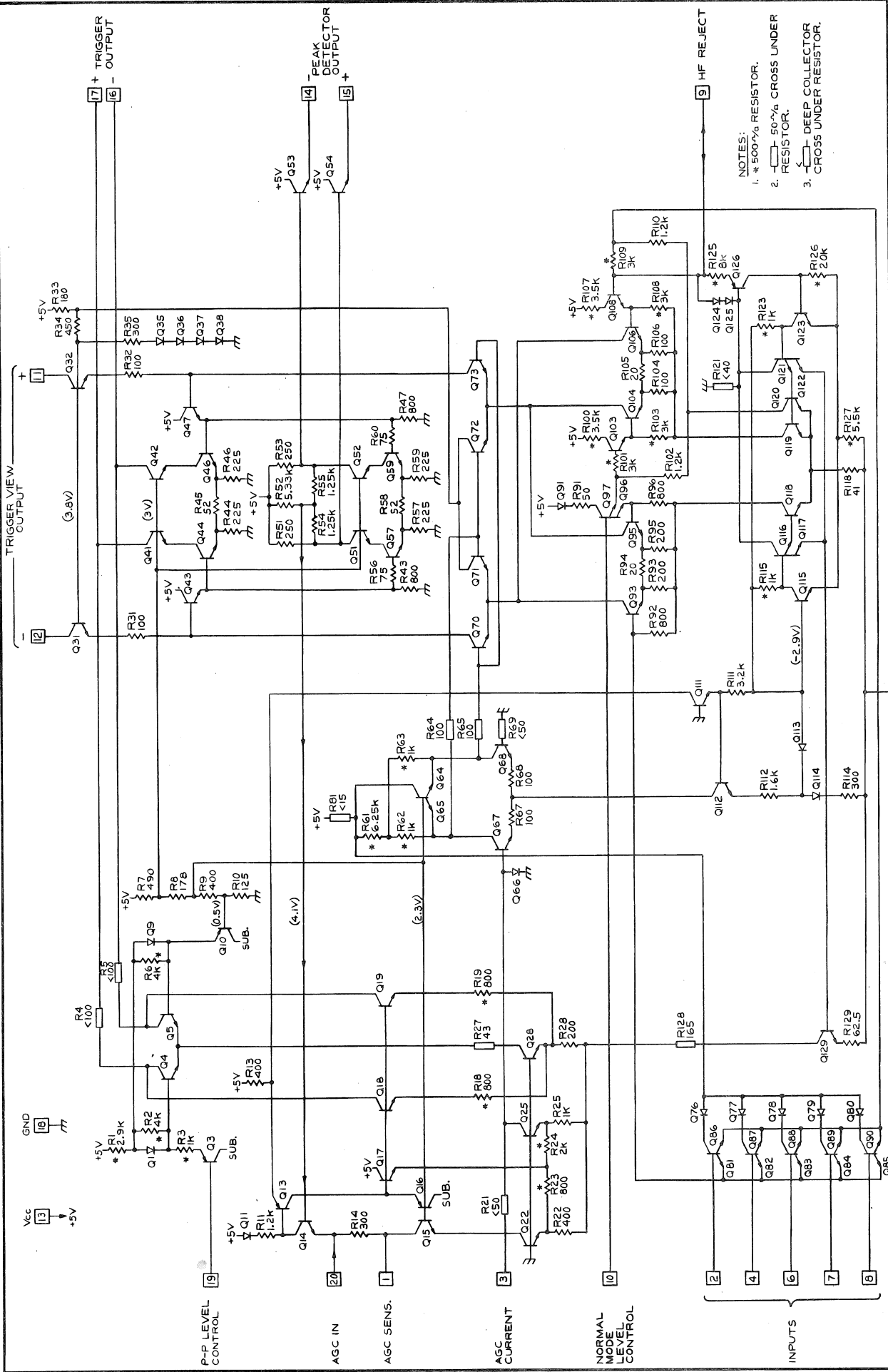
TRIGGER AMPLIFIER/SOURCE SELECT/
PEAK-TO-PEAK AUTO

155-0126-00 M121

DESCRIPTION

The M121 is designed to be used with the M120 (155-0109-00) in medium-to-high frequency instruments. It employs SHF II processing and requires two power supplies; +5 volts and a current source (25 mA out of the integrated circuit source compliance must range at least from -4.5 volts to -5.5 volts). Power dissipation is 425 mW. Provision is made for trigger source switching (5 inputs, high frequency rejection, trigger view, and peak-to-peak auto operation with the addition of external components. A level control is also provided. Input signal range is centered around ground, with input sensitivity of 4 - 5 mV when used with the M120. Maximum amplifier gain is 9, and bandwidth is 600 MHz. A selected version of the M121 having all of the above features except for the peak-to-peak auto mode is available.

PROCESS	SHF II
POWER SUPPLY.	$V_{CC} +5V, I_{EE} -25 \text{ mA}$
PACKAGE	20 Pin DIP (Kovar-Copper-Kovar)
DESIGNER	Art Metz
INSTRUMENT USAGE	7B81P 7B85 7B80 7B50A



- NOTES:
1. * 500-% RESISTOR.
 2. □ 50-% CROSS UNDER RESISTOR.
 3. ▽ DEEP COLLECTOR CROSS UNDER RESISTOR.

ENGR	<i>J. L. ...</i>	5-20-75	PROCESS	SH II
DWN BY	J. L. ...	2-5-75	PACKAGE	20 PIN DIP
CHK BY	<i>A. ...</i>	7-22-75	DIE SIZE	65mil X 65mil
TYPE	MONOLITHIC		TRIGGER AMPLIFIER	MI21C
INTEGRATED CIRCUIT ENG/MFG ELECTRONICS INC. BEAVERTON, OREGON, U.S.A.				

5 SUBSTRATE CURRENT SOURCE

DESCRIPTION

This circuit is intended for use in high frequency instruments. It employs SHF III processing, ECL/E^L circuitry, dissipates about 600 mW, and is packaged in a 1.25 cm x 1.25 cm hybrid substrate (155-0150-00, H473). The circuit should be driven differentially. Input T-coiling is accomplished by a combination of the M122 integrated circuit and the hybrid (the 50 Ω load resistors are not included in the hybrid). Hysteresis at low frequencies is 25 mV and increases by a factor of 2 - 3 at 1.2 GHz. DC trigger input levels are at 0 volts. A slope select control is included. Input signal conditioning (ie, preamplification and source selection) is done external to the integrated circuit. Another integrated circuit, the M136 (155-0160-00), has been designed to accomplish this. Other inputs are hold-off and free-run (if that mode is to be used). Gate out is at an ECL level.

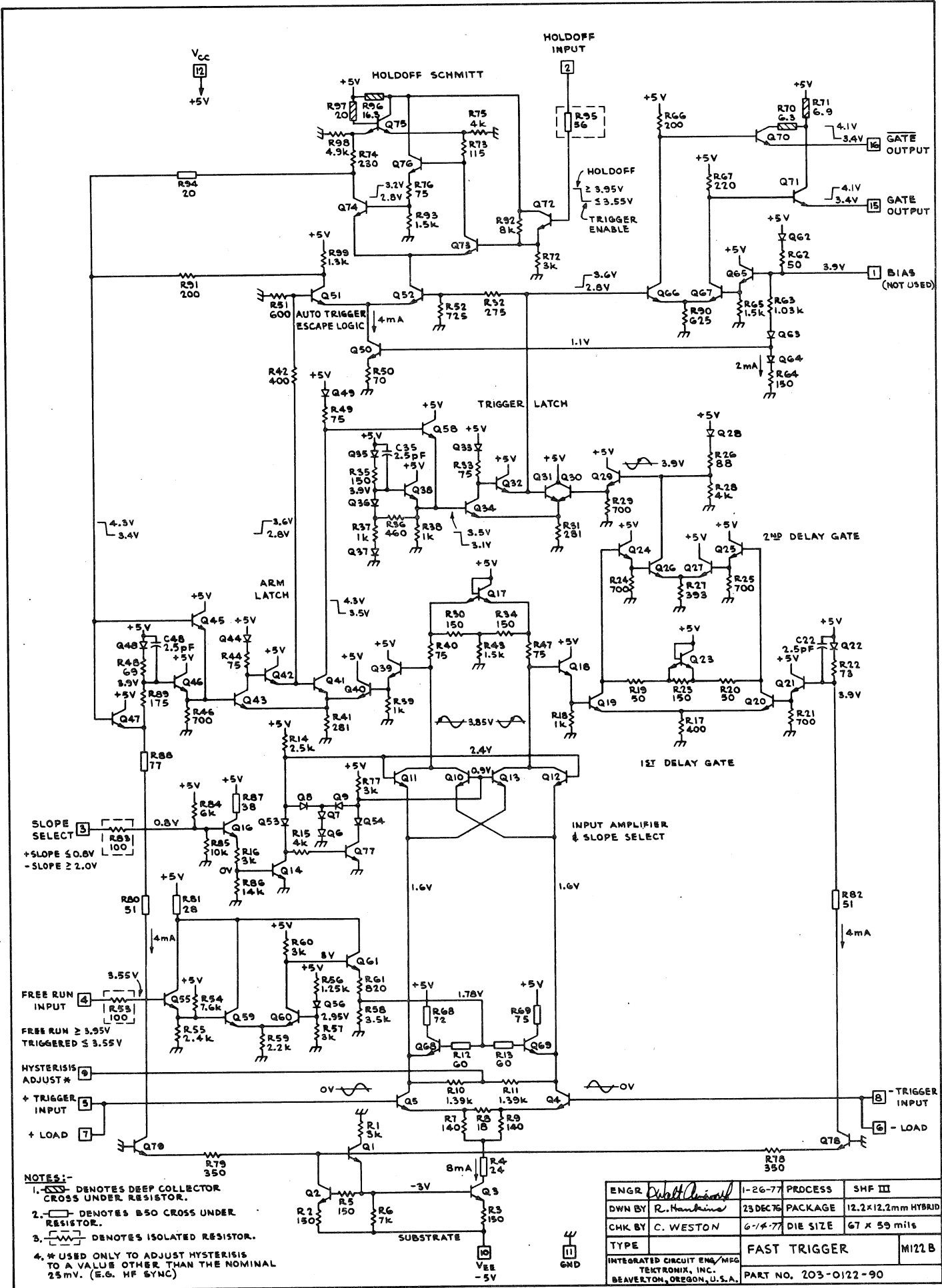
PROCESS SHF III

POWER SUPPLY. V_{CC} +5V, V_{EE} -5V

PACKAGE 1.25 cm x 1.25 cm Hybrid

DESIGNERS. Art Metz/Walt Ainsworth

INSTRUMENT USAGE 7B10
 7B15
 7B92A
 7904
 7104

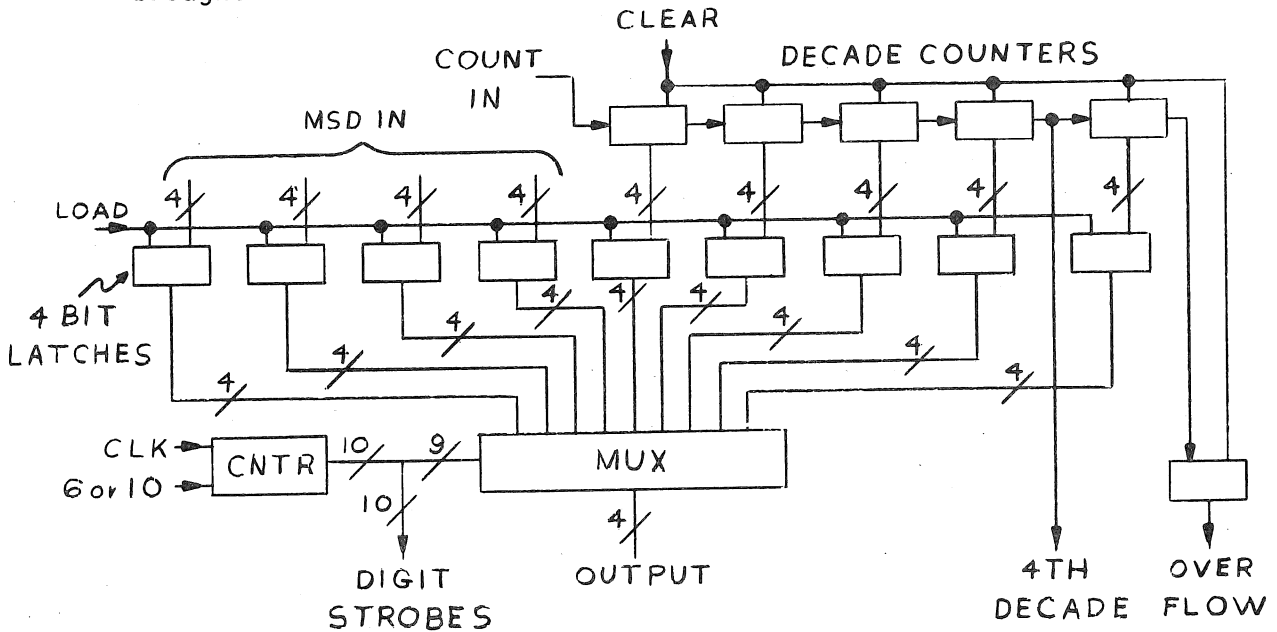


NOTES:-
 1. DENOTES DEEP COLLECTOR CROSS UNDER RESISTOR.
 2. DENOTES B-50 CROSS UNDER RESISTOR.
 3. DENOTES ISOLATED RESISTOR.
 4. * USED ONLY TO ADJUST HYSTERISIS TO A VALUE OTHER THAN THE NOMINAL 25mV. (E.G. HF SYNC)

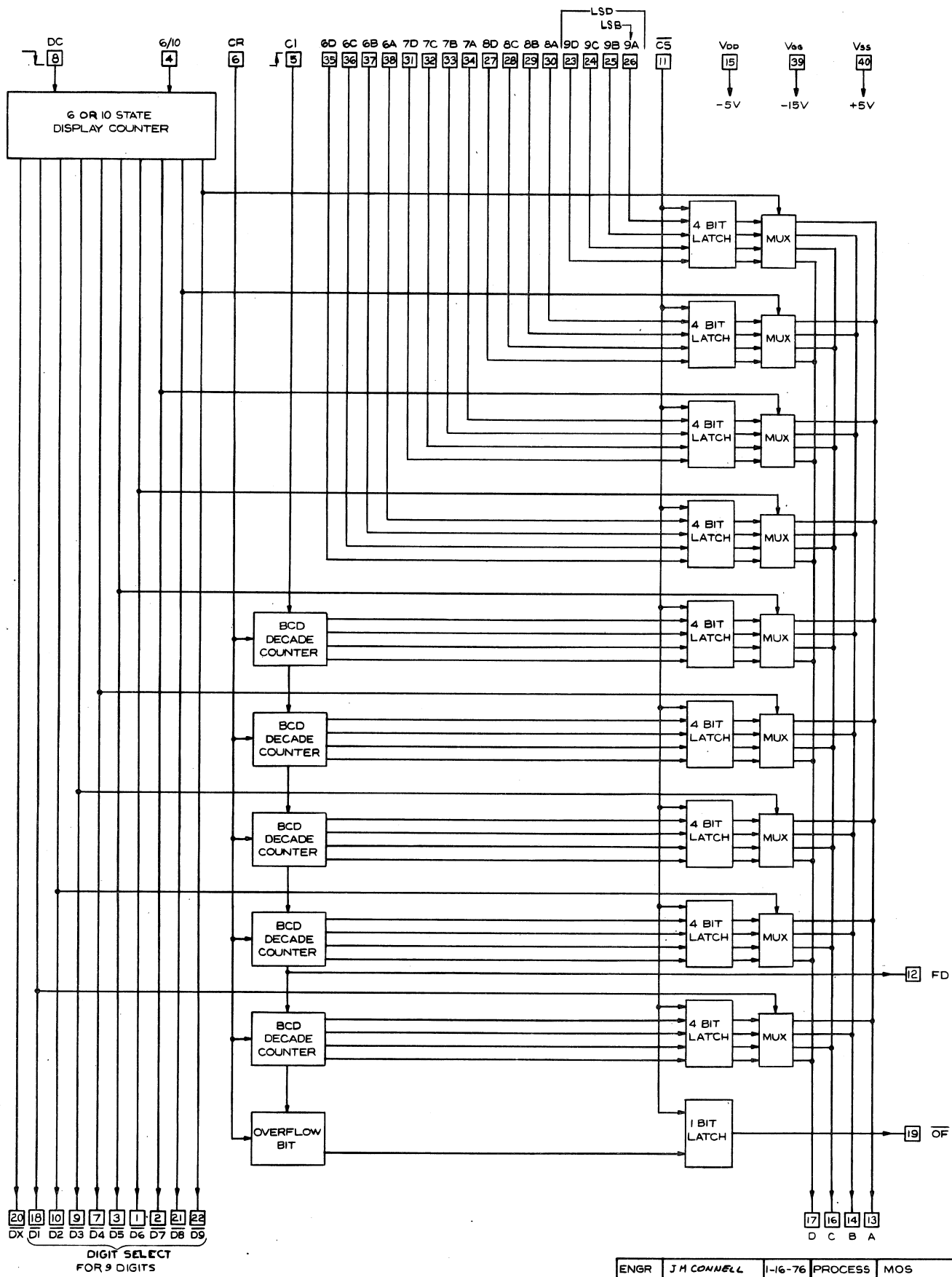
ENGR	<i>D. H. ...</i>	1-26-77	PROCESS	SHF III
DWN BY	R. Hankins	23 DEC 76	PACKAGE	12.2x12.2mm HYBRID
CHK BY	C. WESTON	6-7-77	DIE SIZE	67 x 59 mils
TYPE			FAST TRIGGER	M122 B
INTEGRATED CIRCUIT ENA/MPG			PART NO. 203-0122-90	
TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

The M123 is a five digit BCD counter with the outputs buffered and multiplexed. The maximum input count frequency is 5 MHz and an overflow latch is provided to detect over range counts. The chip also contains latches for four higher order digits which can be loaded from external counter stages. All nine digits are multiplex out serially. Digit strobes are provided in order to easily interface to LED readouts. The output multiplexer can be set to strobe out only the five least significant digits. An extra strobe is provided as a time slot for points or units. The output of the fourth decade is also brought out.



PROCESS	MOS
POWER SUPPLY.	+5V, -5V, -15V
PACKAGE	40 DIP
DESIGNER	Dave Allstot
INSTRUMENT USAGE	DC 508



DIGIT SELECT FOR 9 DIGITS

ENGR	J. M. CONNELL	1-16-76	PROCESS	MOS
DWN BY	J. Langley	1-9-76	PACKAGE	40 PIN DIP
CHK BY	<i>(Signature)</i>	2-25-76	DIE SIZE	125MIL X 130MIL
TYPE	MONOLITHIC	5 DIGIT BCD COUNTER BLOCK DIAGRAM		MI23A
INTEGRATED CIRCUIT ENG./MFG TEKTRONIX, INC BEAVERTON, OREGON, U.S.A.			PART NO. 155-0119-00	

SYNC STRIPPER

155-0144-00 M124

DESCRIPTION

This circuit provides a means of precisely determining the time of occurrence of the 50% points of the horizontal sync pulses accompanying a wide variety of different composite video systems. Several auxilliary outputs are available to aid in system control.

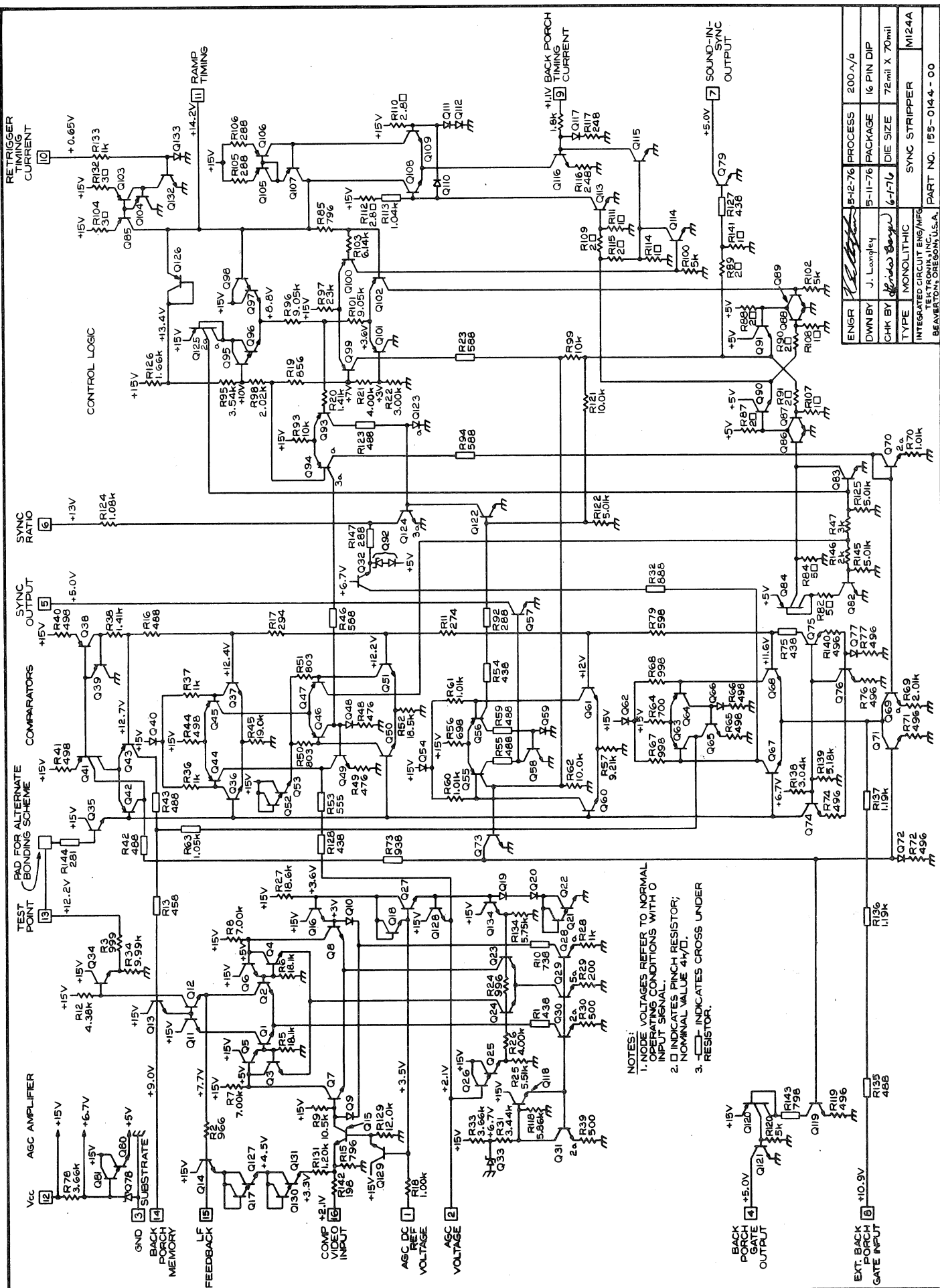
PROCESS 200 Ω /Sq

POWER SUPPLY. +15V

PACKAGE 16 DIP

DESIGNERS. Steve Roth
Ken Schlottzhauer

INSTRUMENT USAGE 1410
1470



NOTES:
 1. NODE VOLTAGES REFER TO NORMAL OPERATING CONDITIONS WITH O INPUT SIGNAL.
 2. D INDICATES PINCH RESISTOR; NOMINAL VALUE 4H/D.
 3. - INDICATES CROSS UNDER RESISTOR.

ENGR	J. Lamley	PROCESS	5-12-76	200 y/d
DWN BY	J. Lamley	PACKAGE	5-11-76	16 PIN DIP
CHK BY	J. Lamley	DIE SIZE	6-1-76	72mil X 70mil
TYPE	MONOLITHIC	SYNC STRIPPER		M124A
INTEGRATED CIRCUIT ENG/MFG. TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 195-0144-00				

M124A SYNC STRIP CIRCUIT

INTRODUCTION

TV Waveforms

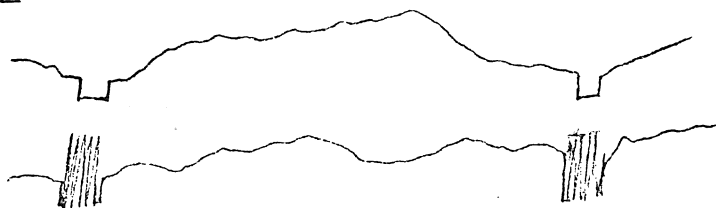
A detail of a typical line of a composite video waveform is shown on the block diagram. The complete signal, containing one frame of the televised picture, is made up of 525 lines interlaced into two fields. The horizontal sync pulses (H syncs) and a detail of the vertical interval are shown on the next page. Note that during the vertical interval, the leading edges of sync appear at a 2H rate (\approx every 32μ) for the equivalent of 9 lines. This description applies strictly to the NTSC system; however, the principles of the other common systems are similar.

Three variations of the comp video signal are usually poisonous to sync extracting systems:

A. Sound-in-syncs

In this system the audio content associated with each line is digitally sampled and the resulting word is encoded during the sync pulse! Thus instead of a sync pulse like this:

one gets:



Only a leading and trailing edge of sync pulse of about 140 ns each is assured; the digital bits can take any value between sync tip and white.

B. Helical Scan Video Tape Recorders

For a period of ≈ 20 lines the comp video output simply collapses to the blanking level.

$$\frac{10}{500} = \frac{1}{50} \text{ of } 10 \text{ KHz} = 200 \text{ Hz}$$

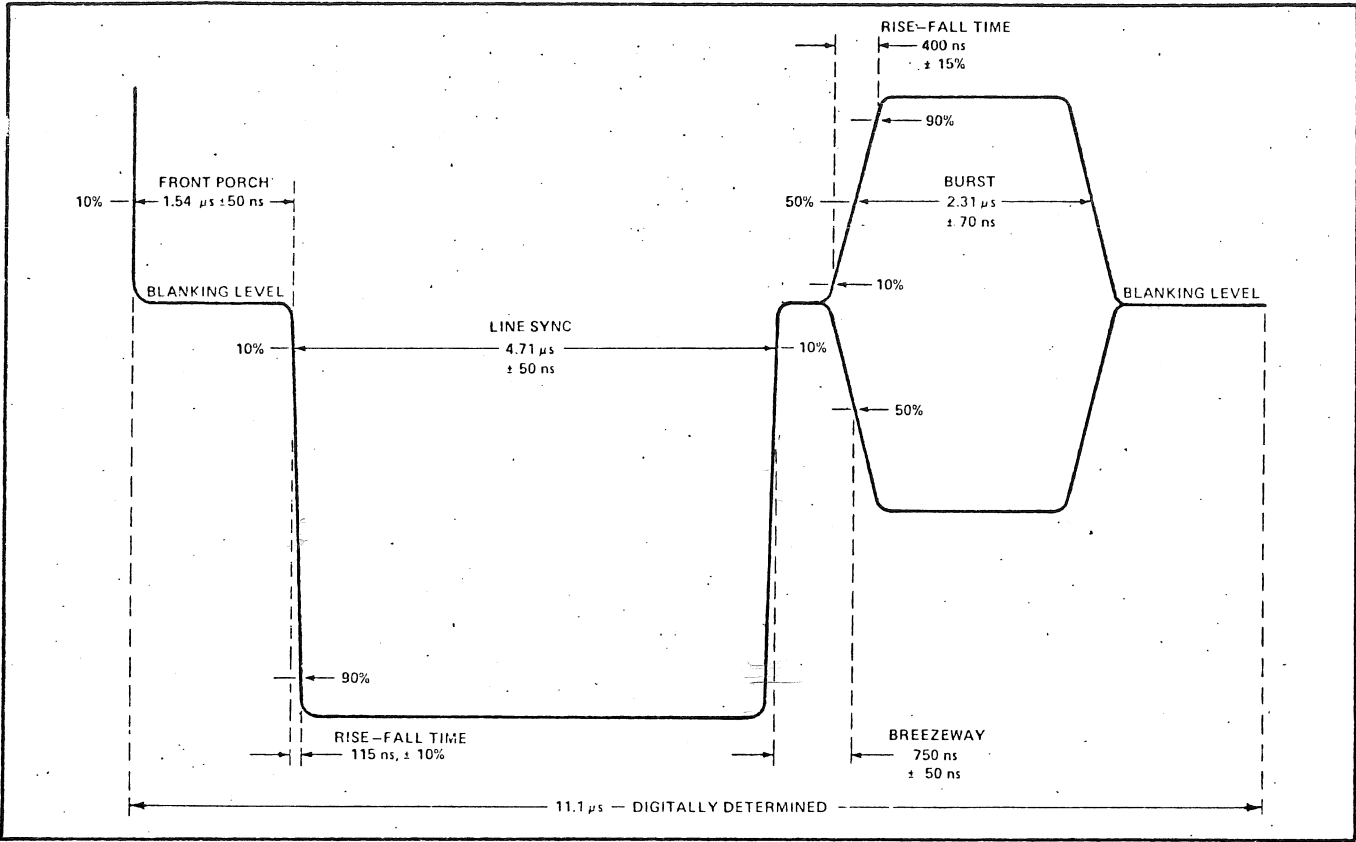


Fig. 1-2. Comp Video horizontal blanking details.

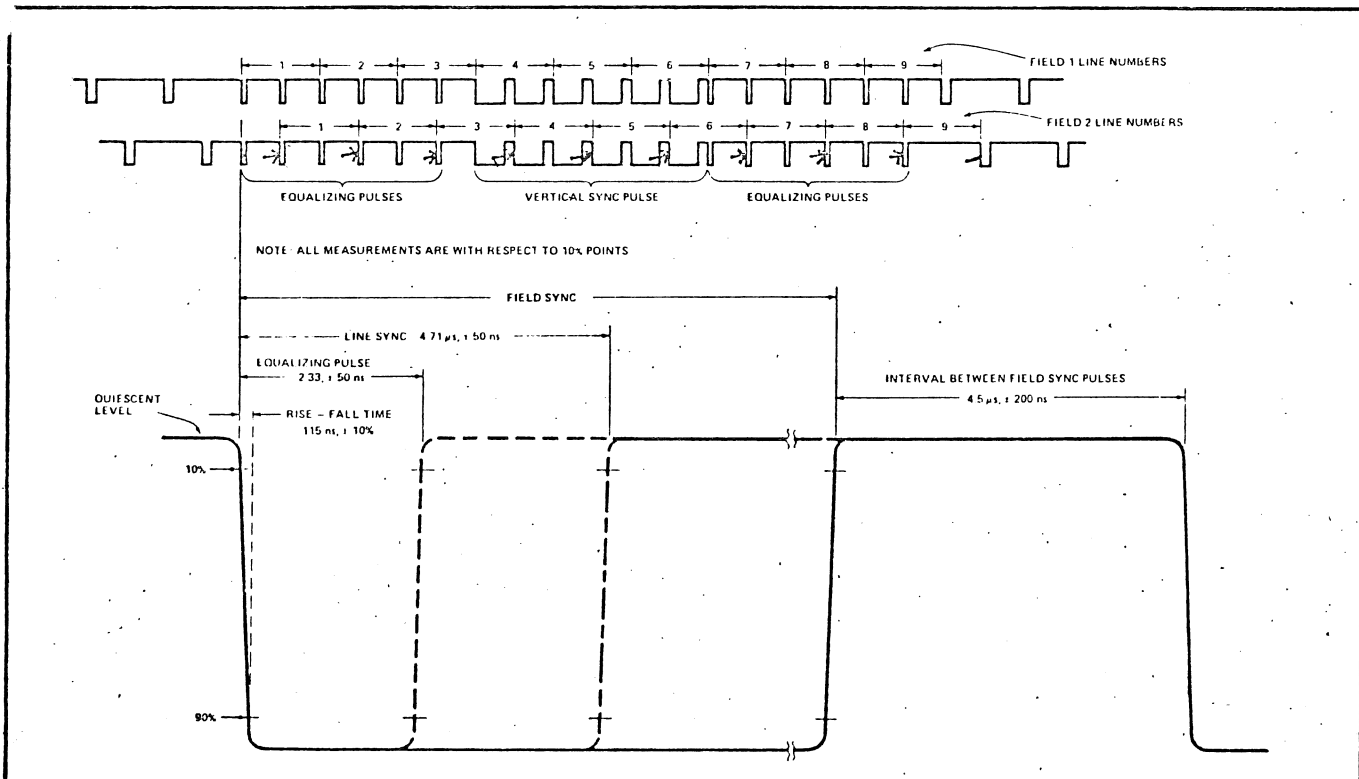


Fig. 1-3. Comp Sync blanking details.

C. Video switchers

Such systems can switch between mismatched sources possessing blanking levels which differ by as much as 1 1/2 sync pulse heights.

Role of the Sync Strip Circuit

This circuit must generate an output pulse whose leading edge faithfully reproduces the timing of the 50% point on the leading edge of the sync pulses contained in the input comp video waveform. In addition to the variations of the input signal described above, input signal degradations include noise (white and impulse), hum, and varying signal amplitude.

Theory of Operation (see block diagram)

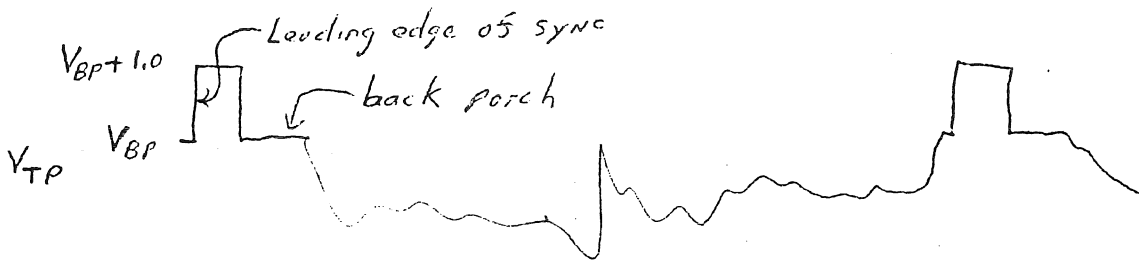
The composite video waveform is AC coupled as an input current into the AGC amp. The inverted output of this amp is then presented to a digital system which forces the following conditions at the test point:

- The back porch is DC restored to V_{BP} volts by adjustment of the DC input of the AGC amp.
- The sync tip is set to $(V_{BP}+1.0)$ volts by adjustment of the gain of the AGC amp.
- The sync output is picked off at the $(V_{BP}+0.5)$ volt level; that is, at the middle of the sync pulse.

How the digital system achieves these ends will be the topic of the next section. Normal operation will be considered first, where it is assumed that a standard signal appears at the input and the circuit has reached equilibrium. Non-equilibrium and abnormal inputs will be considered later.

Normal Equilibrium Operation

By assumption, an inverted comp video voltage exists at the test point with the following features:



As the leading edge of sync passes the $(V_{BP} + .75)$ volt level, the Pulse generator is triggered; further, assuming the output of the Timing Cycle Generator, V_{TC} , exceeds V_D , then the retrigger enable detector will provide a trigger enable pulse to the Pulse generator; thus a set pulse is delivered to the flip-flop, changing its state. This state change initiates a timing cycle rundown from V_A to V_B at a rate determined by I_1 . When V_{TC} falls below V_D , the output of the Pulse generator is inhibited. V_B is reached after $\sim 5\mu s$, tripping the Invert Ramp Detector which resets the flip-flop. The flip-flop output initiates the run up from V_B to V_C at a rate determined by I_1 .

The combination of the flip-flop output with the mid-cycle detector output yields a gate pulse occurring during the back porch and $\sim 2.5 \mu s$ wide. This signal gates the Back Porch detector, which forces the DC operating point of the AGC amp to be such that $v_{TP} = V_{BP}$ during the back porch. The middle of sync detector inhibits the taking of incorrect samples during the vertical sync pulses.

When the mid-cycle detector observes that $v_{TC} \geq V_C$, it switches the charging rate to I_2 . When $v_{TC} = V_D$ some 50 ns later, the Retrieger Enable Detector enables the Pulse generator for the next trigger.

The Sync Tip Detector is self-enabled at $(V_{BP} + .75)$ volts. It then forces the gain of the AGC amp to be such that $v_{TP} = V_{BP} + 1.0$ whenever $v_{TP} > V_{BP} + .75$. This feedback path is very slow due to C_{AGC} , and requires several fields to reach equilibrium; in contrast, the DC feedback achieves its ends in a few lines.

The Middle-of-sync Detector operates the output switch, and thus generates the output sync, correctly picked off at the 50% point of the input sync pulse.

Normal Input, Non Equilibrium Conditions

Consider initially the case of no input; under this condition, v_{TC} will run out to V_A , where it is caught. The Timing Cycle Overrun Detector will then open the gate of the Back Porch Detector, setting v_{TP} to V_{BP} ; it will also adjust V_{AGC} to increase the gain of the AGC amp. Equilibrium will be reached when the gain attains its maximum value. The output switch will indicate no sync as $v_{TP} < (V_{BP} + .5)$.

When an input signal is provided, the first positive excursion above $V_{BP} + .75$ of v_{TP} will start the timing cycle and initiate a sample by the Back Porch Detector, as previously described. If the first trigger is the correct one (a leading edge of sync) then it is clear that the system will settle in a simple manner to the normal equilibrium condition; however, if the first trigger occurred elsewhere (possibly at a step in the video portion of the line) the chain of events is more complex. Regardless of what test waveform is proposed, an auxiliary system exists to force convergence to the normal equilibrium. This auxiliary system is comprised of the Excess Sync Height Detector, which adjusts the DC input of the AGC amplifier to keep $v_{TP} < V_{BP} + 1.5$ and the Excess Ratio of Sync to Video Detector, which increases the gain if v_{TP} exceeds $(V_{BP} + .5)$ on an averaged basis for more of the time than the known proportion of comp video.

The log-linear relationship between V_{AGC} and AGC amp gain was arranged to ensure a similar response time to equilibrium conditions for equal db changes in V_{IN} , regardless of the previous value of V_{IN} .

THE AGC AMPLIFIER

Figure 1 shows a slightly simplified form of the AGC amp used in the M124A. Assume initially that V_{DC} is fixed such that $I_{IN} \approx I_A/2$. The amplifier is comprised of two cascaded gain cells, Q1 through Q4 and Q5 through Q8. Treating Q12 as a cascode for the upper gain cell, it is straightforward to show that

$$A_I = i_{OUT}/i_{IN} \approx \left(\frac{I_D}{I_A}\right) (I_B/I_C),$$

where the shunting of the R_B 's

is ignored and $\alpha = 1$ is assumed. The diff amp, Q9 - Q10, gives a transfer function of

$$I_C/I_B = \text{EXP}(V_{AGC}/V_t)$$

Combining these two relationships and reformulating in decibel notation yields

$$A_{IdB} = 20 \log_{10} (I_D/I_A) - 8.69 (V_{AGC}/V_t).$$

At room temperature, the slope of the gain vs. V_{AGC} curve is $\sim 3\text{mV/dB}$. This log-linear relationship is desirable, as it ensures an equal settling time from similar dB input amplitude changes, regardless of the gain prevailing at the moment of the amplitude change.

Consider next the DC conditions within the amplifier. As previously mentioned, Q12 cascodes the output of the upper gain cell; in addition, for slow changes in V_{DC} , Q12 operates as an emitter follower, moving V_{LF} and thus I_{IN} ; finally, for fast changes in V_{DC} , Q12 acts as a common emitter amp where

$$V_{OUT}/V_{DC} \approx R_{OUT}/R_1$$

Note that A_I is independent of I_{IN} , and thus of V_{DC} , except during rapid

changes in V_{DC} . Q_{11} is provided to hold the V_{CB} of Q_5 low, and thus minimize the thermal distortion in the upper gain cell. Finally consider the dc voltages V_{B1} and V_{B2} .

$$V_{B1} = V_{B2} \approx V_{CC} - R_B I_E / 2$$

Thus as V_{AGC} changes, the dc potentials within the circuit are unchanged. This independence of gain on V_{DC} and dc conditions on V_{AGC} simplifies the design of the control signals.

The main schematic indicates the addition of emitter followers Q_5 and Q_6 and their bleed resistors in order to increase the maximum gain of the upper cell. The darlington follower $Q_{25} - Q_{26}$ feeding the diff amp input is used to buffer the voltage across C_{AGC} and reduce the gain control sensitivity to 15 mv./db. $Q_{18} - Q_{19}$ provide a reference potential so that the majority of the dc component of the AGC voltage can be cancelled; thus a differential output can be taken between pins 2 and 3 which closely represents V_{AGC} .

The remaining circuitry is generally of a conventional nature, and follows from an implementation of the elements of the block diagram.

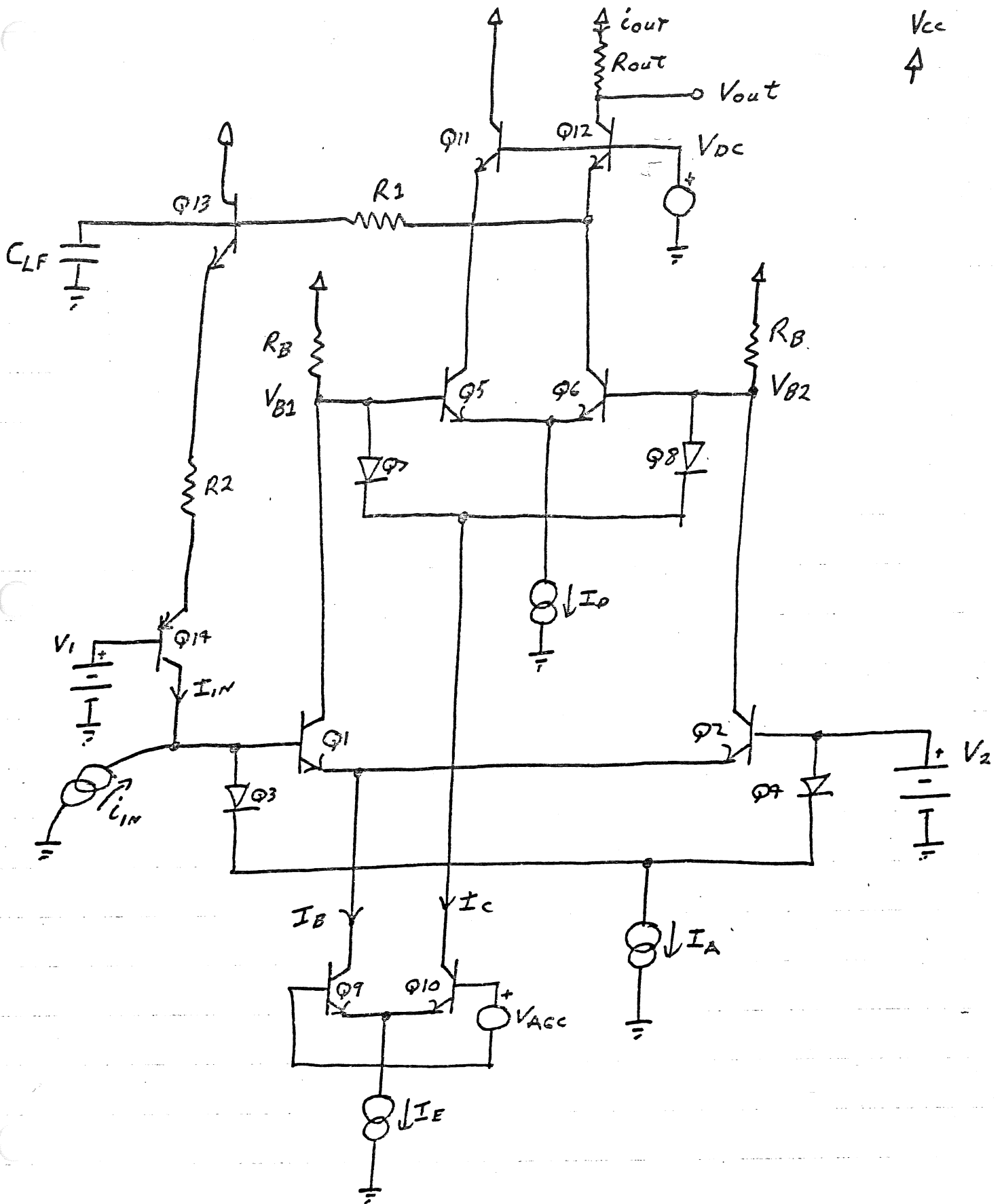
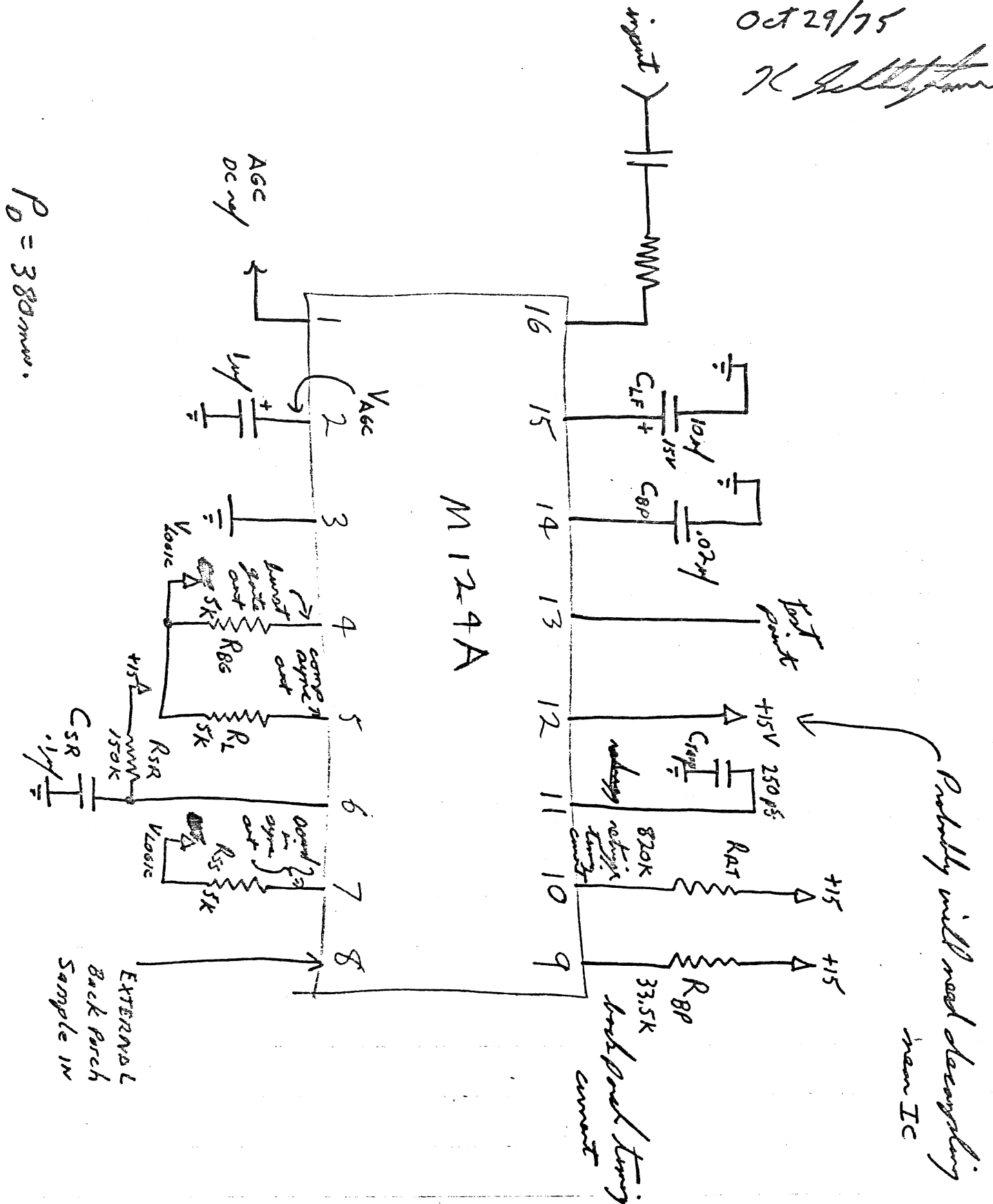


Fig. 1 Simplified Schematic of the AGC amplifier

PINOUT M124

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K. [Signature]

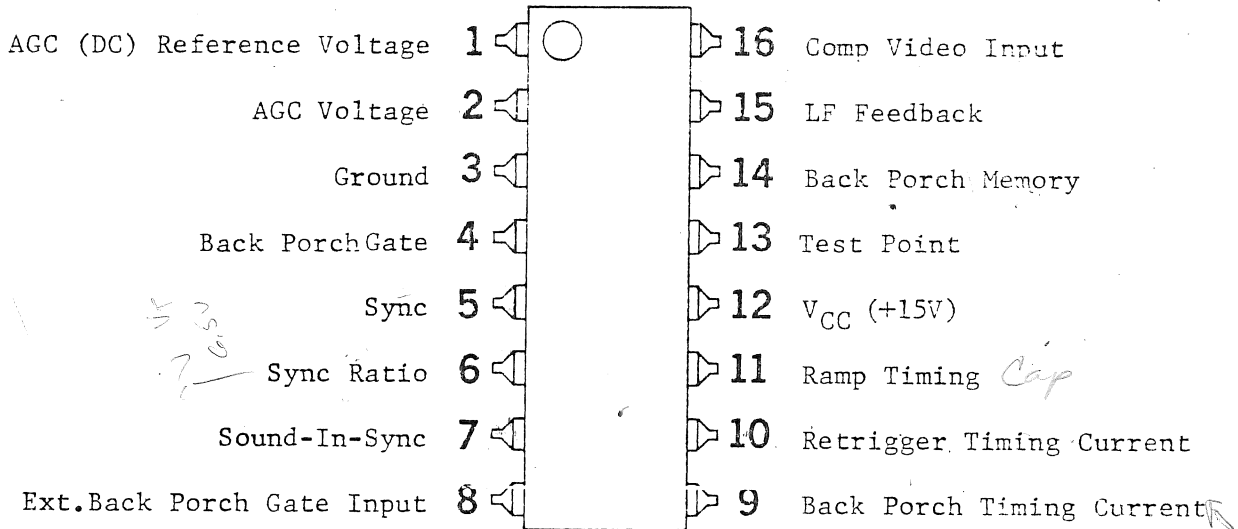


M124A
155-0144-00

Package Outline
Connection Diagram
16 Lead Dual In Line
Top View

THIS SPEC HAS NOT BEEN CHECKED
OR VERIFIED BY THE DESIGNER
FOR PRODUCTION

3.58 MHz done for 100 + 3.58 MHz
3.58 MHz NISC
4.93 MHz



70

Need: Performance Curve - done 10-12-72
Circuit Schematic - done
Application Note - Figure 1 - done
Figure 2 - done

SYNC STRIP CIRCUIT

60
12
120
60
720

TEKTRONIX, INC.
BEAVERTON, OREGON

SHT *A* OF

CODE IDENT NO
80009

SIZE
A

PART NUMBER
155-0144-00

REV

GENERAL DESCRIPTION

The P124A is a Monolithic Sync Strip circuit for use in a wide variety of T.V. related products.

FEATURES

Open Collector Outputs-"Comp Sync", "Sound-In-Sync", and "Back Porch Gate"

AGC is based upon input Sync amplitude. A "Test Point" is available with inverted Comp Video referenced to 0.8 volt Sync amplitude.

Wide Input Dynamic Range with leading Sync Edge Timing preserved.

Provides a Block Sync Output to be used with "Sound-In-Sync" Video Input.

Provides a "Back Porch Gate" suitable for Video Clamping Amplifiers.

Internal Timing, adjustable by External Components to accommodate different Line rates, creates a window for the acceptance of Sync Inputs (this minimizes sensitivity to Noise Bursts).

The Gain of the Input Amplifier (and thus the amplitude of the Input Sync) can be determined by the DC voltage between the "AGC Voltage" and "AGC Reference Voltage" Pins.

ABSOLUTE MAXIMUM RATINGS*

Input Current (Pin 16)	± 2 mA
V _{CC} (Pin 12)	+ 16 Volts
Back Porch Gate Input (Pin 4)	- 4 mA
Output Voltage (Pins 4,5,7)	+10 Volts
Maximum Operating Temperature (Results in a 125°C Junction Temp.)	80°C
Power Dissipation	400 mW

(operating)
THIS SPEC HAS NOT BEEN SIGNED
OR VERIFIED. IT IS NOT TO BE USED
FOR PRODUCTION.

*ABSOLUTE MAXIMUM RATINGS are those ratings beyond which the serviceability of the device may be impaired.

P124A (155-0144-00)

PRODUCT SPECIFICATION SUMMARY

THIS SPEC HAS NOT BEEN SIGNED
OR VERIFIED & IS NOT TESTED
FOR TOLERANCES

PARAMETER	SYMBOL	MIN	MAX	
Test Point Voltage (Pin 13)	V_{TP}	11.0	13.0	(NOTE 1) VOLTS
Sync Out Voltage (Pin 5)	V_{SY}	4.9	5.1	(NOTE 1) VOLTS
Back Porch Gate Out Voltage (Pin 4)	V_{BP}	4.9	5.1	(NOTE 1) VOLTS
Sound In Syncs Out Voltage (Pin 7)	V_{SS}	4.9	5.1	(NOTE 1) VOLTS
Ramp Timing Voltage (Pin 11)	V_{RP}	13.6	14.6	(NOTE 1) VOLTS
AGC Voltage (Pin 2)	V_{AGC}	1.8	2.6	(NOTE 1) VOLTS
AGC Reference Voltage (Pin 1)	V_{REF}	3.3	3.9	(NOTE 1) VOLTS
Sync Ratio Voltage (Pin 6)	V_{SR}	12.0	14.0	(NOTE 1) VOLTS
Back Porch Gate In Voltage (Pin 8)	BP(In)	9.5	11.5	(NOTE 1) VOLTS
Input Voltage (Pin 16)	V_{IN}	1.8	2.4	(NOTE 1) VOLTS
LF Feedback Voltage (Pin 15)	V_{LF}	7.0	9.0	(NOTE 1) VOLTS
Back Porch Memory Voltage (Pin 14)	V_{MEM}	8.0	10.0	(NOTE 1) VOLTS
Retrigger Input Voltage (Pin 10)	V_{RT}	0.6	0.8	(NOTE 1) VOLTS
Back Porch Timing Voltage (Pin 9)	V_{BPT}	0.8	1.4	(NOTE 1) VOLTS

TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 3 OF

CODE IDENT NO
80009

SIZE
A

PART NUMBER

155-0144-00

REV

PRODUCT SPECIFICATION SUMMARY

PARAMETER	SYMBOL	MIN	MAX	UNITS
Input to Output Delay (V_{gen} to Pin 5) (NOTE#2) (Figure #2)	T_{IO}	120 (Typ)		nSEC
Output Logic Zero Levels (Pins 4,5,7) (Figure #2)	V_{L0}	300 (Typ)	750	mVOLTS
Trailing Edge of Test Point Pulse to Leading Edge of Back Porch Gate Output Pulse (Pin 13 to Pin 4) (Figure #2)	T_X	100	250	nSEC

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Product Spec Summary (Note Section)

All product specifications refer to Test Circuit depicted in Figure #1., with 525/60 or 625/50 Composite Video TV Waveform as Input.(V_{gen}).

NOTE 1. V_{gen} = 0 Volts

2. V_{gen} = 286 mVOLTS of Horizontal Sync, Timing measurements between 50% points.

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TEKTRONIX, INC.
BEAVERTON, OREGON

SHT OF

CODE IDENT NO

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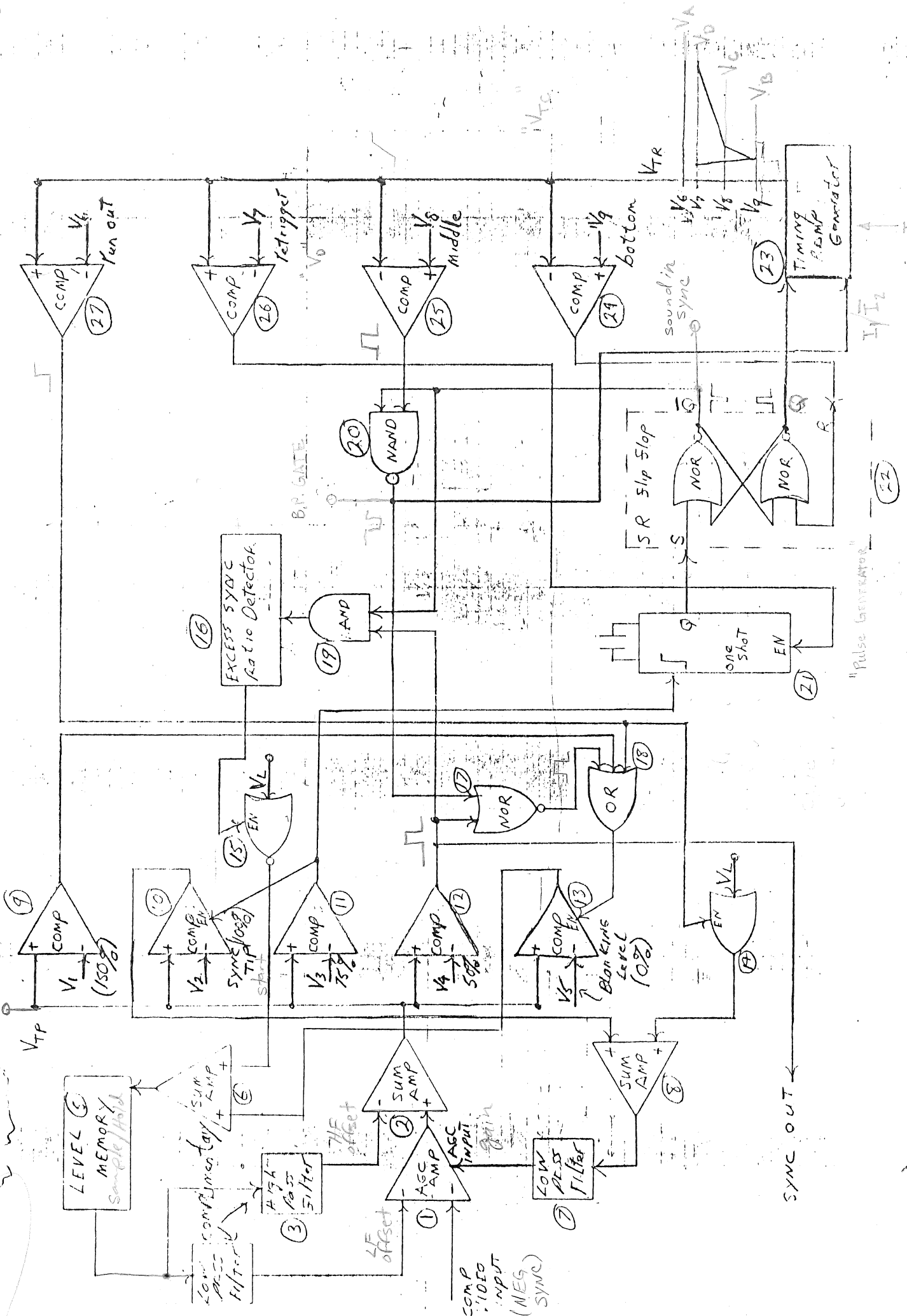
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PART NUMBER

155-0144-00

REV

SYNC STRIP CIRCUIT



APPLICATION NOTE

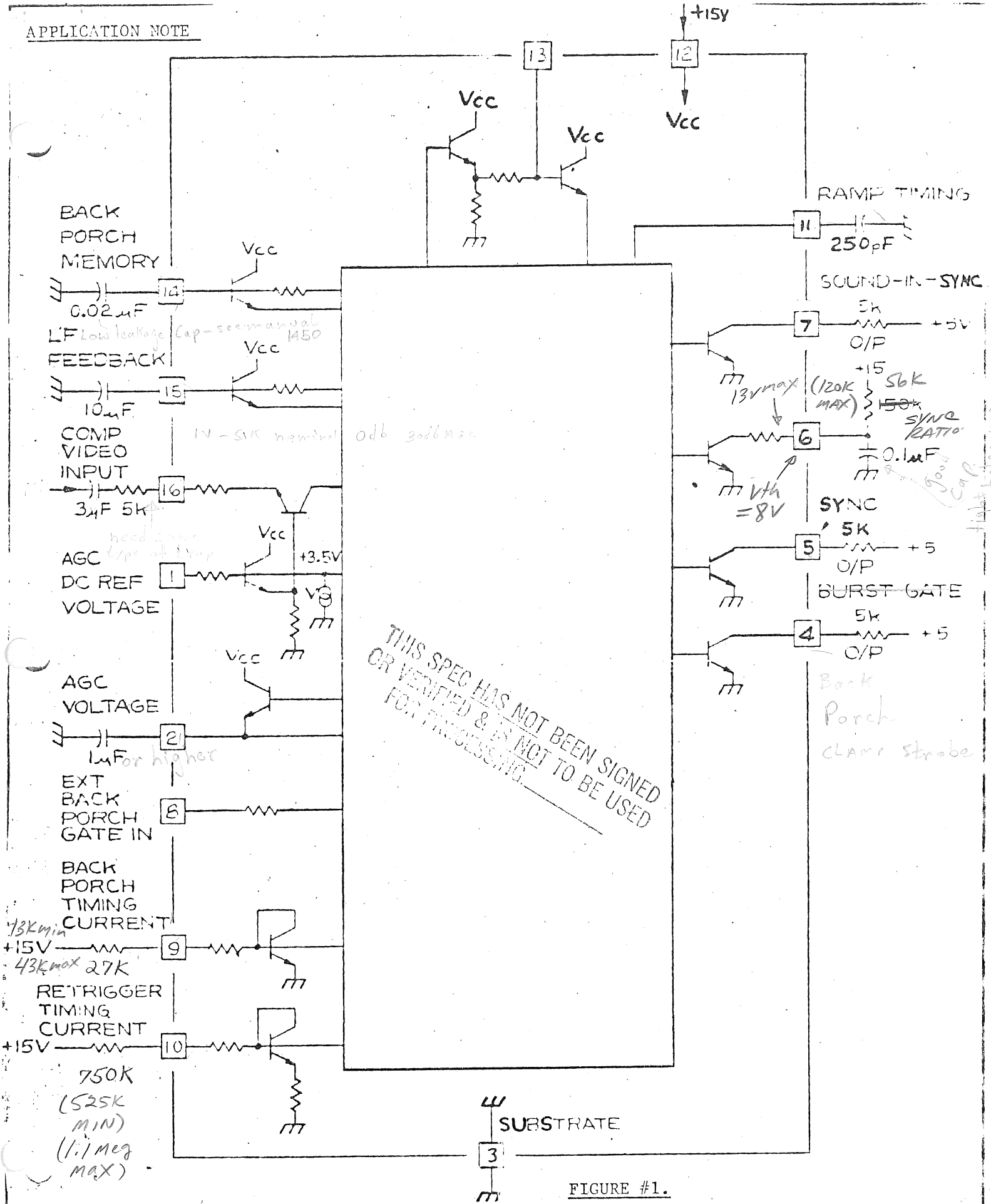


FIGURE #1.

INPUT

TEST POINT

SYNC
SOUND IN
SYNC

OV

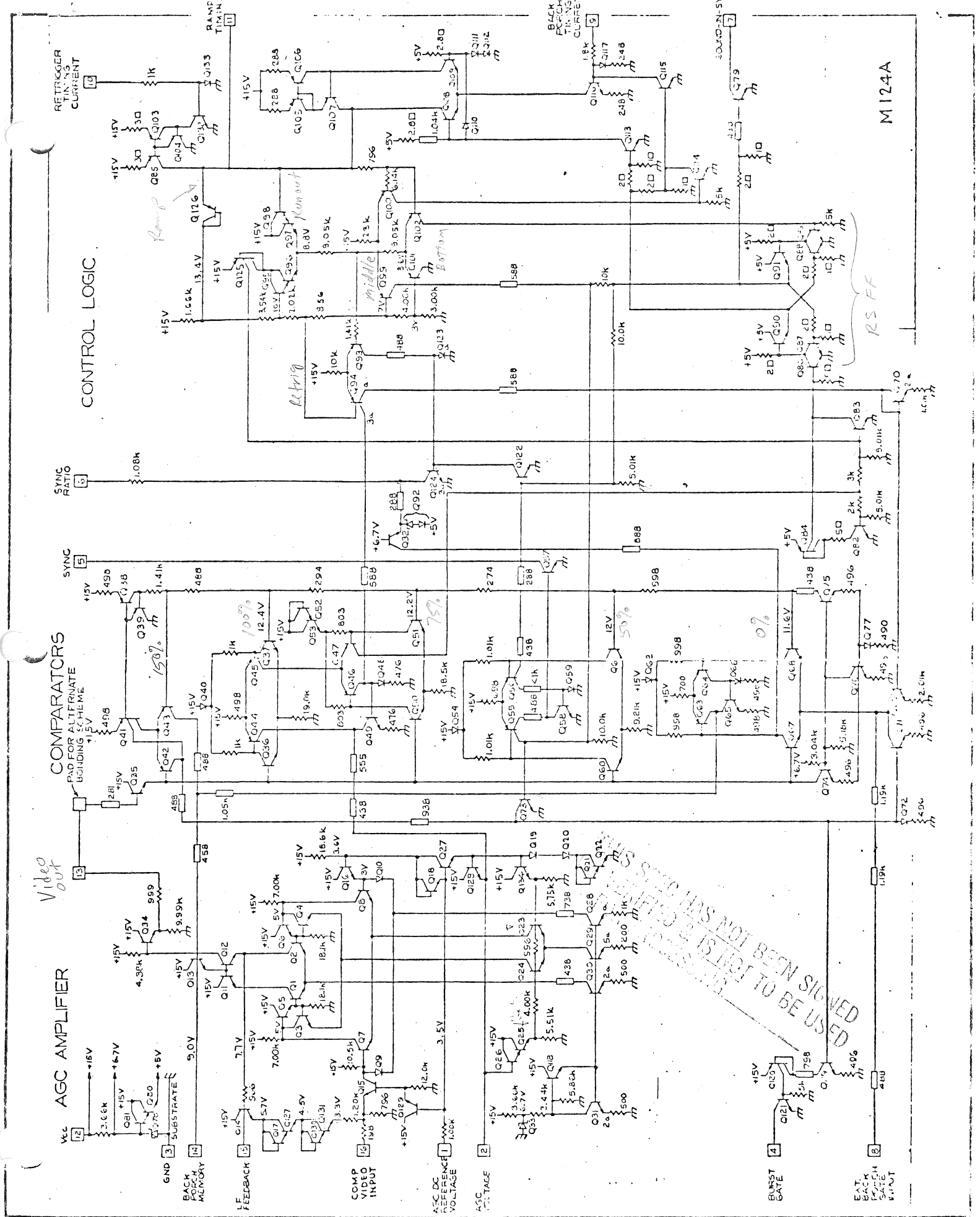
T_x

T_{10}

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$V_{L\phi}$

FIGURE # 2

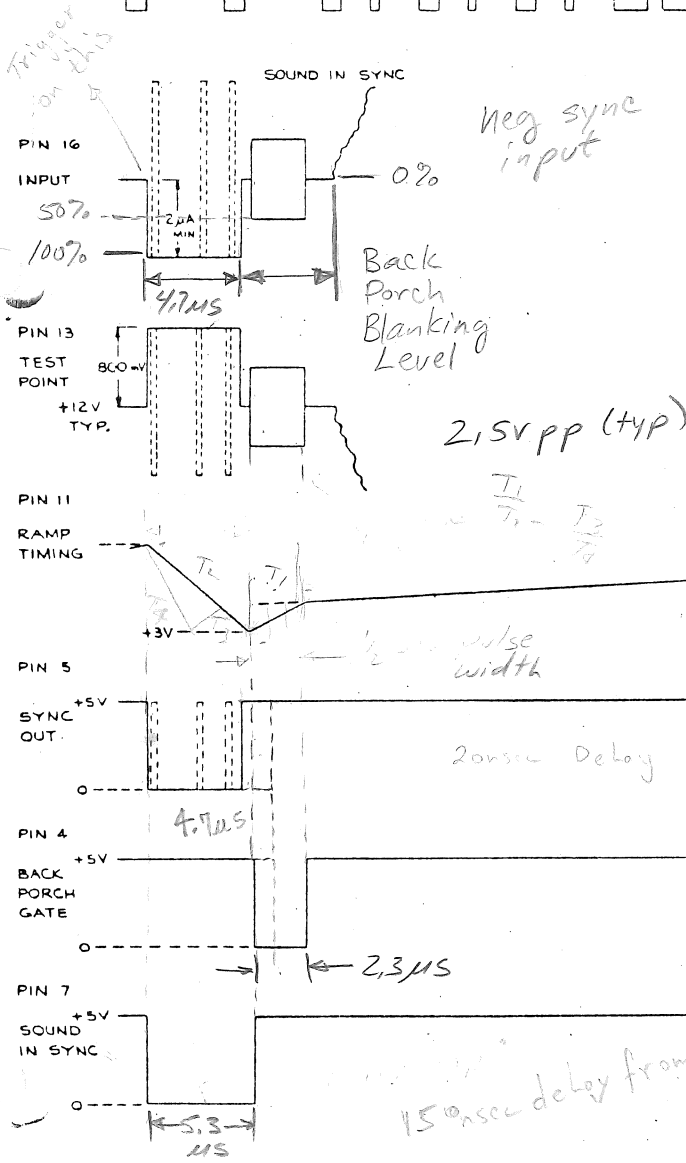
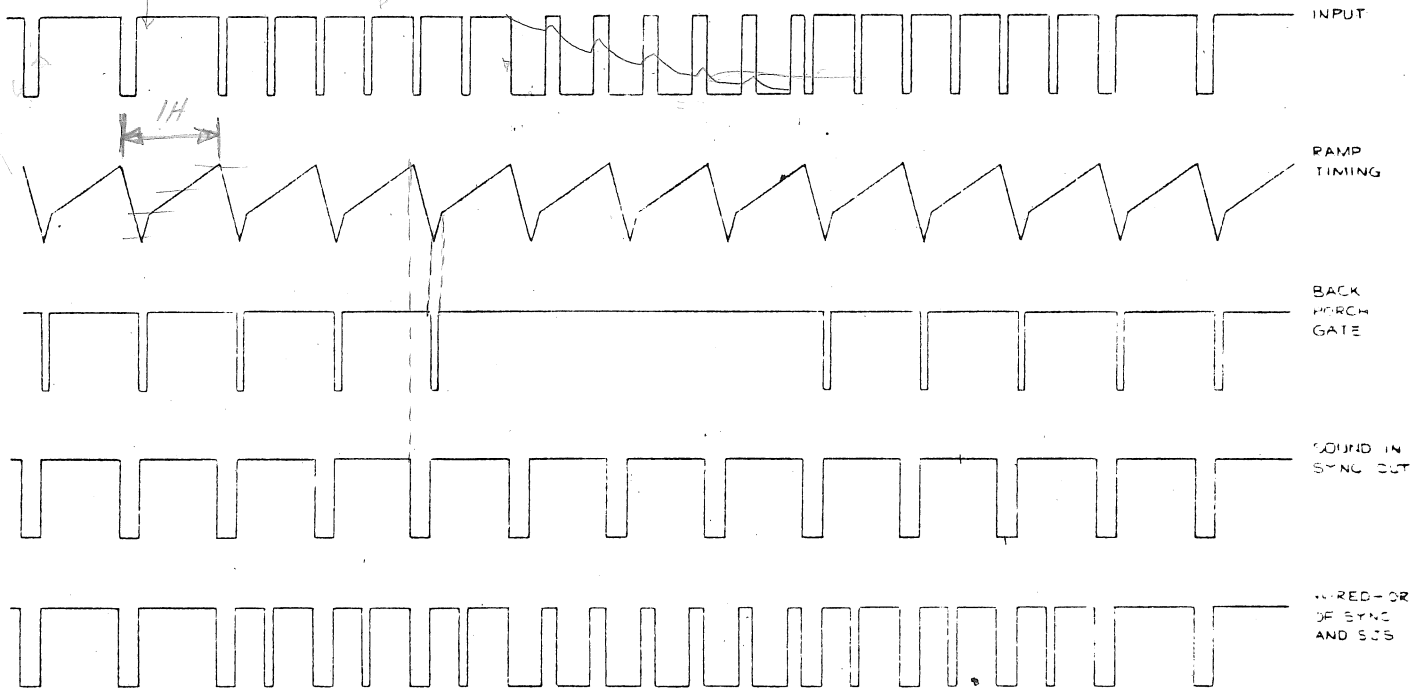


M124A

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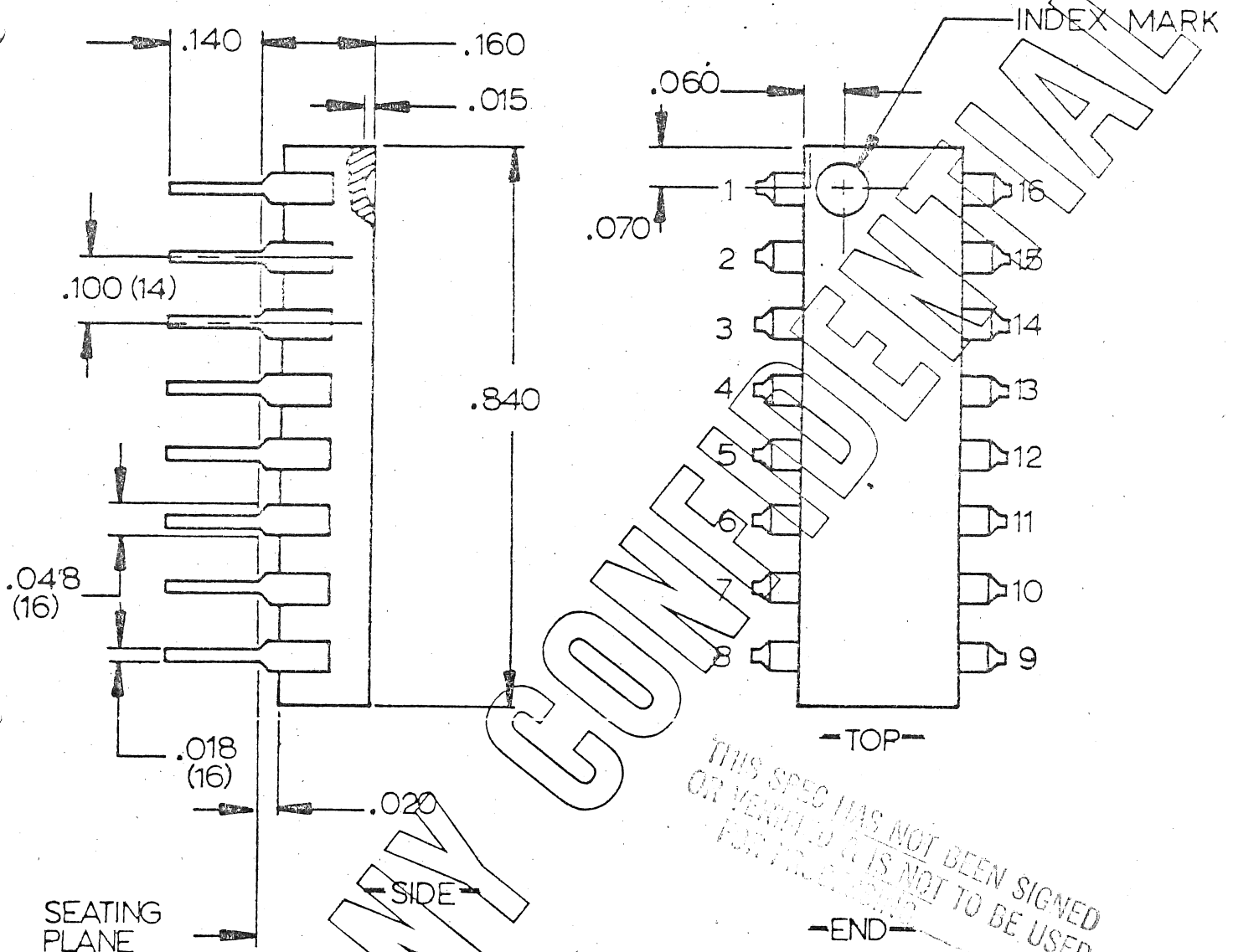
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TEKTRONIX, INC. BEAVERTON, OREGON	SHT 8 OF	CODE IDENT NO 80009	SIZE A	PART NUMBER 155-0144-00	REV
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OUTLINE DRAWING.



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PACKAGE DATA

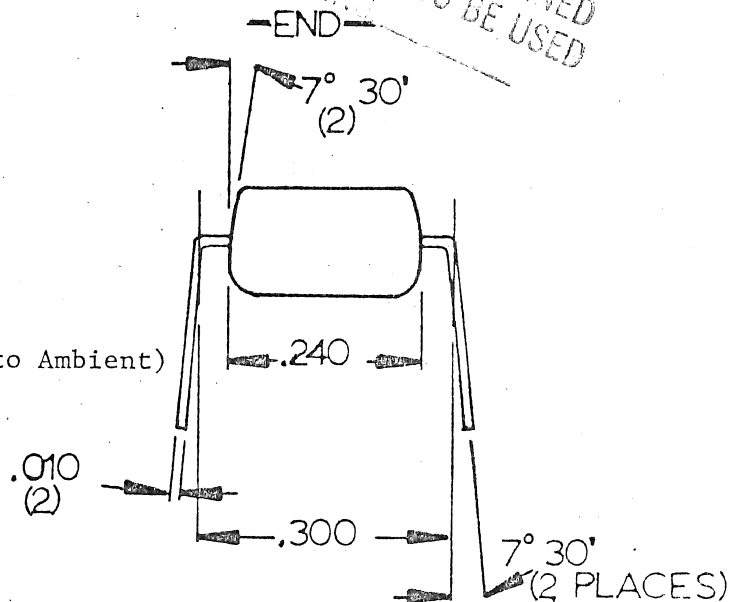
Package Material: HYSOL

Metal Frame: Cu-Clad (Pin 3 is Substrate)

Thermal Impedance: 107.4°C/Watt (Junction to Ambient)

NOTE: The data on this page does not constitute a specification but is intended for reference only.

Package Drawing: 155-0000-00





SPECIFICATIONS AND DOCUMENTATION CHANGE NOTICE

NO. 182
DATE 6-10-76

SPECIFICATION CHANGED: 155-0144-00 M124A

ORIGINATOR: Ken Schlotzhauer

DESCRIPTION OF CHANGE: Initial Documentation

REASON FOR CHANGE:

DISTRIBUTE:

Ken Schlotzhauer
Joe McGrady
ICM Master Log

TO BE APPROVED BY	SIGNATURE	DATE
Ken Schlotzhauer	<i>[Signature]</i>	6/23/76
Chuck Gold	<i>[Signature]</i>	6/23/76
Carl Brown	<i>[Signature]</i>	6/23/76
Bob Poulin	<i>[Signature]</i>	6/23/76
Bill Quinn	<i>[Signature]</i>	6-23-76

REV	REF	DESCRIPTION OF CHANGE	CHK BY	DATE
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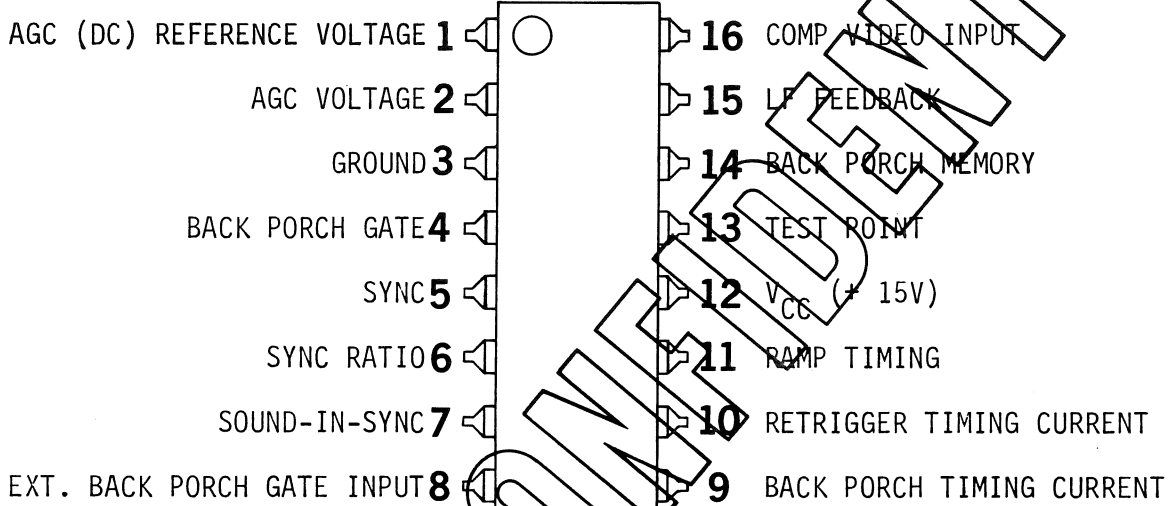
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6-10-76

155-0144-00

PART NUMBER

PACKAGE OUTLINE CONNECTION DIAGRAM
16 LEAD DUAL-IN-LINE
TOP VIEW



CONFIDENTIAL

Tektronix, Inc.

P124A

155-0144-00

MANUFACTURER

CODE IDENT NO

MANUFACTURER'S PART NUMBER

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ENGR			
CHKR		DEC	ANLR
PROD		SCALE	FIRST USED ON
MATERIAL			
FINISH			
TITLE SYNC STRIP CIRCUIT			

182

SH 1 OF 9

CODE IDENT NO
80009

SIZE
A

PART NUMBER
155-0144-00

REV
OR

1 GENERAL DESCRIPTION

The P124A is a Monolithic Sync Strip circuit for use in a wide variety of television related products.

2 FEATURES

- 2.1 Open Collector Outputs: Comp Sync, Sound-In-Sync, and Back Porch Gate.
- 2.2 AGC is based upon input Sync amplitude. A "test point" is available with inverted Comp Video reference to 0.8 volt Sync amplitude.
- 2.3 Wide Input Dynamic Range with leading Sync Edge Timing preserved.
- 2.4 Provides a Block Sync Output to be used with Sound-In-Sync video input.
- 2.5 Provides a Back Porch Gate suitable for video clamping amplifiers.
- 2.6 Internal Timing, adjustable by external components to accommodate different line rates, creates a window for the acceptance of Sync inputs. (This minimizes sensitivity to noise bursts).
- 2.7 The Gain of the Input Amplifier (and thus the amplitude of the Input Sync) can be determined between the AGC Voltage and the AGC Reference Voltage Pins.

3 ABSOLUTE MAXIMUM RATINGS*

- 3.1 Input Current (Pin 16) ± 2 mA
- 3.2 V_{CC} (Pin 12). + 16 Volts
- 3.3 Back Porch Gate Input (Pin 4) -4 mA
- 3.4 Output Voltage (Pins 4, 5, 7) + 10 Volts
- 3.5 Maximum Operating Temperature 80°C
(Results in a 125°C Junction Temperature)
- 3.6 Power Dissipation 400 mW

*Absolute Maximum Ratings are those ratings beyond which the serviceability of the device may be impaired.

PRODUCT SPECIFICATION SUMMARY

PARAMETER	SYMBOL	MIN	MAX	UNITS
Test Point Voltage (Pin 13)	V_{TP}	11.0	13.0	Volts (NOTE 1)
Sync Out Voltage (Pin 5)	V_{SY}	4.9	5.1	Volts (NOTE 1)
Back Porch Gate Out Voltage (Pin 4)	V_{BP}	4.9	5.1	Volts (NOTE 1)
Sound In Syncs Out Voltage (Pin 7)	V_{SS}	4.9	5.1	Volts (NOTE 1)
Ramp Timing Voltage (Pin 11)	V_{RP}	13.6	14.6	Volts (NOTE 1)
AGC Voltage (Pin 2)	V_{AGC}	1.8	2.6	Volts (NOTE 1)
DC Reference Voltage (Pin 1)	V_{REF}	3.3	3.9	Volts (NOTE 1)
Sync Ratio Voltage (Pin 6)	V_{SR}	12.0	14.0	Volts (NOTE 1)
Back Porch Gate In Voltage (Pin 8)	$V_{BP(In)}$	9.5	11.5	Volts (NOTE 1)
Input Voltage (Pin 16)	V_{IN}	1.8	2.4	Volts (NOTE 1)
LF Feedback Voltage (Pin 15)	V_{LF}	7.0	9.0	Volts (NOTE 1)
Back Porch Memory Voltage (Pin 14)	V_{MEM}	8.0	10.0	Volts (NOTE 1)
Retrigger Input Voltage (Pin 10)	V_{RT}	0.6	0.8	Volts (NOTE 1)
Back Porch Timing Voltage (Pin 9)	V_{BPT}	0.8	1.4	Volts (NOTE 1)

PRODUCT SPECIFICATION SUMMARY

PARAMETER	SYMBOL	MIN	MAX	UNITS
Input to Output Delay (V_{gen} to Pin 5) (Figure 2)	T_{10}	120 (TYP)		nSec (NOTE 2)
Output Logic Zero Levels (Pins 4, 5, 7) (Figure 2)	V_{L0}	300 (TYP)	750	mVolts
Trailing Edge of Test Point Pulse to Leading Edge of Back Porch Gate Output Pulse (Pin 13 to Pin 4) (Figure 2)	T_X	100	250	nSEC

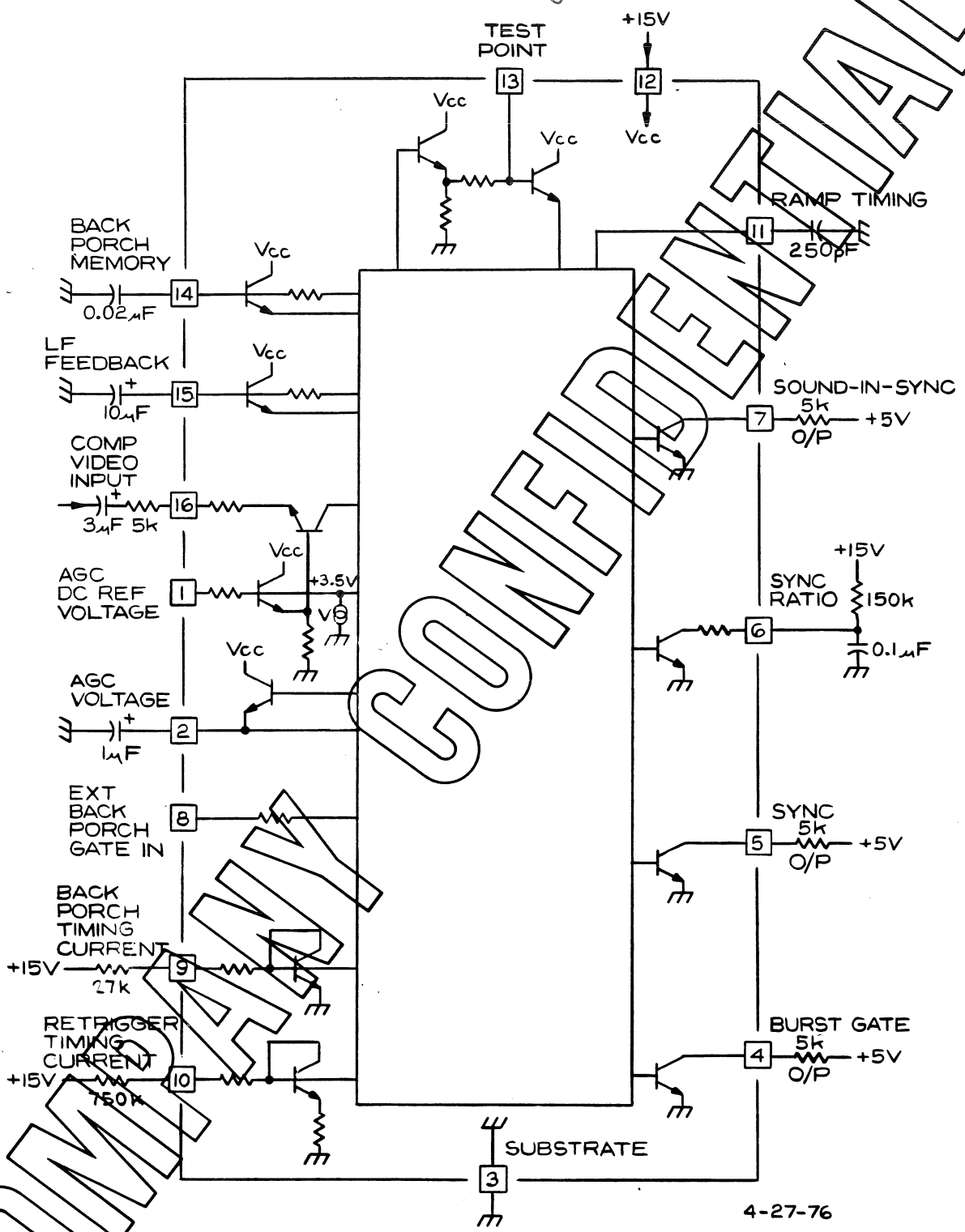
NOTE SECTION

All product specifications refer to Test Circuit depicted in Figure 1 with 525/60 or 625/50 Composite Video TV Waveform as Input (V_{gen}).

NOTE 1: V_{gen} = 0 Volts

NOTE 2: V_{gen} = 286 mVolts of Horizontal Sync, timing measurements between 50% points.

AGC'd VIDEO



MI24A SYNC SEPARATOR PIN-OUT DIAGRAM

FIGURE 1

INPUT

TEST POINT

SYNC
SOUND IN
SYNC

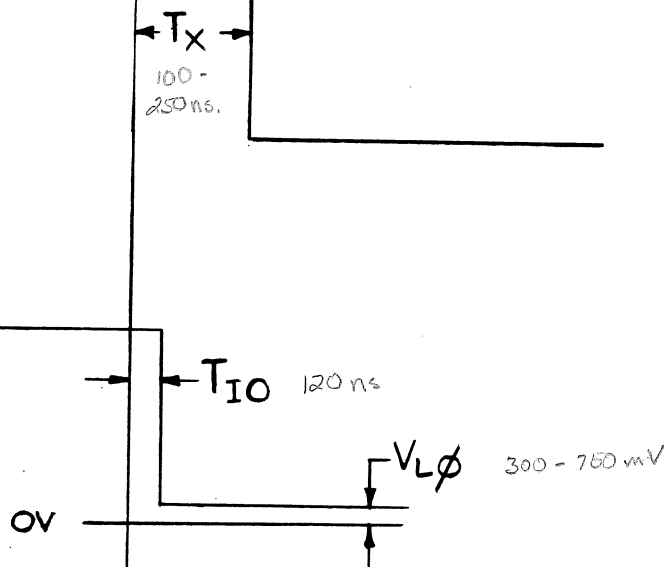
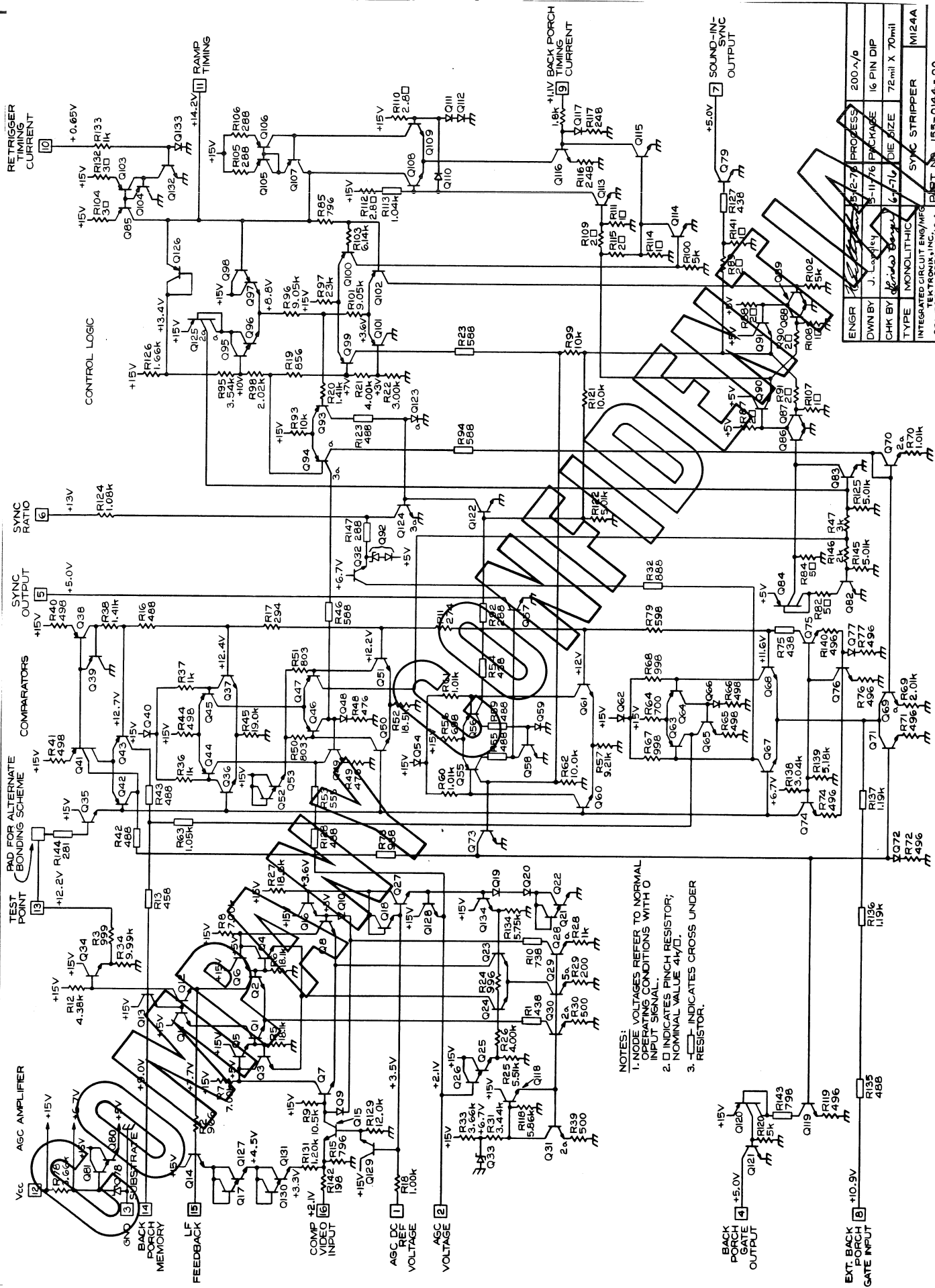
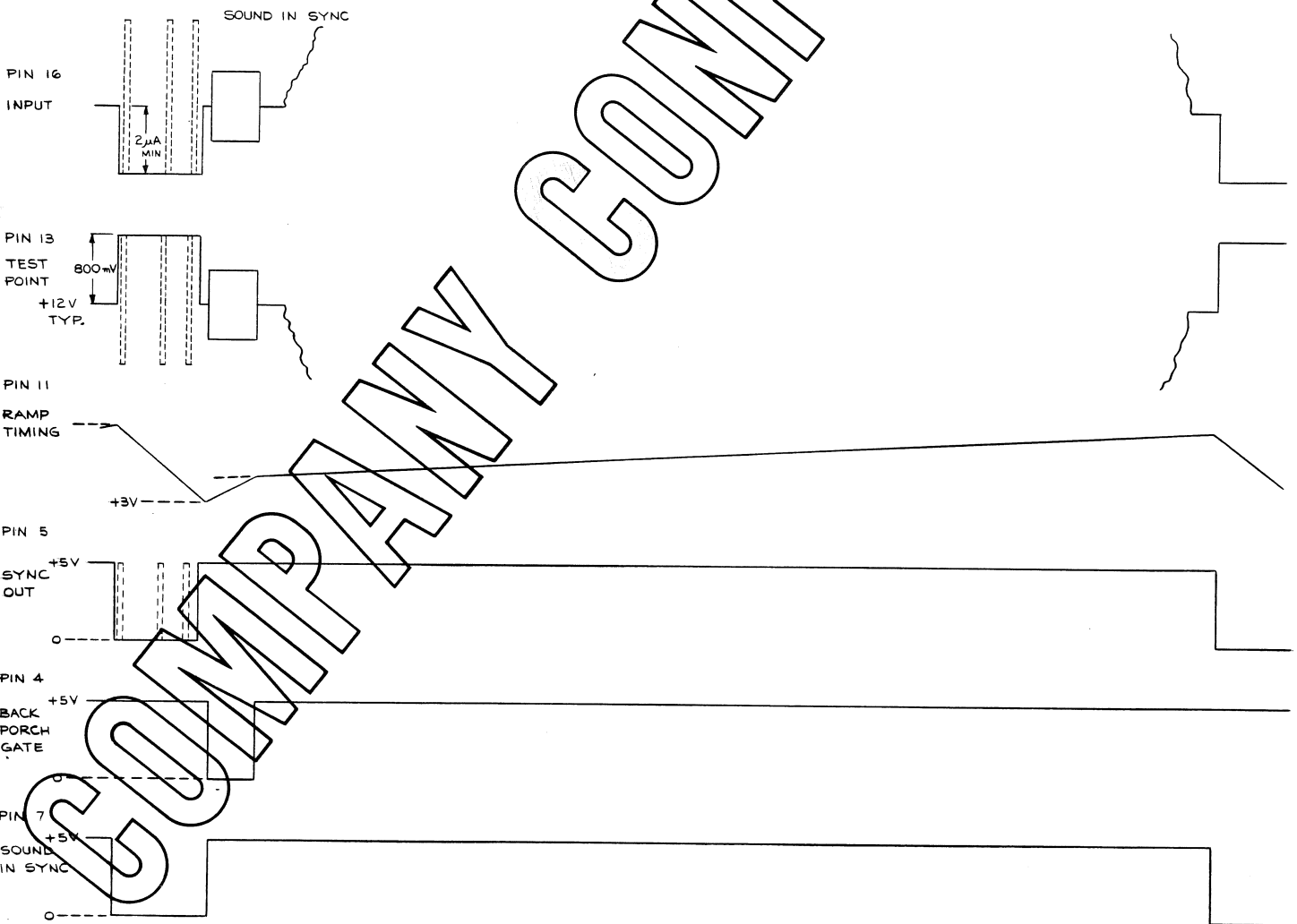
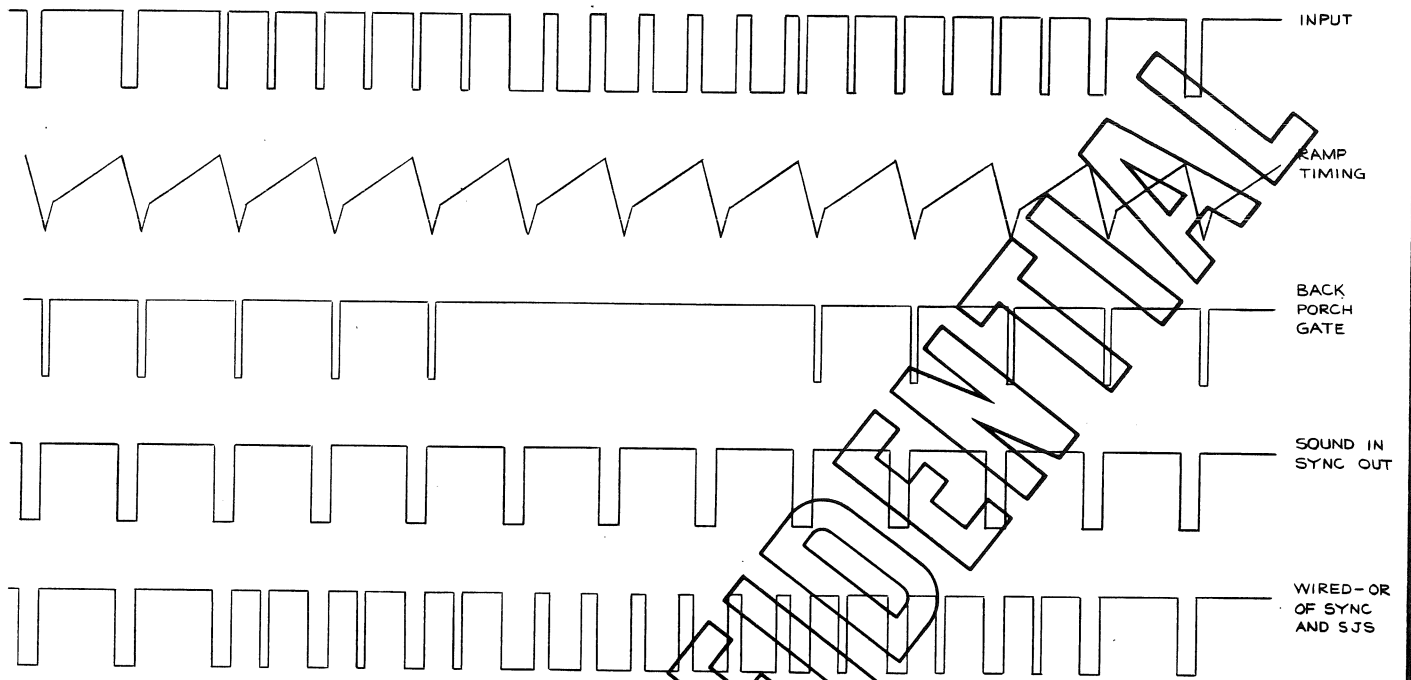


FIGURE 2



NOTES:
 1. NODE VOLTAGES REFER TO NORMAL OPERATING CONDITIONS WITH 0 INPUT SIGNAL.
 2. □ INDICATES PINCH RESISTOR; □ NOMINAL VALUE 41/0.
 3. □ INDICATES CROSS UNDER RESISTOR.

ENGR	J. L. ...	PROCESS	200-7
DWN BY	J. L. ...	PACKAGE	16 PIN DIP
CHK BY	J. L. ...	QIE SIZE	72mil X 70mil
TYPE	MONOLITHIC	SYNC STRIPPER	M124A
INTEGRATED CIRCUIT ENG/MP/PC		PART NO. 155-0144-00	
BEAVERTON, OREGON, U.S.A.			



TEKTRONIX, INC.
BEAVERTON, OREGON

SHT. 8 OF 9

CODE IDENT NO
80009

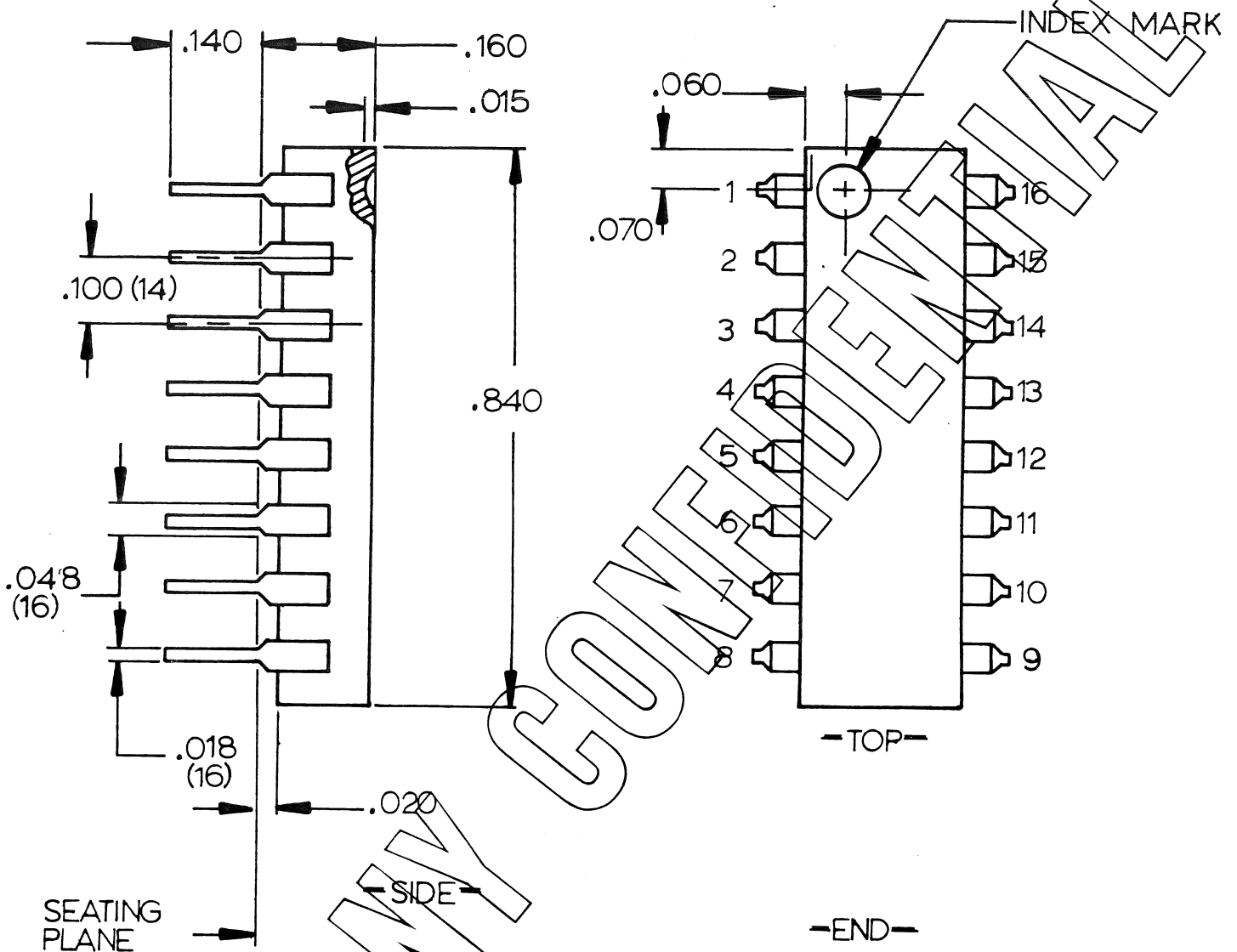
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PART NUMBER

155-0144-00

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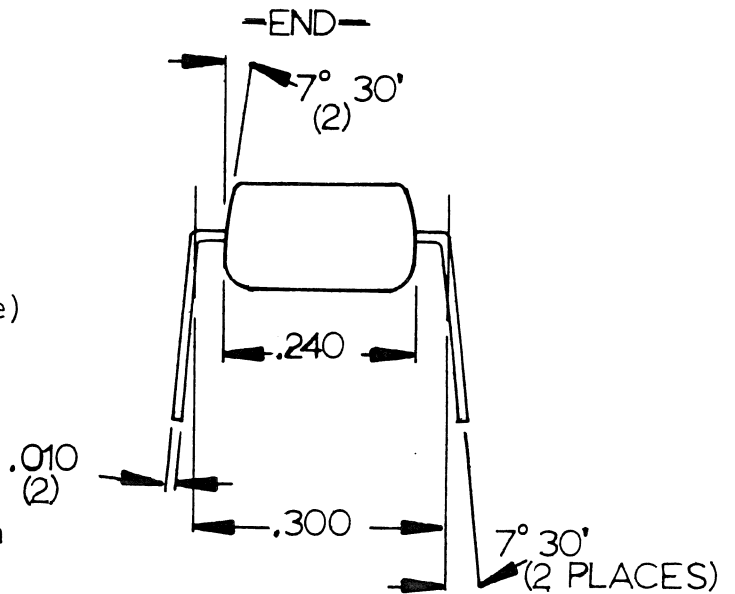
OUTLINE DRAWING.



PACKAGE DATA

Package Material: HYSOL
 Metal Frame: Cu-Clad (Pin 3 is Substrate)
 Thermal Impedance: 107.4°C/Watt
 (Junction to Ambient)
 Package Drawing: 155-0000-00

NOTE: The data on this page does not constitute a specification but is intended for reference ONLY.

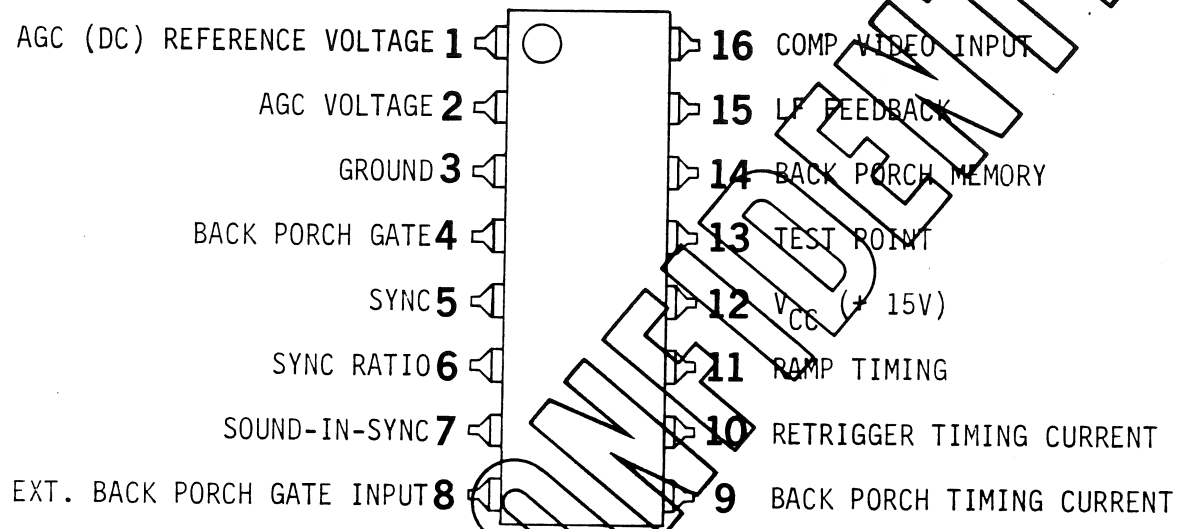


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6-10-76

PART NUMBER 155-0144-00

PACKAGE OUTLINE CONNECTION DIAGRAM
16 LEAD DUAL-IN-LINE
TOP VIEW



Tektronix, Inc.	P124A	155-0144-00
MANUFACTURER	CODE IDENT NO	MANUFACTURER'S PART NUMBER

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				TOLERANCES: UNLESS OTHERWISE SPECIFIED	
				DEC	ANLR
				SCALE	FIRST USED ON

MATERIAL

FINISH

TITLE

SYNC STRIP CIRCUIT

182	SH 1 OF 9	CODE IDENT NO 80009	SIZE A	PART NUMBER 155-0144-00	REV OR
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DESCRIPTION

This circuit is an altered version of the M083 (155-0061-00). The M083 Nichrome emitter resistors have been removed; otherwise it is the same.

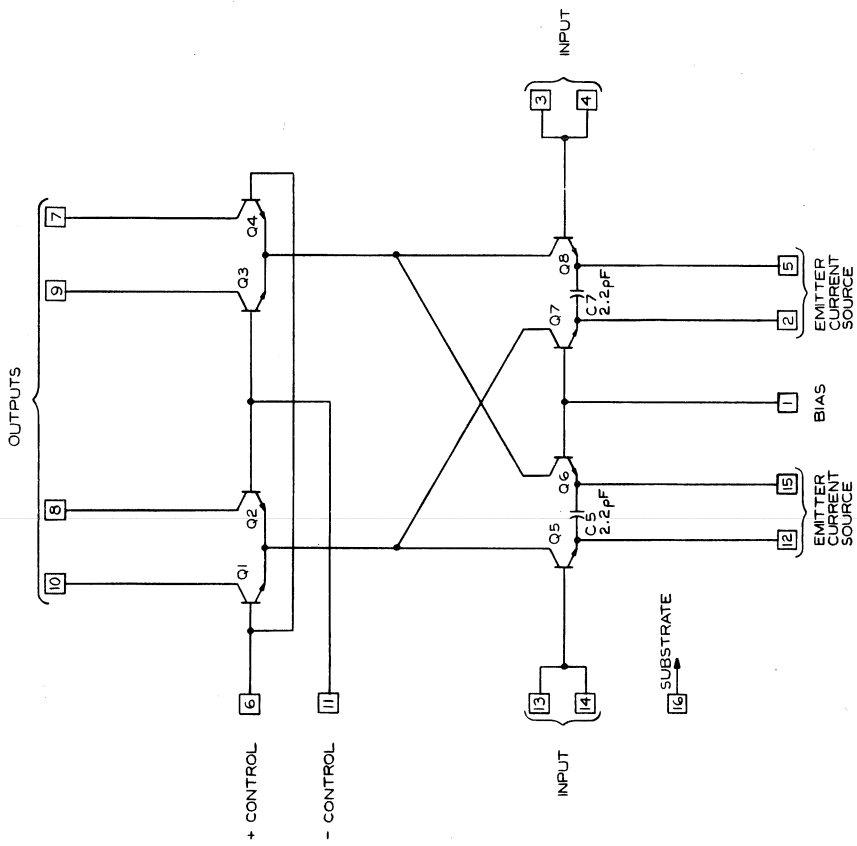
PROCESS SHF II

POWER SUPPLY

PACKAGE T0-8 With Small Stud

DESIGNER Hans Springer

INSTRUMENT USAGE 7903
7904
7844 MODS



ENGR	<i>Smith</i>	10-28-75	PROCESS	SH II
DWNB	J. Langley	10-22-75	PACKAGE	TO-8 w. STUD
CHK BY	C. WESTON	10-28-75	DIE SIZE	50mil X 45mil
TYPE	MONOLITHIC		f _T DOUBLER AMPLIFIER	M126
INTEGRATED CIRCUIT ENG/MFG SILICONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 203-0126-90				

DESCRIPTION

This circuit takes information inputed in BCD form (negative logic), decodes it, and generates the necessary outputs to display a seven segment character on a CRT screen. Inputs have TTL voltage thresholds. The "X" and "Y" position outputs are currents as is the Z-axis output. A character segment is generated by first positioning the segment origin with "X" and "Y" currents and then ramping either the "X" or "Y" current to create the segment. The next segment is created by repositioning the origin and again ramping either "X" or "Y", and so on. A sign input is provided allowing a choice of plus, minus, or no sign to be displayed. Outputs are provided to indicate when the M127 is generating a character and to indicate when a decimal point is being made.

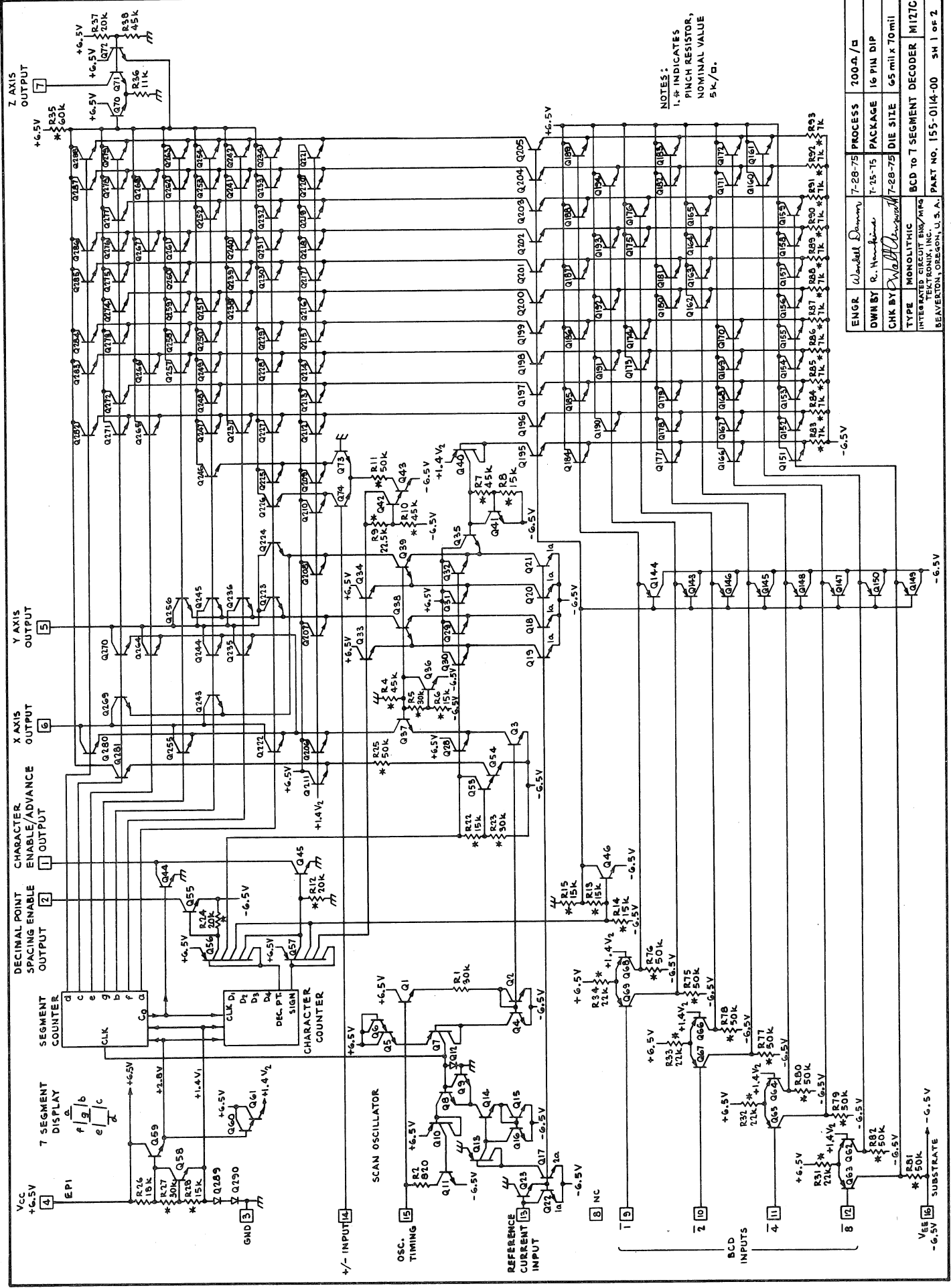
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +6.5V, V_{EE} -6.5V

PACKAGE 16 DIP

DESIGNER Wendell Damm

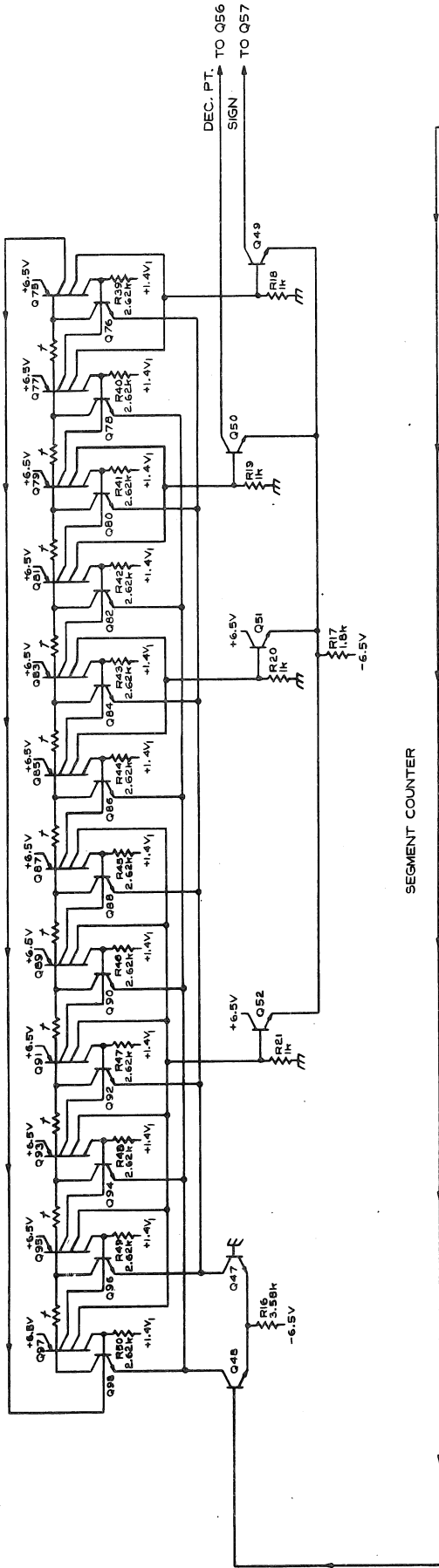
INSTRUMENT USAGE 213



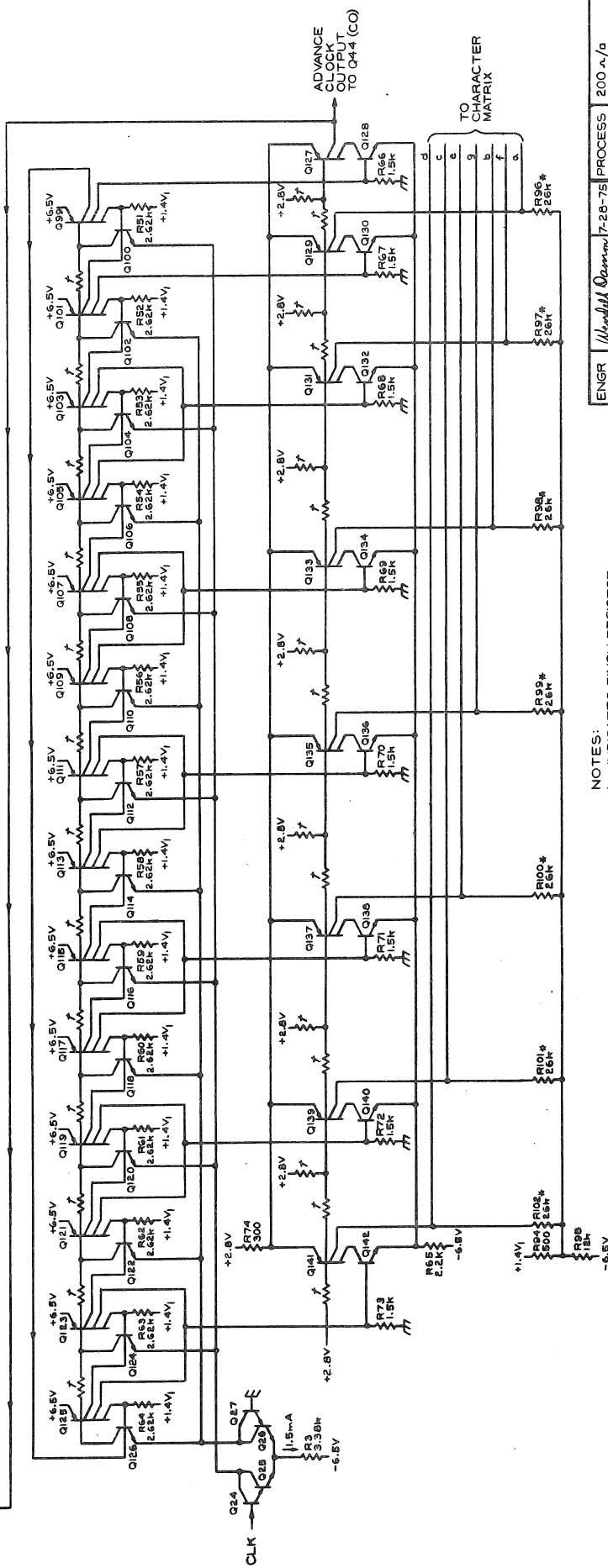
NOTES:
 1. * INDICATES
 PINCH RESISTOR,
 NOMINAL VALUE
 5 K./Ω.

ENGR	W. J. D. Dorman	7-28-75	PROCESS	200A./D
OWN BY	R. N. H. H. H.	7-25-75	PACKAGE	16 PIN DIP
CHK BY	W. J. D. Dorman	7-28-75	DIE SITE	65 mil x 70 mil
TYPE	MONOLITHIC		BCD TO 7 SEGMENT DECODER	M127C
	INTEGRATED CIRCUIT BKG/AFK9			
	TELECTRONIX, INC.			
	BEAVERTON, OREGON, U.S.A.		PART NO. 155-0114-00	SH 1 OF 2

CHARACTOR COUNTER



SEGMENT COUNTER



NOTES:
 1. * INDICATES PINCH RESISTOR
 2. * INDICATES PULSE RESISTOR.

ENGR	Wendell Damm	7-28-75	PROCESS	200 μ /d
DWNBV	J. Langley	7-14-75	PACKAGE	16 PIN DIP
CHK BY	<i>[Signature]</i>	7-28-75	DIE SIZE	65mil X 70mil
TYPE	MONOLITHIC	7-SEGMENT DECODER	MI27C	
	INTEGRATED CIRCUIT ENG/WFG			
	BEAVERTON, OREGON, U.S.A.	PART NO. 155-0114-00	SH 2 OF 2	

VERTICAL AMPLIFIER

203-0130-90 M130

DESCRIPTION

The M130 is a Preamplifier for the 455 Portable Oscilloscope. Each chip contains one channel with gain switch, gain calibration, positioning, trigger pick-off, and channel switch. Two chips are combined on a ceramic substrate with heatsink and printed resistors to form the 155-0155-00 (H332).

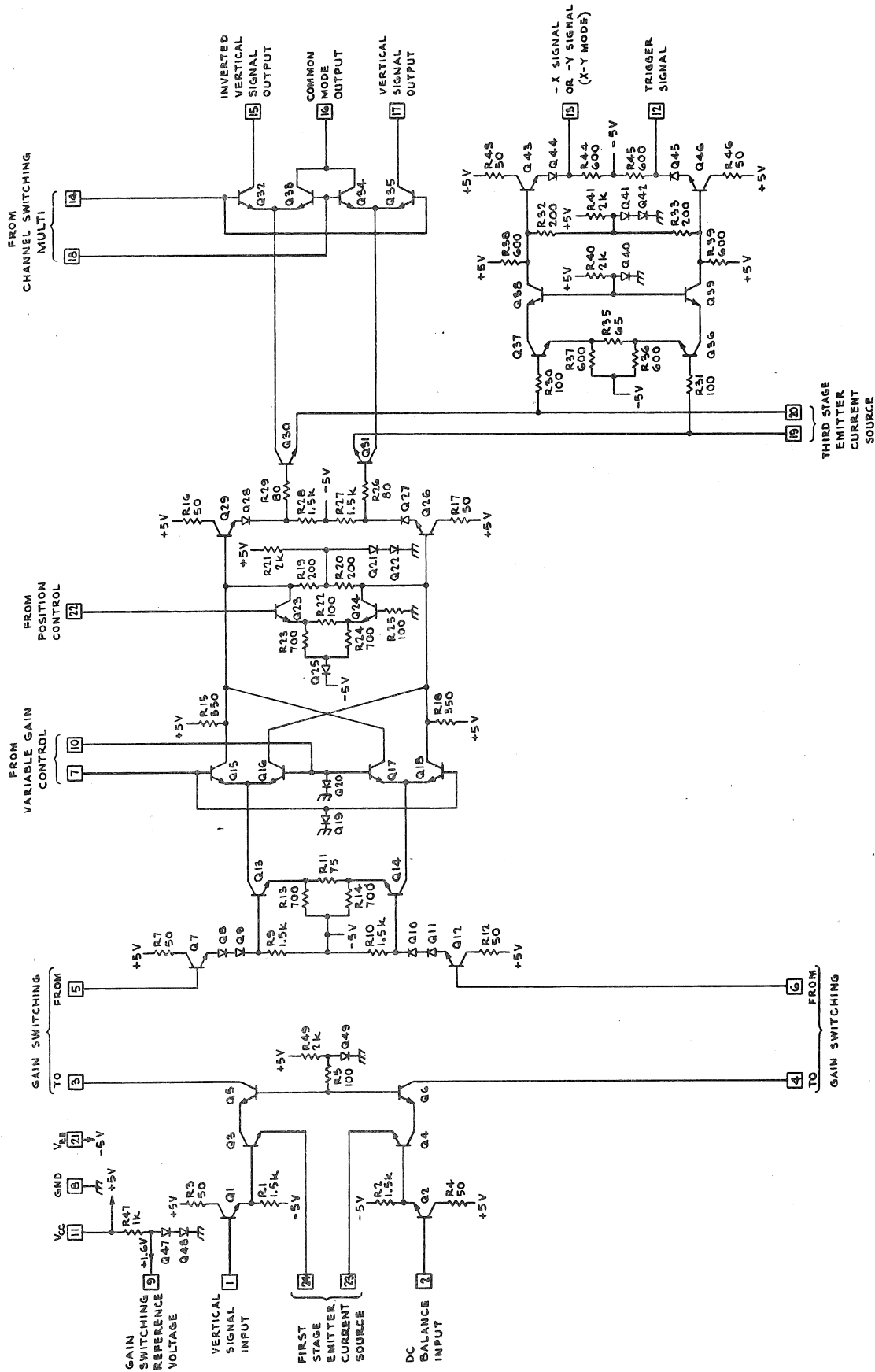
PROCESS SHF II

POWER SUPPLY. ± 5 Volts and Ground

PACKAGE Custom Hybrid

DESIGNER Jim Woo

INSTRUMENT USAGE 455
465M



ENGR	Shir Ircs	1-24-75	PROCESS	SHE II
DWN BY	R. Kunkin	12-18-74	PACKAGE	H332
CHK BY	A. Blain	6-18-75	DIE SIZE	65mil x 65mil
TYPE	MONOLITHIC		VERTICAL AMPLIFIER	M130
INTEGRATED CIRCUIT BWA/M130 TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 203-0130-90				

DESCRIPTION

This Trigger Circuit is intended for use up to 50 MHz. It contains a triggering circuit, a trigger signal preamplifier, and a trigger view amplifier. The trigger signal input and level input are designed ± 0.5 V signals referenced to ground. The M131A is designed to interface with the M132A sweep control and M133A sweep and delay pickoff integrated circuits to form a complete horizontal system. Operating voltages for the M131A are ± 5 V at a power dissipation of approximately 310 mW.

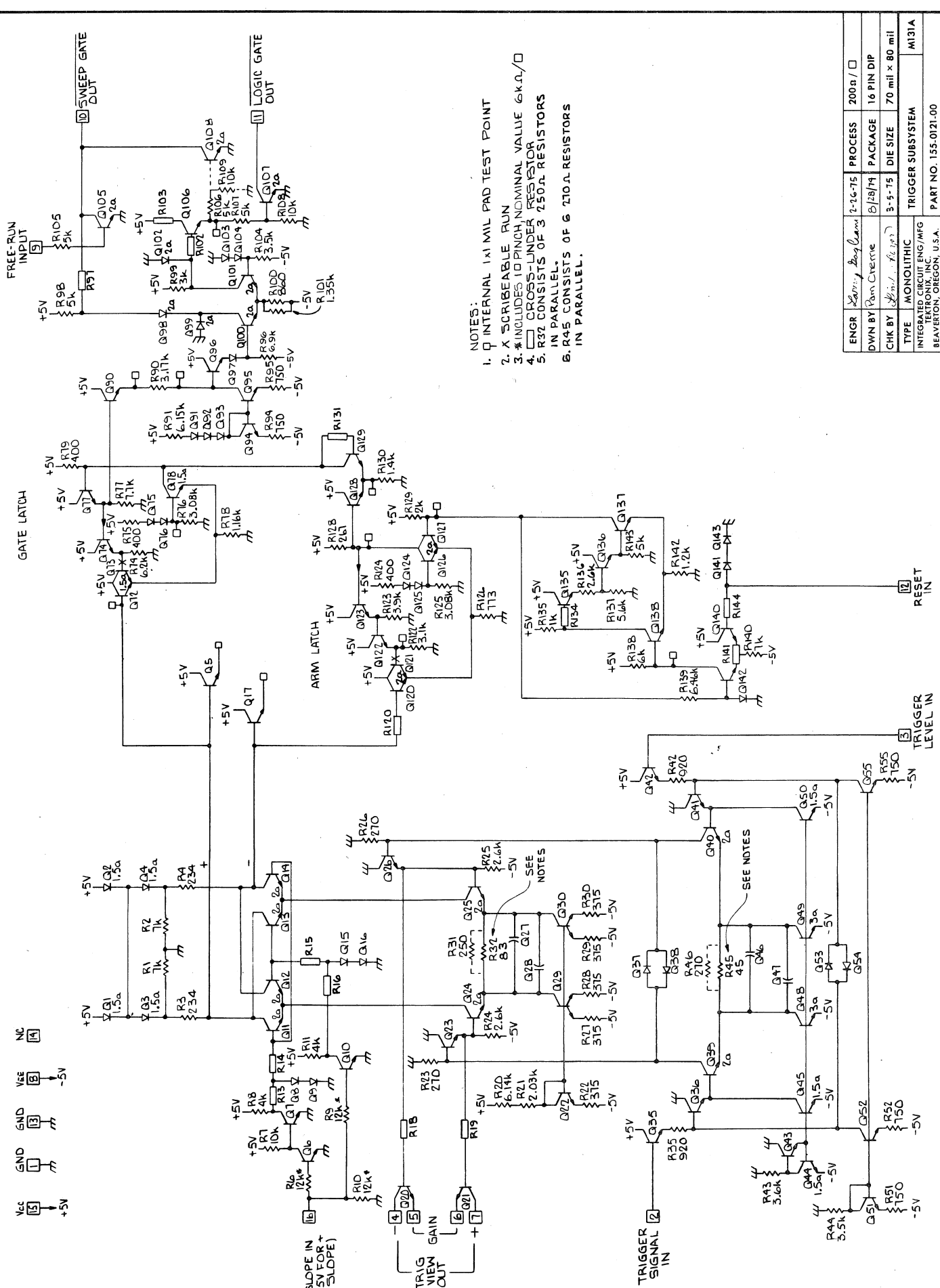
PROCESS 200 Ω /Sq

POWER SUPPLY V_{CC} +5V, V_{EE} -5V

PACKAGE 16 Pin DIP

DESIGNER Larry Gagliani

INSTRUMENT USAGE 455



- NOTES:
- INTERNAL 1 MIL PAD TEST POINT
 - X SCRIBEABLE RUN
 - * INCLUDES 10 PINCH NOMINAL VALUE 6k Ω /O
 - CROSS-UNDER RESISTOR
 - R32 CONSISTS OF 3 250 Ω RESISTORS IN PARALLEL.
 - R45 CONSISTS OF 6 210 Ω RESISTORS IN PARALLEL.

ENGR	Leary, Baylumi	2-26-75	PROCESS	200R / □
DVN BY	Pam Cierne	8/28/74	PACKAGE	16 PIN DIP
CHK BY	W. J. ...	3-5-75	DIE SIZE	70 mil x 80 mil
TYPE	MONOLITHIC		TRIGGER SUBSYSTEM	M131A
INTEGRATED CIRCUIT ENG/MFG TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 155-0121-00				

SEE NOTES

SWEEP CONTROL

155-0122-00 M132A

DESCRIPTION

This sweep control circuit contains the hold-off timing Miller, single sweep lockout circuit, triggered and single sweep ready light lamp drivers, single sweep reset debounce circuit, auto timing circuit and an "A" Gate output. The M132A is designed to operate with the M133A sweep and delay pickoff and the M131A trigger. The M132A operates from +5V at a power dissipation of approximately 125 mW.

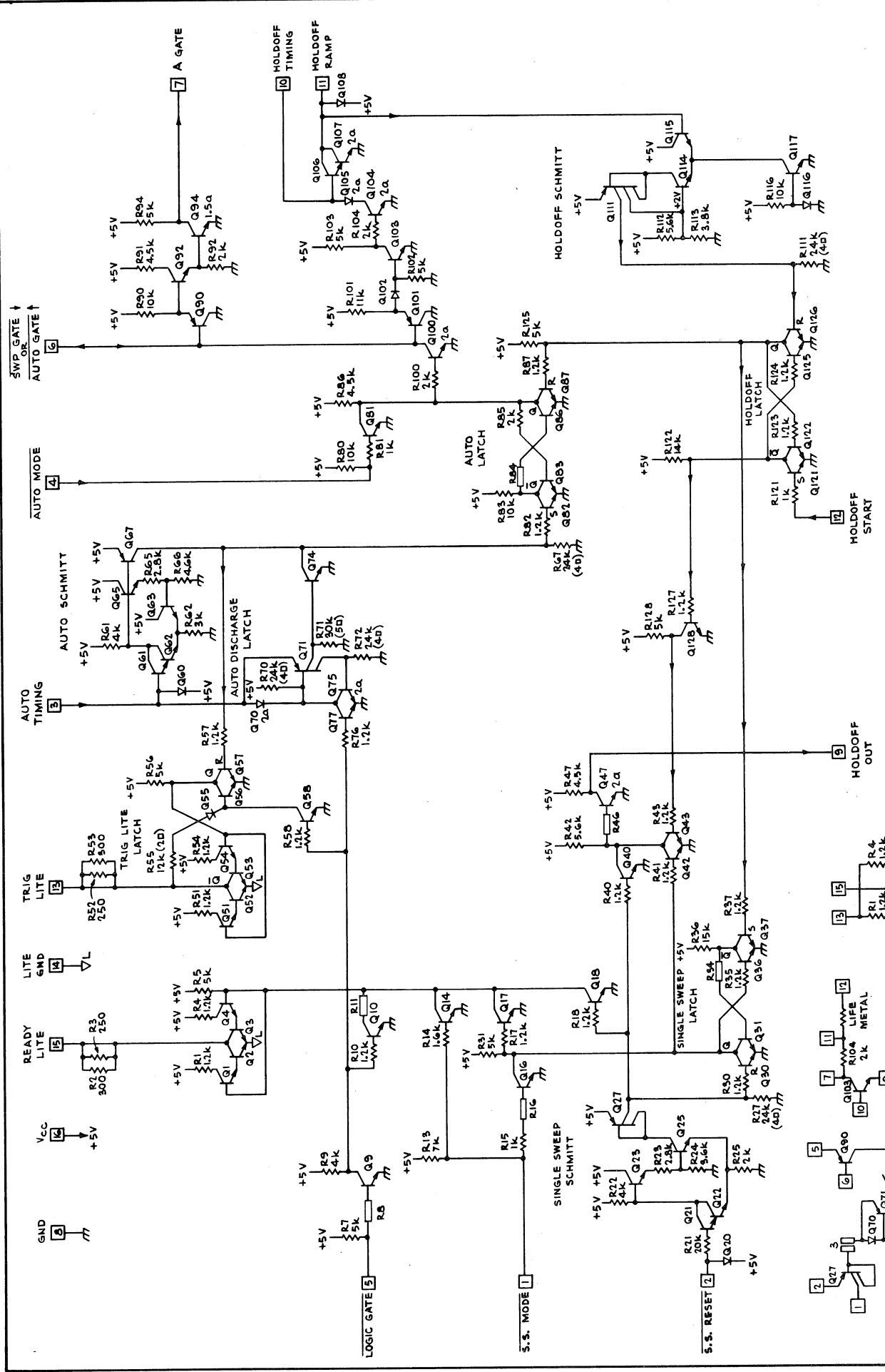
PROCESS 200 Ω /Sq

POWER SUPPLY.

PACKAGE 16 Pin DIP

DESIGNER Larry Gagliani

INSTRUMENT USAGE 455



ENGR	Larry D. Gorman	2-26-75	PROCESS	200A/D
DWN BY	R. H. Hunsinger	8-26-74	PACKAGE	16 PIN DIP
CHK BY	John M. Wood	5-21-75	DIE SIZE	65mil x 65mil
TYPE	MONOLITHIC		SWEEP CONTROL	M192A
INTEGRATED CIRCUIT ENG/MFG. BEAVERTON, OREGON, U.S.A.				

NOTES:
 1. □ INDICATES PINCH RESISTOR
 NOMINAL VALUE 6KΩ/B.
 2. □ INDICATES CROSS UNDER RESISTOR.

MIN AREA
 0.5 X 0.7 mil EMITTER
 1 BASE
 1 COLLECTOR

TEST ROW

SWEEP AND PICKOFF

155-0123-00 M133A

DESCRIPTION

The 155-0123-00 (M133) contains a control circuit and current source for an external Miller, sweep end circuit, sweep switch, "Z" axis control, and a delay pickoff.

It is used with the 155-0122-00 (M132) sweep control integrated circuit, and the 155-0124-00 (M138) horizontal pre-amplifier integrated circuit.

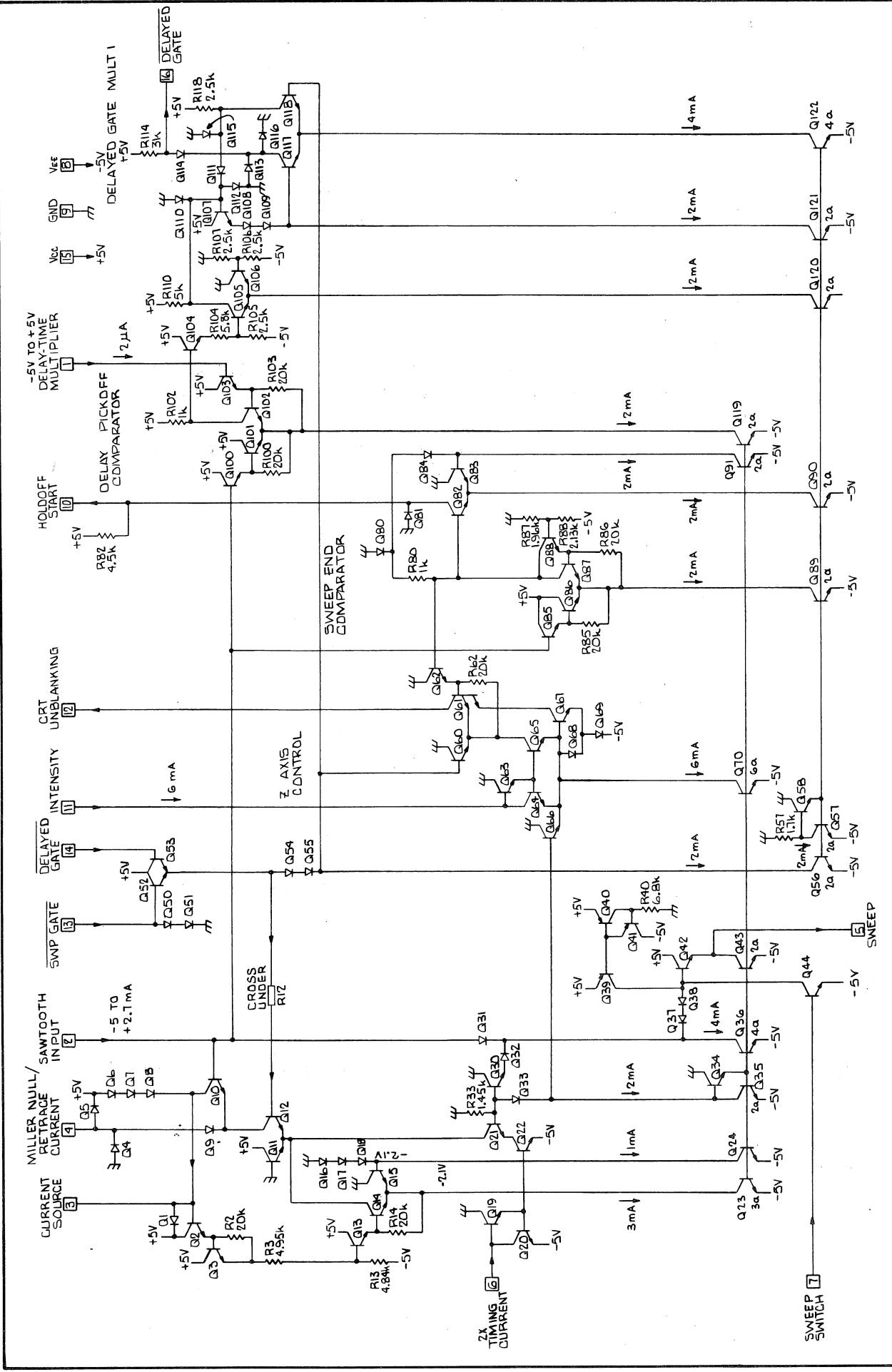
PROCESS 200 Ω /Sq

POWER SUPPLY. \pm 5 Volts, 330 mW

PACKAGE 16 Pin DIP

DESIGNERS. Jim Godwin/Mike Metcalf

INSTRUMENT USAGE 455



ENGR	Jim Bohlin	PROCESS	200B / □
DWN BY	Tom Cherie	PACKAGE	16 PIN DIP
CHK BY	Garth Smith	DIE SIZE	60 mil x 60 mil
TYPE	MONOLITHIC	SWEET & PICKOFF	M133A
INTEGRATED CIRCUIT ENG/MFG		BEAVERTON, OREGON, U.S.A.	
PART NO. 155-0123-00			

DESCRIPTION

The M136 provides for selection of one of three trigger sources. There are two high frequency channels and one low frequency channel. Channel selection is accomplished by switching a current source (resistor to -15V) to the appropriate select pin. Input voltages are at zero volts. External load resistors are required. When the load resistors are 50 ohms, gain and bandwidth are nominally 6 MHz and 1500 MHz respectively.

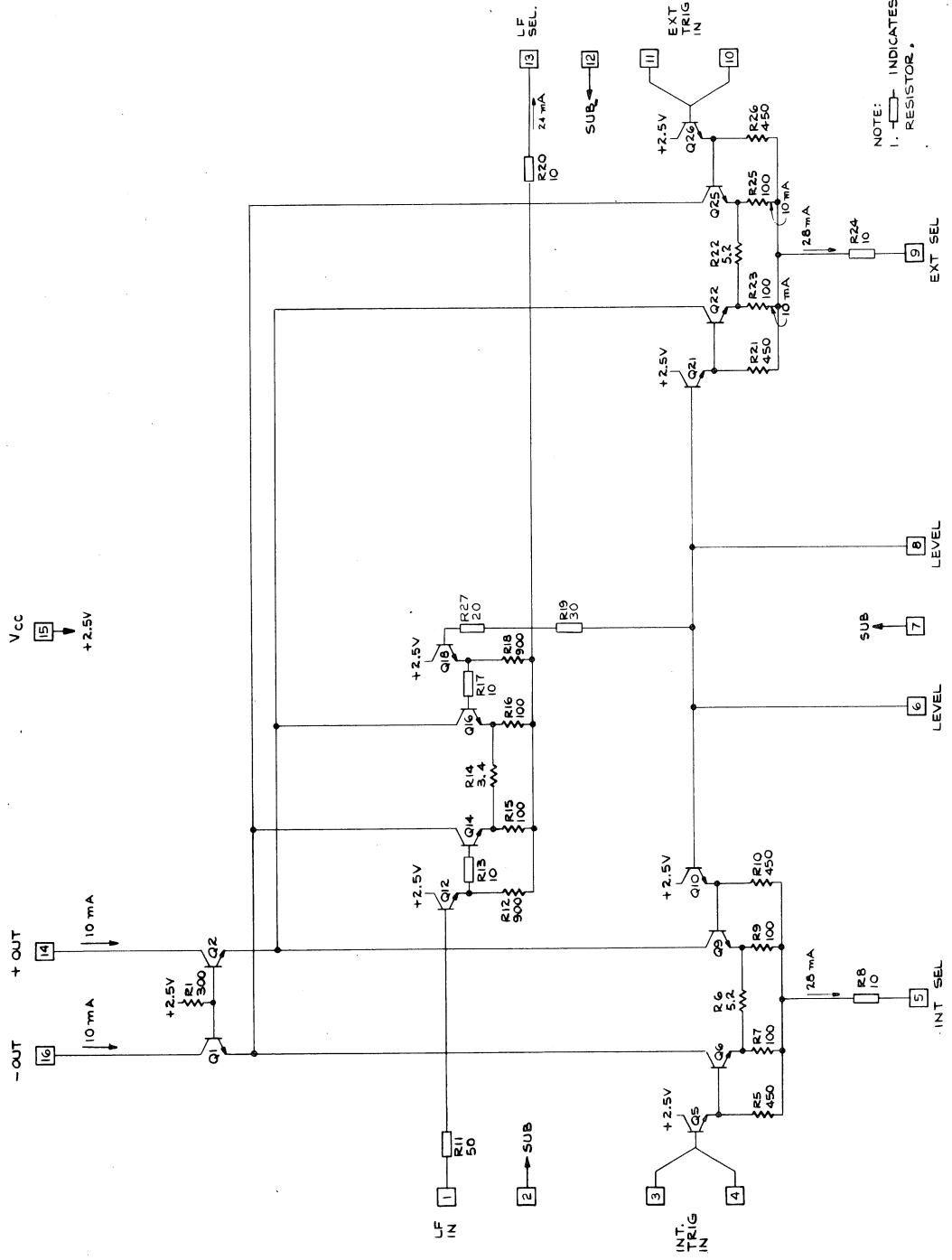
PROCESS SHF III

POWER SUPPLY. +2.5 Volt Resistor From
-15 Volts to Source Select
(one of three)

PACKAGE 16 Pin MiniPac

DESIGNER Art Metz

INSTRUMENT USAGE 7B10 7B15
067-0821-00



NOTE: I. INDICATES CROSSUNDER RESISTOR.

ENGR	<i>W. H. ...</i>	12-9-76	PROCESS	SHF III
DWN BY	S. POLENDEY	9-9-76	PACKAGE	16 PIN MINIPAC
CHK BY	C. WESTON	3-17-77	DIE SIZE	48mil. X 48mil.
TYPE	MONOLITHIC		TRIGGER AMPLIFIER	M136C
	INTEGRATED CIRCUIT		CHANNEL SWITCH	
	TELEPHONIX, INC.			
	BEAVERTON, OREGON, U.S.A.			
			PART NO.	155-0160-00

DESCRIPTION

This Integrated Circuit has a maximum sweep rate of 5 ns/div. "A" and "B" sweep input range is +2.0 volts to -2.4 volts with channel switching accomplished by pulling 2 mA out of the unused input(s). In X-Y operation (selected by pulling mode control to +5 volts), the "X" signal sees a 5 MHz preamplifier with gain of 10 and input range of approximately ± 200 mV. Output is a differential current from common base transistors with a sensitivity of 0.2 mA/div/side. Gain is adjusted and switched externally by selecting emitter resistors for the input differential pair.

The M138 has provisions for mag registration and horizontal position inputs. Bias current level is set with an external resistor. Nominal operation is ± 5.0 volt supplies with a power dissipation of 185 mW (215 mW in X-Y mode).

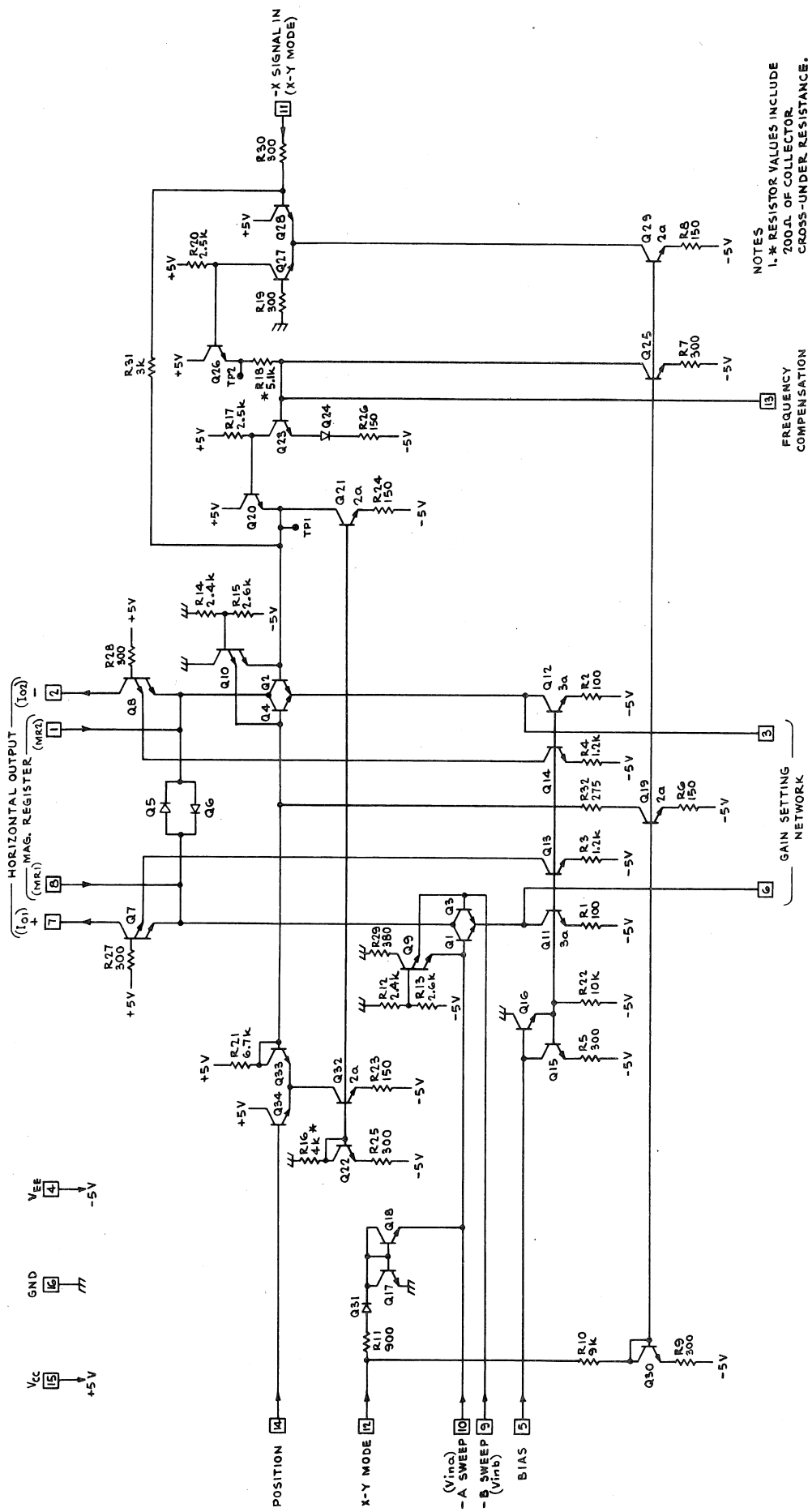
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5V, V_{EE} -5V

PACKAGE 16 Pin DIP

DESIGNER Bob Nordstrom

INSTRUMENT USAGE 455



NOTES
 1. * RESISTOR VALUES INCLUDE
 200.Ω OF COLLECTOR
 CROSS-UNDER RESISTANCE.

ENGR	R. Plonkin	9-19-74	PROCESS	700A/D
DWBY	R. Handline	9-16-74	PACKAGE	16 PIN DIP
CHK BY	J. M. Gandy	11-12-74	DIE SITE	55 mil x 55 mil
TYPE	MONOLITHIC	HORIZONTAL PREAMPLIFIER M138		
INTEGRATED CIRCUIT ENG./MFG. TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A. PART NO. 155-0124-00				

DESCRIPTION

This circuit is comprised of four cascaded decade counters, each with a buffer memory, each of which can drive the decimal to analog converter. Thus it can count up to 9999, store the count at anytime and convert it to an output form suitable for interfacing with the New Generation knob-readout system. Output pulses are also provided at the output of the 2nd, 3rd, and 4th decades. A zero-not output is provided for leading zero's blanking. Maximum input frequency is 15 MHz.

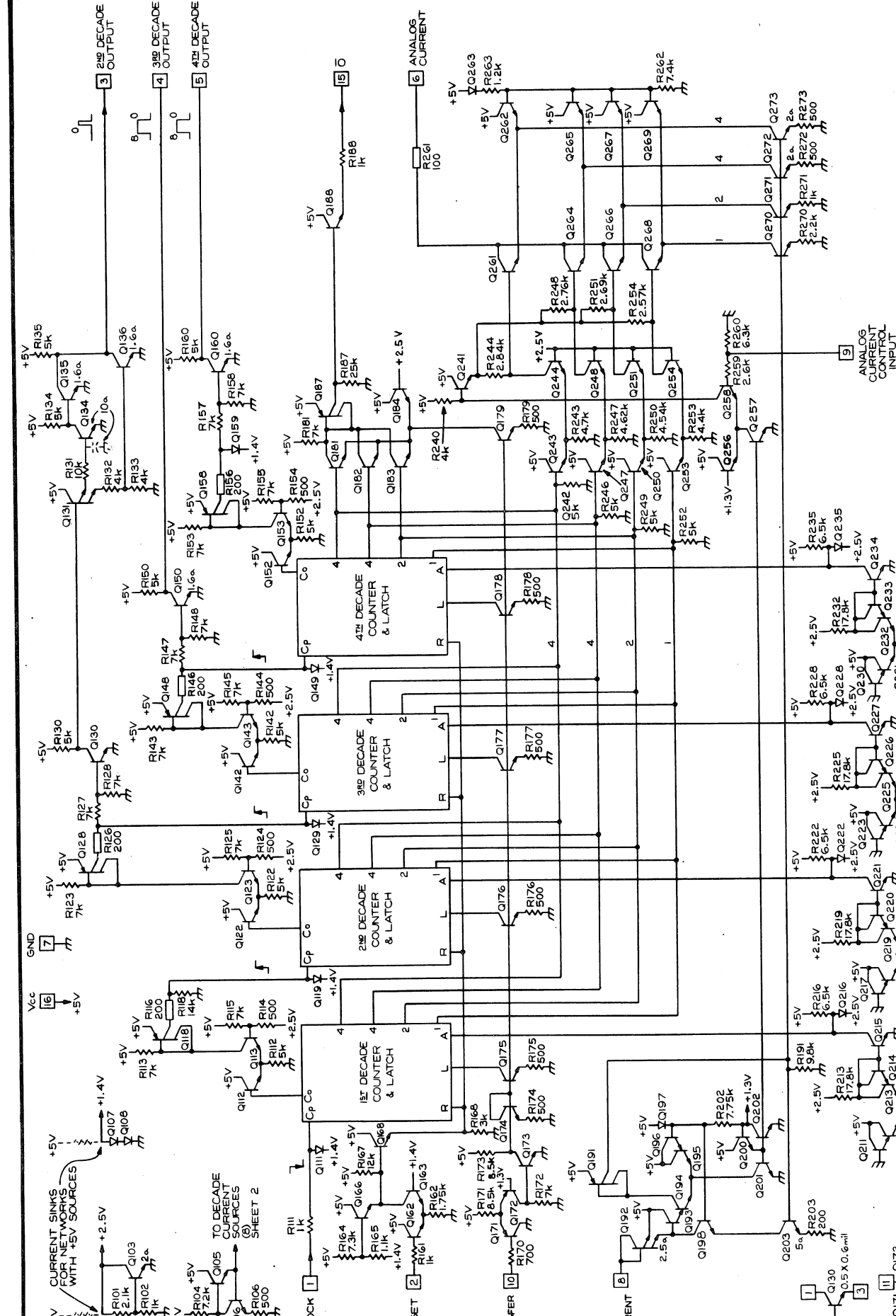
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5 Volts

PACKAGE 16 Minipac

DESIGNER Mike Metcalf

INSTRUMENT USAGE 7J20 7D12
7D15 7B85
7D01

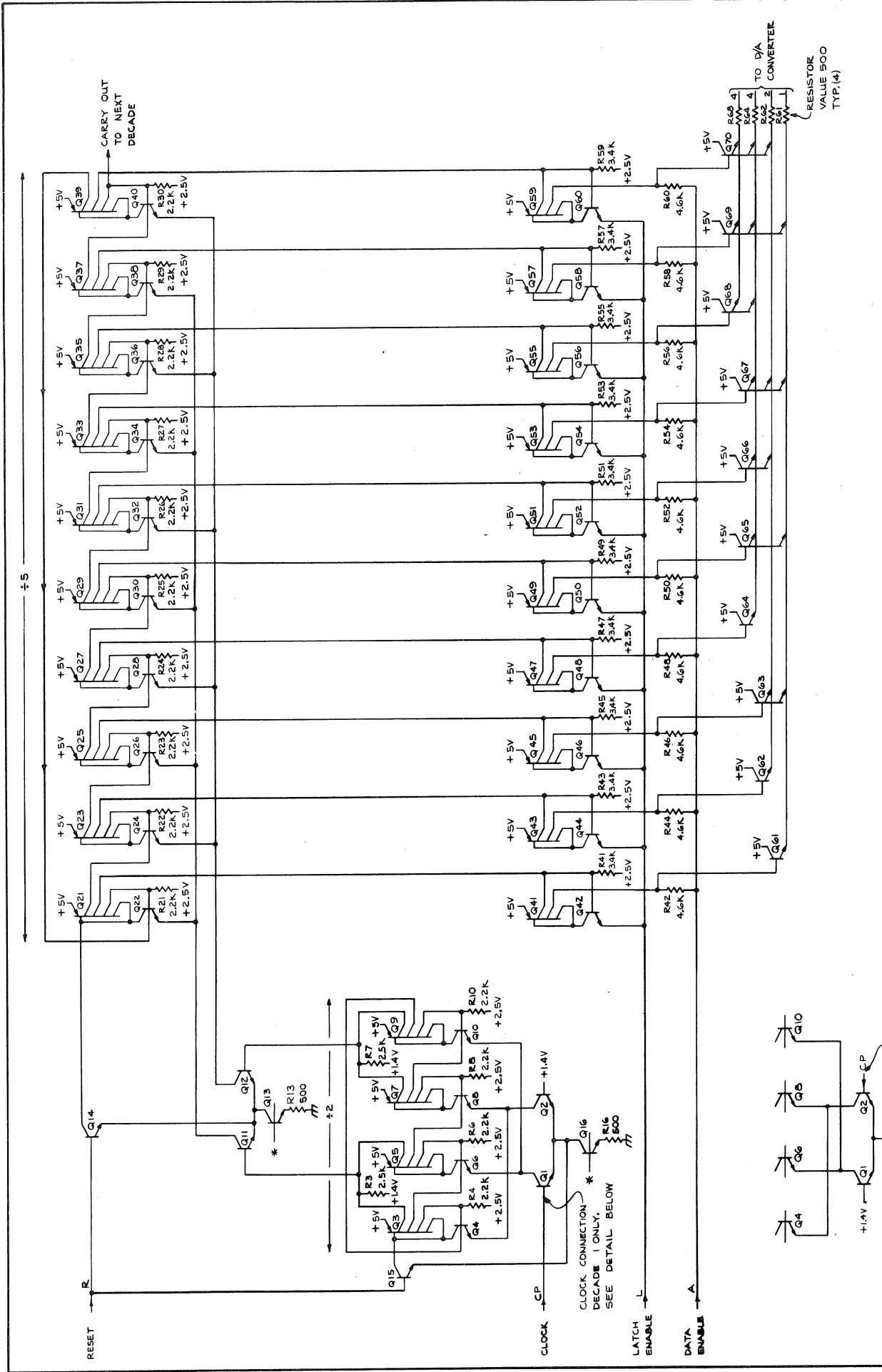


REVISIONS:

REVISED:	ENGR	M.H. Mendenhall	3-11-76	PROCESS	2.00A/5
	DWN BY	J. Langley	3-9-76	PACKAGE	16 PIN MINIPAC
	CHK BY	W. J. ...	4-4-77	DIE SIZE	32mil X 86mil
	TYPE	MONOLITHIC		4 DECADE	COUNTER & MEMORY
				INTEGRATED CIRCUIT ENG/MFG	M150A
				BEAVERTON, OREGON, U.S.A.	PART NO. 155-0171-00
					SH 1 of 2

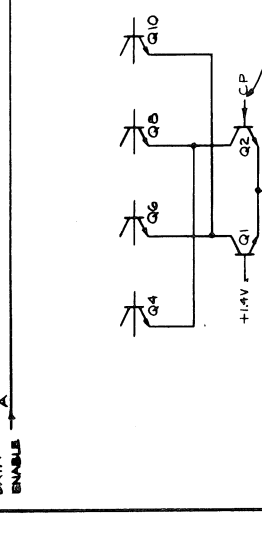
NOTE: 1-10 INDICATES CROSS-UNDER RESISTOR.

TEST ROW: 151st DECADE, 2nd DECADE, 3rd DECADE, 4th DECADE, READ, READ DECADE, READ DECADE, READ DECADE.



ENGR. *M.H. Anderson* 3-11-76 PROCESS 200-2/0
 DWN BY S. POLENEY 2-12-76 PACKAGE 16 PIN MINIPAC
 CHK BY *Steve Nettles* 4-4-77 DIE SIZE 92mil X 86mil
 TYPE MONOLITHIC 4 DECADE COUNTER M 150A
 INTEGRATED CIRCUIT ENGINEERING
 BEAVERTON, OREGON, USA PART NO. 155-0171-00 SH 2 OF 2

NOTES:
 1. * FOR CURRENT SOURCE CONTROL SEE SHEET 1.



PULSE OUTPUT AMPLIFIER

155-0145-00 M151

DESCRIPTION

This circuit provides a controlled risetime output pulse occurring between ground and a programmable negative level, given a TTL input pulse. Two such amplifiers are provided per package.

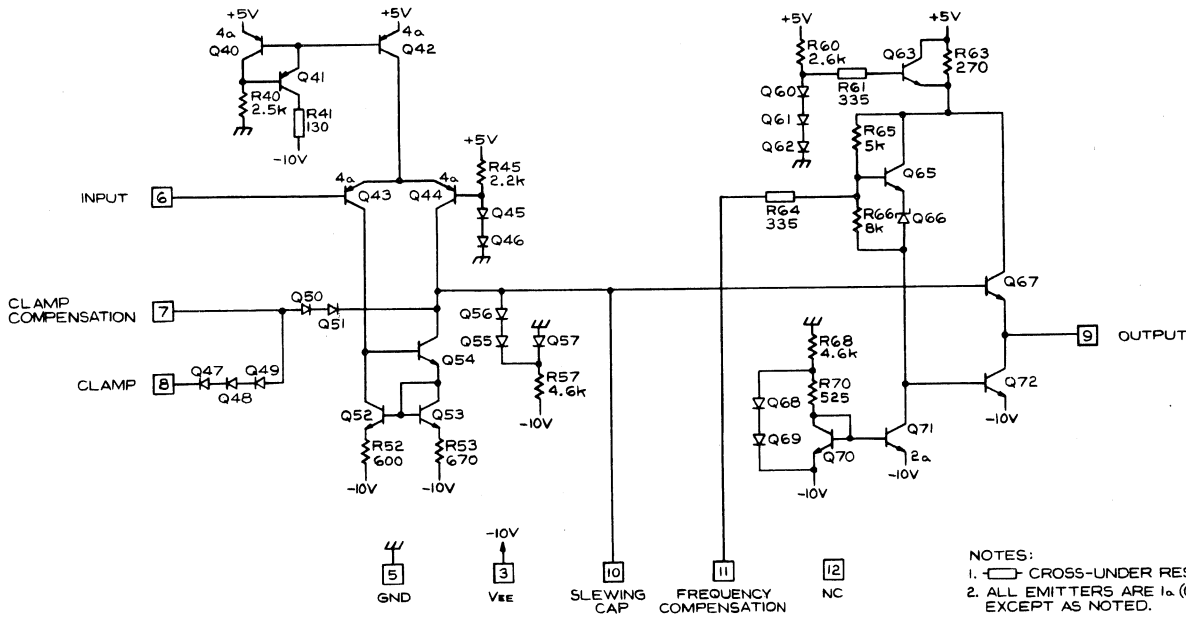
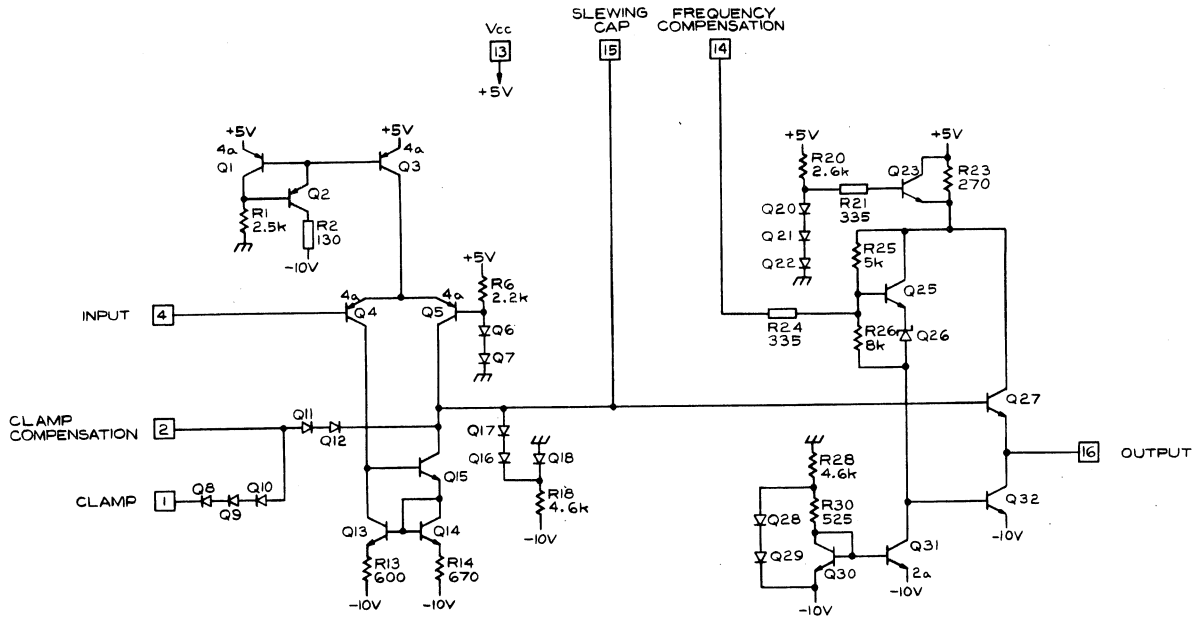
PROCESS 200 Ω /Sq

POWER SUPPLY. +5V to -10V

PACKAGE 16 DIP

DESIGNERS. Howard Landsman/
Ken Schlotzhauer

INSTRUMENT USAGE 1410
1470



NOTES:
 1. CROSS-UNDER RESISTORS.
 2. ALL EMITTERS ARE 1a (0.4mil X 0.6mil) EXCEPT AS NOTED.

ENGR	<i>J. Langley</i>	12-29-75	PROCESS	200n/a
DWN BY	J. Langley	12-17-75	PACKAGE	16 PIN DIP
CHK BY	<i>Linda Berg</i>	1-15-76	DIE SIZE	51mil X 70mil
TYPE	MONOLITHIC		PULSE OUTPUT AMPLIFIER	MISIA
INTEGRATED CIRCUIT ENG/MFG			PART NO. 155-0145-00	
TEKTRONIX, INC.			BEAVERTON, OREGON, U.S.A.	

DESCRIPTION

The M152 is designed to appropriately predistort "X" and "Y" signals before they are applied to the electromagnetic deflection coils of a CRT, in such a way as to eliminate "pincushion" distortion. It also provides a signal to correct for spot de-focusing that occurs away from the screen's center. The circuit may be used in CRT's of various deflection angles (up to 90°) by adjusting the values of two external resistors.

Mathematically, the following signals are available as outputs:

$$|x|, |y|, \frac{\sqrt{1 + (K_1 X)^2 + (K_2 Y)^2}}{K_3}$$

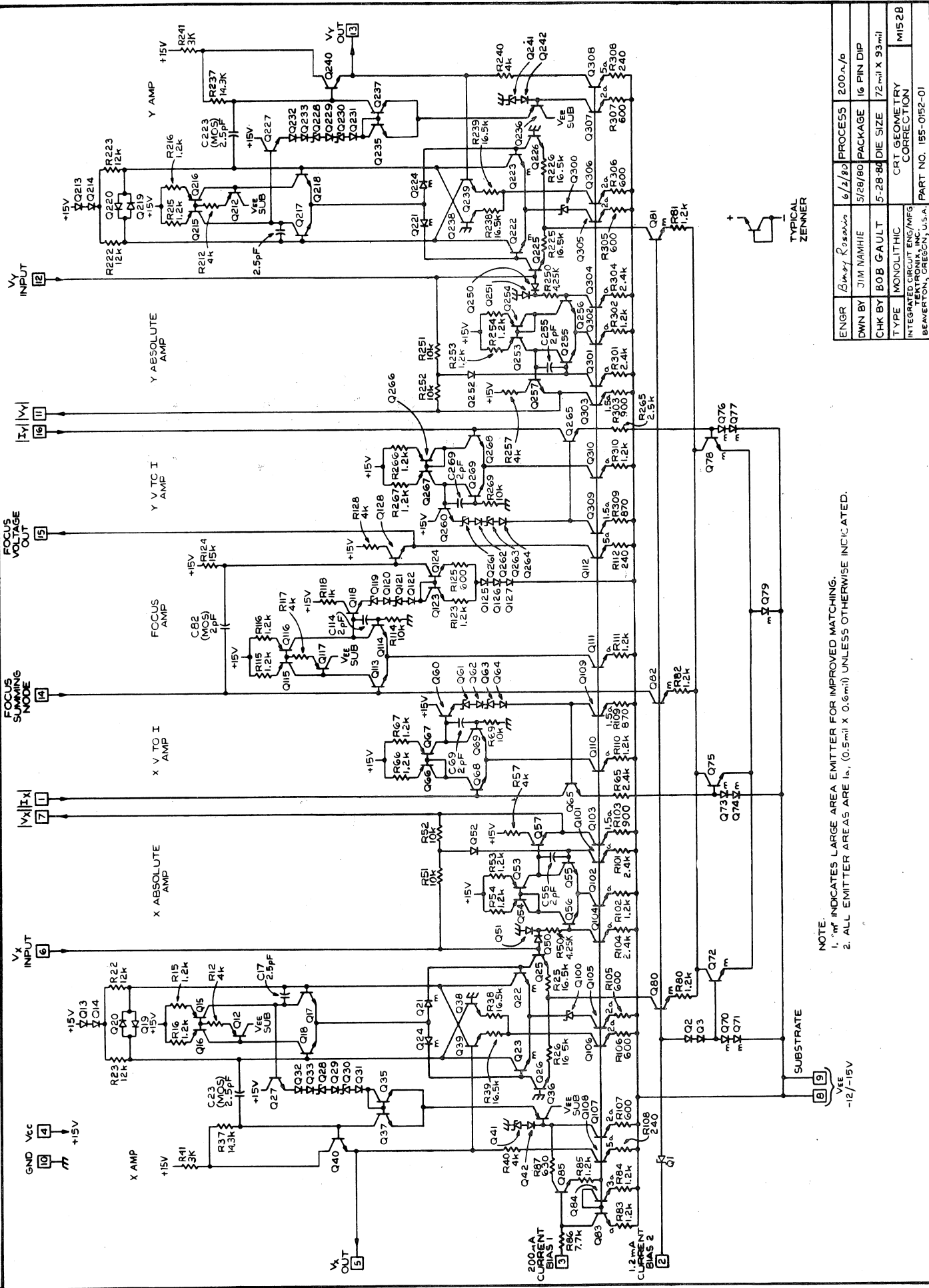
$$K_3 = \frac{X}{\sqrt{1 + (K_1 X)^2 + (K_2 Y)^2}}$$

$$\frac{Y}{\sqrt{1 + (K_1 X)^2 + (K_2 Y)^2}}$$

$$\frac{Y}{\sqrt{1 + (K_1 X)^2 + (K_2 Y)^2}}$$

Where K_1 , K_2 , and K_3 are adjustable externally.

PROCESS	200 Ω/Sq
POWER SUPPLY.	+15V, -12V, (-15V Optional)
PACKAGE	16 DIP (Plastic)
DESIGNERS.	Binoy Rosario Harvey Golladay
INSTRUMENT USAGE	4006



NOTE:
 1. "m" INDICATES LARGE AREA EMITTER FOR IMPROVED MATCHING.
 2. ALL EMITTER AREAS ARE 1 μ (0.5mil X 0.6mil) UNLESS OTHERWISE INDICATED.

ENGR	Binet, Rosanna	6/2/80	PROCESS	200n/a
DWN BY	JIM MAMMIE	5/28/80	PACKAGE	16 PIN DIP
CHK BY	BOB GAULT	5-28-80	DIE SIZE	72 mil X 93 mil
TYPE	MONOLITHIC		CRT GEOMETRY CORRECTION	M1528
INTEGRATED CIRCUIT ENGINEERING ELECTRONICS, INC. BENVENUTO, CALIFORNIA, U.S.A. PART NO. 155-0152-01				

200 μ A
 CURRENT
 BIAS 1

1.2 mA
 CURRENT
 BIAS 2

200 n/a

16 PIN DIP

72 mil X 93 mil

M1528

CRT GEOMETRY CORRECTION

ELECTRONICS, INC.

BENVENUTO, CALIFORNIA, U.S.A.

PART NO. 155-0152-01

DESCRIPTION

The M154 transmits one of three sets of inputs (hardcopy alpha-numeric-mode or vector-mode) in accordance with the appropriate two-bit instruction on lines "A" and "B". Each input set has "X" and "Y" channels.

A counter sequences through eight offset positions each time a "page" (erase) signal is received. These offsets are added to the "X" and "Y" inputs to uniformly exercise the phosphor on all parts of the screen.

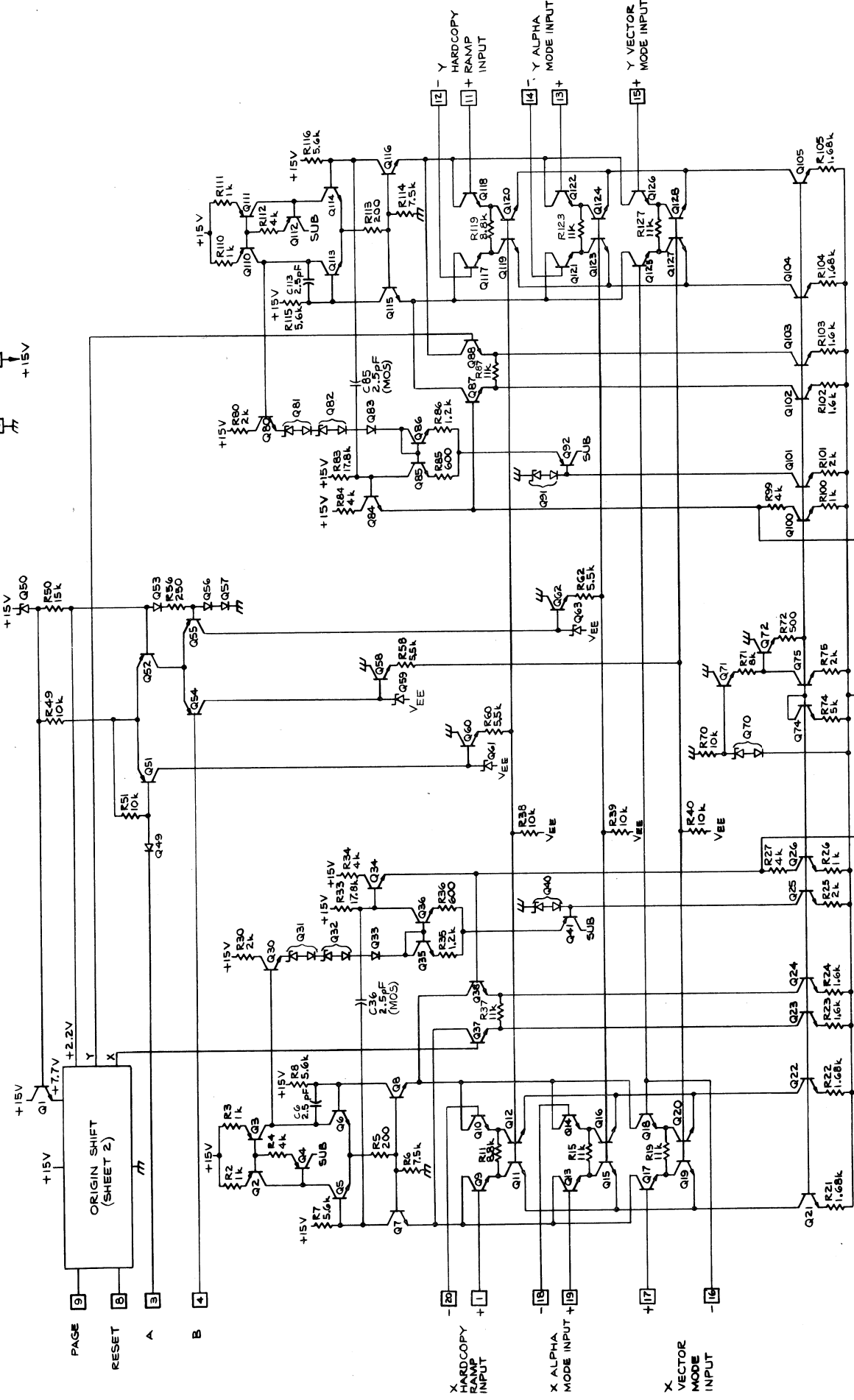
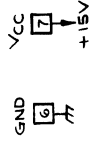
PROCESS 200 Ω /Sq

POWER SUPPLY. +15V, -12V (-15V Optional)

PACKAGE 20 DIP (Plastic)

DESIGNER Harvey Golladay

INSTRUMENT USAGE 4006

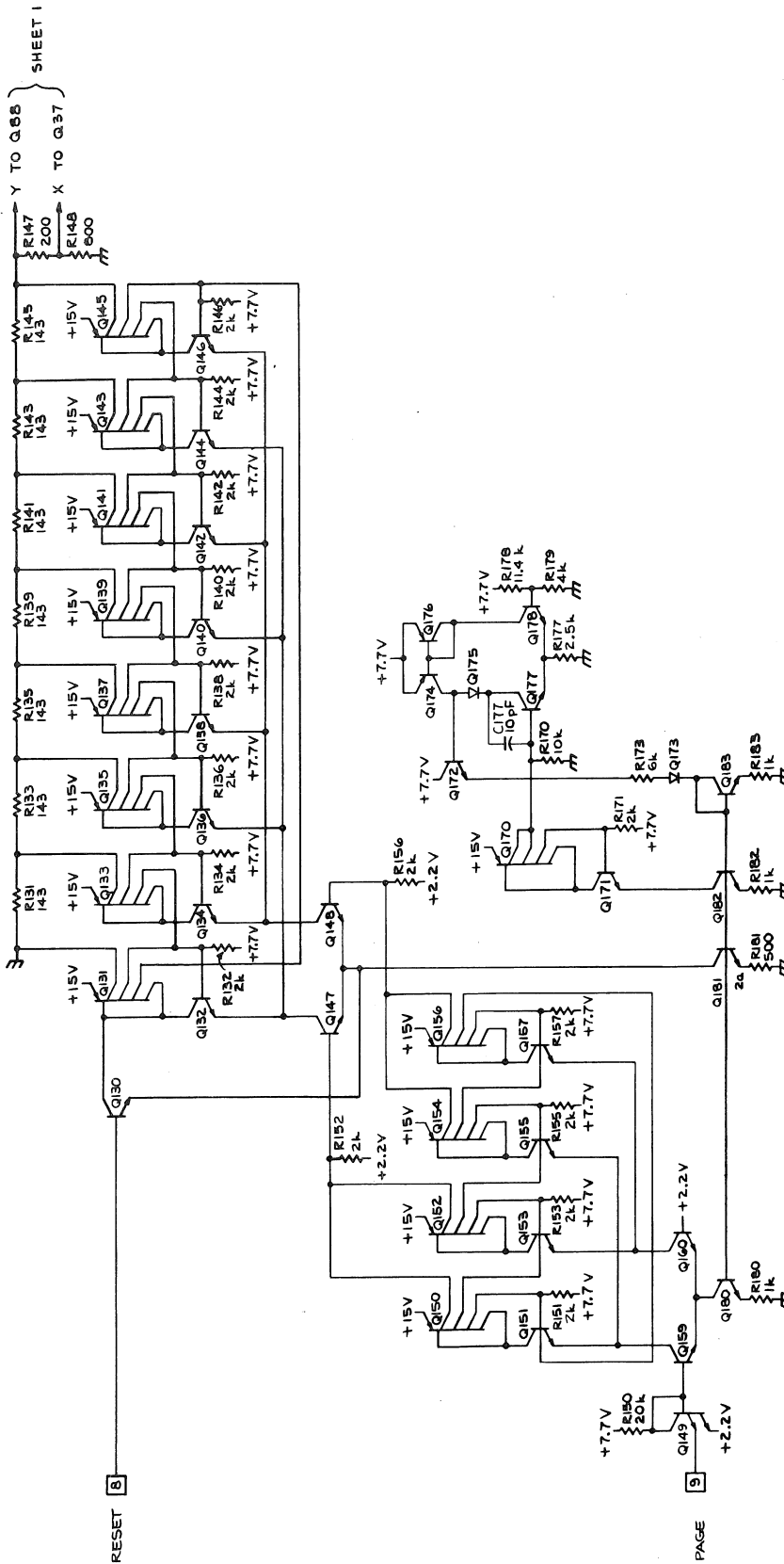


PAGE 9
RESET 8
A 3
B 4

X HARD COPY RAMP INPUT 12
X ALPHA MODE INPUT 19
X VECTOR MODE INPUT 17

ENGR	B. P. ...	1-14-77	PROCESS	200-42 / □
DWN BY	S. POLENDEY	7-6-76	PACKAGE	20 PIN DIP
CHK BY	S. ...	3-4-77	DIE SIZE	90 mil. X 66 mil.
TYPE	MONOLITHIC	DISPLAY		
INTEGRATED CIRCUIT ENGINEER	TEKTRONIX INC.	MULTIPLEXER		M154
BEAVERTON, OREGON, USA. PART NO. 155-0154-00 SH.1 OF 2				

Y OUT 10
VEE -12/-15V 5
X OUT 2



ENGR	B. Romano	1-14-77	PROCESS	200 52 / □
DWN BY	S. POLENDEY	7-6-76	PACKAGE	20 PIN DIP
CHK BY	S. G. GARDNER	3-4-77	DIE SIZE	90 mil. X 66 mil.
TYPE	MONOLITHIC		DISPLAY	M154
	INTEGRATED CIRCUIT ENGINEERING		MULTIPLEXER	
	BENTON, OREGON, U.S.A.		PART NO. 155-Q154-00	SH. 2 OF 2

DESCRIPTION

The M155A is a 17 level digitizer (4-bits plus over-range), and is designed specifically for use in parallel-serial A/D converter systems. It consists of 16 comparator cells, digital encoding circuitry, and output drivers.

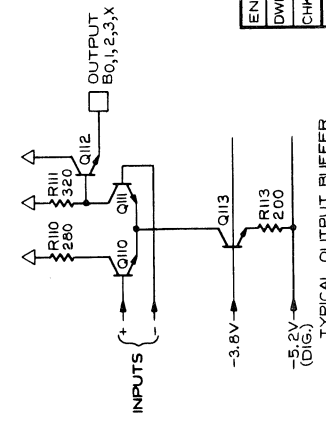
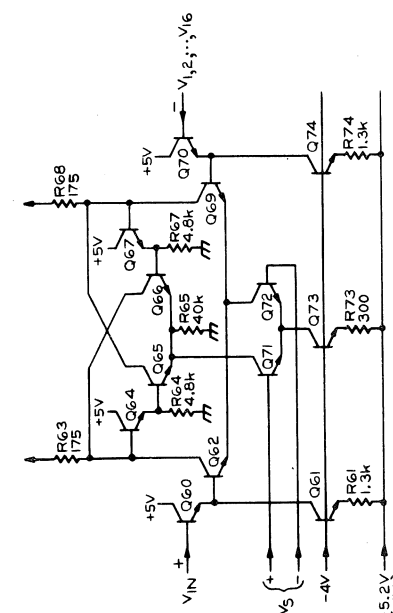
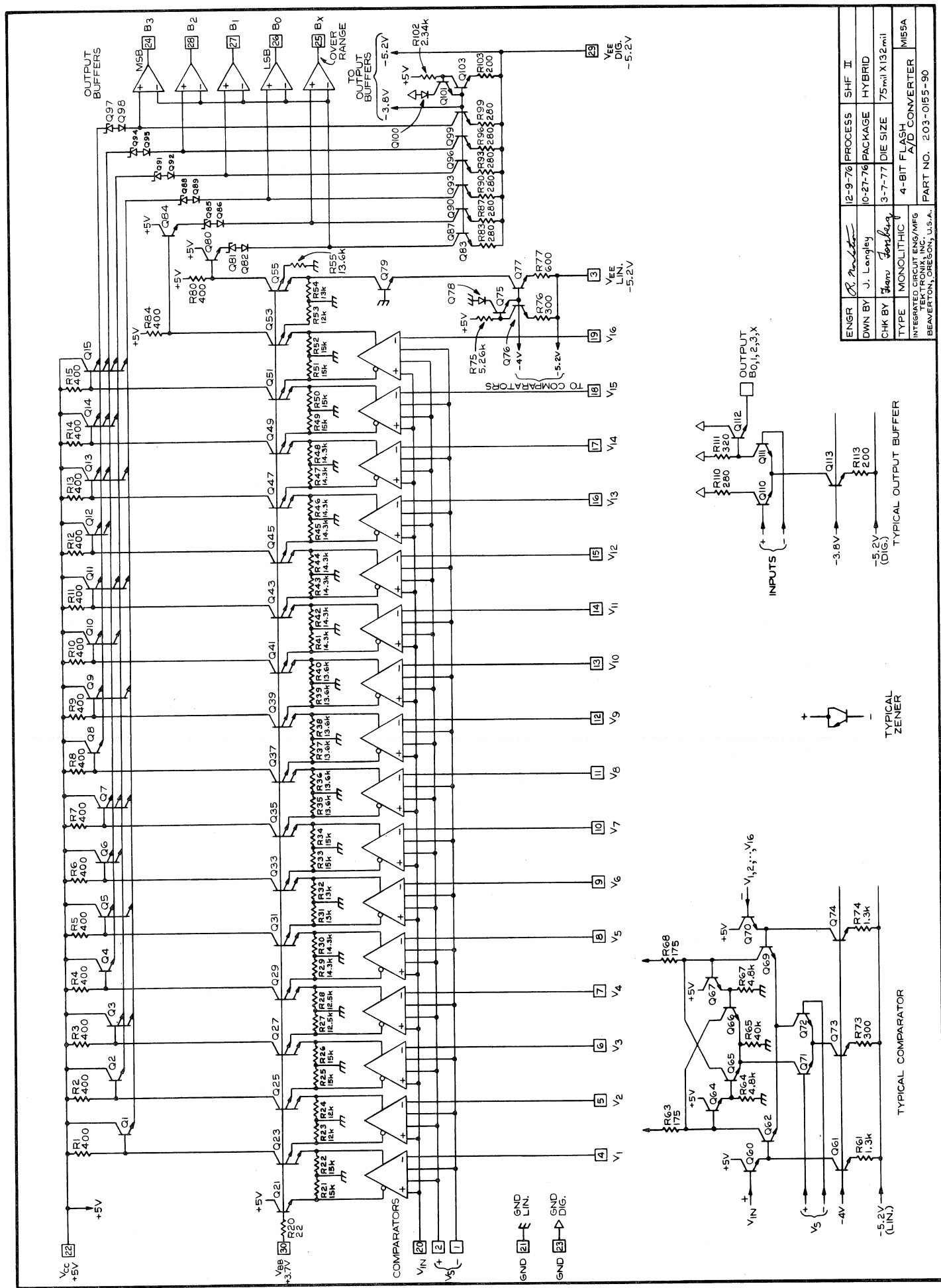
The comparators have a common input V_{in} and separate, monotonically increasing, reference voltages which may be derived from an external resistor string (155-0165-00/01, H508). A strobe command forces each comparator (simultaneously) to make a binary decision. Further changes in input are locked out so that the circuit functions as a digital sample-and-hold. This is done by steering a current source from the input differential pair to a cross-coupled latching pair.

Sixteen common base transistors encode the comparator output to a one-of-sixteen code which is translated to binary by 16 multiple-emitter common collector transistors. The digital data is then level shifted to the output drivers and is valid at the output within 5 nS of strobing.

The inclusion of the sixteenth comparator (over-range) makes it possible to directly combine two M155A integrated circuits for a 5-bit parallel A/D converter.

Input Range	$\pm 1.5V$ OR \emptyset to 3V
Power Dissipation	850 mW
Output	ECL (Binary)
Maximum Clock Rate	80 MHz
Input Bandwidth	5 MHz

PROCESS	SHF II Double Layer Metal
POWER SUPPLY	+5.0V, -5.2V
PACKAGE.	TEKFORM 35000 (Hybrid) Square Metal Can
DESIGNER	Bob Nordstrom
INSTRUMENT USAGE.	

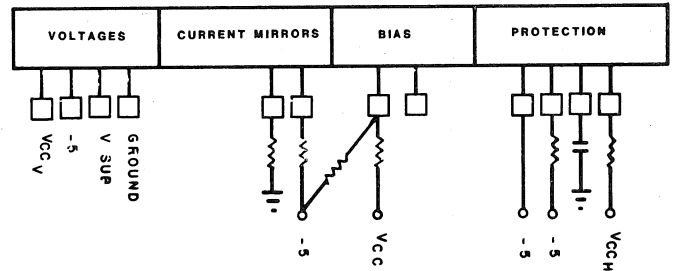
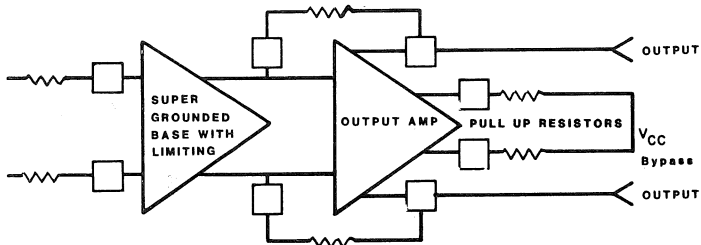


ENGR	R. R. R.	PROCESS	SHF II
DWN BY	J. Langley	PACKAGE	HYBRID
CHK BY	Frank Borzage	DIE SIZE	75mil X 132mil
TYPE	MONOLITHIC	4-BIT FLASH CONVERTER	
INTEGRATED CIRCUIT ENG/MFG		PART NO. 203-0155-90	
BEAVERTON, OREGON, U.S.A.		M55A	

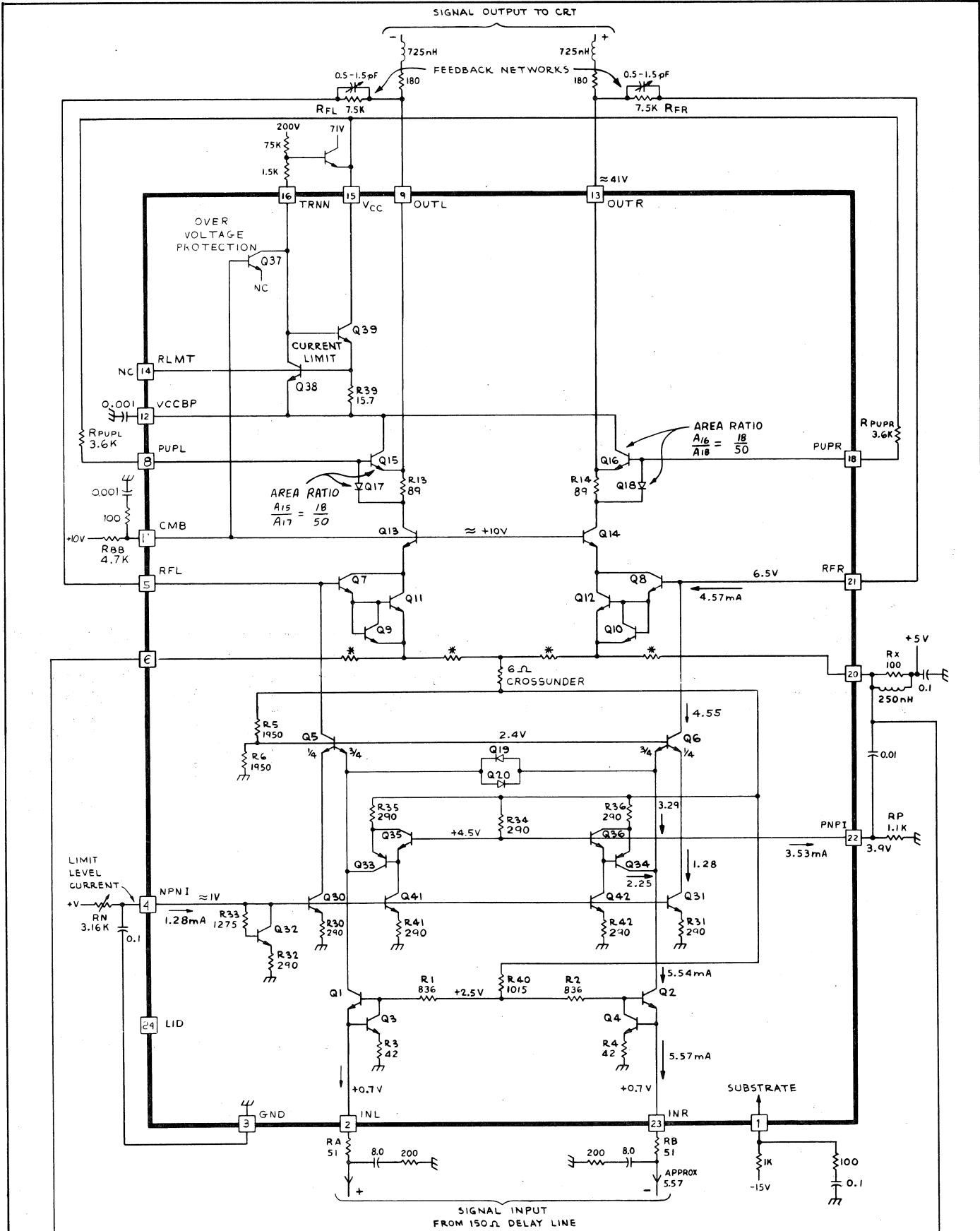
DESCRIPTION

The M156 is a Low Power Vertical Output Amplifier, Class AB, up to 50 MHz bandwidth, up to 45 volts swing per side (± 45 volt differential). Short circuit protection, output limiting and input circuit for delay line termination are on-chip.

M156 (Vertical)



PROCESS	HVIC II
POWER SUPPLY.	$\pm 5V$, V_{CC} Up to 65V
PACKAGE	24 DIP Ceramic or Hybrid
DESIGNER	Carl Battjes
INSTRUMENT USAGE	5223



NO CONNECTION TO
PIN 7, 10, 17 & 19

- NOTES:
1. \square INDICATES PIN NUMBERS
PINS ARE NUMBERED CLOCKWISE
LOOKING AT LID SURFACE OF 24 PIN
CERAMIC PACKAGE
 2. RESISTOR VALUES AT 25°C
 3. * METAL OHMS \approx .6Ω

ENGR	<i>Carl R. B. [Signature]</i>	1-20-77	PROCESS	HVICII
DWN BY	R. Hankins	19NOV76	PACKAGE	24 PIN CERAMIC
CHK BY	BOB GAULT	17OCT76	DIE SIZE	55mil X 67mil
TYPE	MONOLITHIC		LOW POWER CLASS AB VERTICAL AMPLIFIER	M156
INTEGRATED CIRCUIT ENG/MFG	TEKTRONIX, INC.		PART NO. 155-Q207-00	
	BEAVERTON, OREGON, U.S.A.			

DESCRIPTION

This Integrated Circuit is intended for use in scopes with up to 100 MHz bandwidth. It employs SHF II processing with ECL circuitry, and requires +5 volt and -5 volt power supplies with a power dissipation of 310 mW. Low frequency sensitivity is typically 7.5 mV to 25 MHz and increases by a factor of 3 at 100 MHz. DC trigger input levels are around 0 volts. Features include slope selection, hysteresis adjustment, trigger level centering, free-run input, trigger-view outputs centered around ground, and an operational amplifier with typical open-loop gain of 500. The gate and gate complement signals are at ECL levels. A Schmitt trigger circuit accepts reset signals with slow transistions.

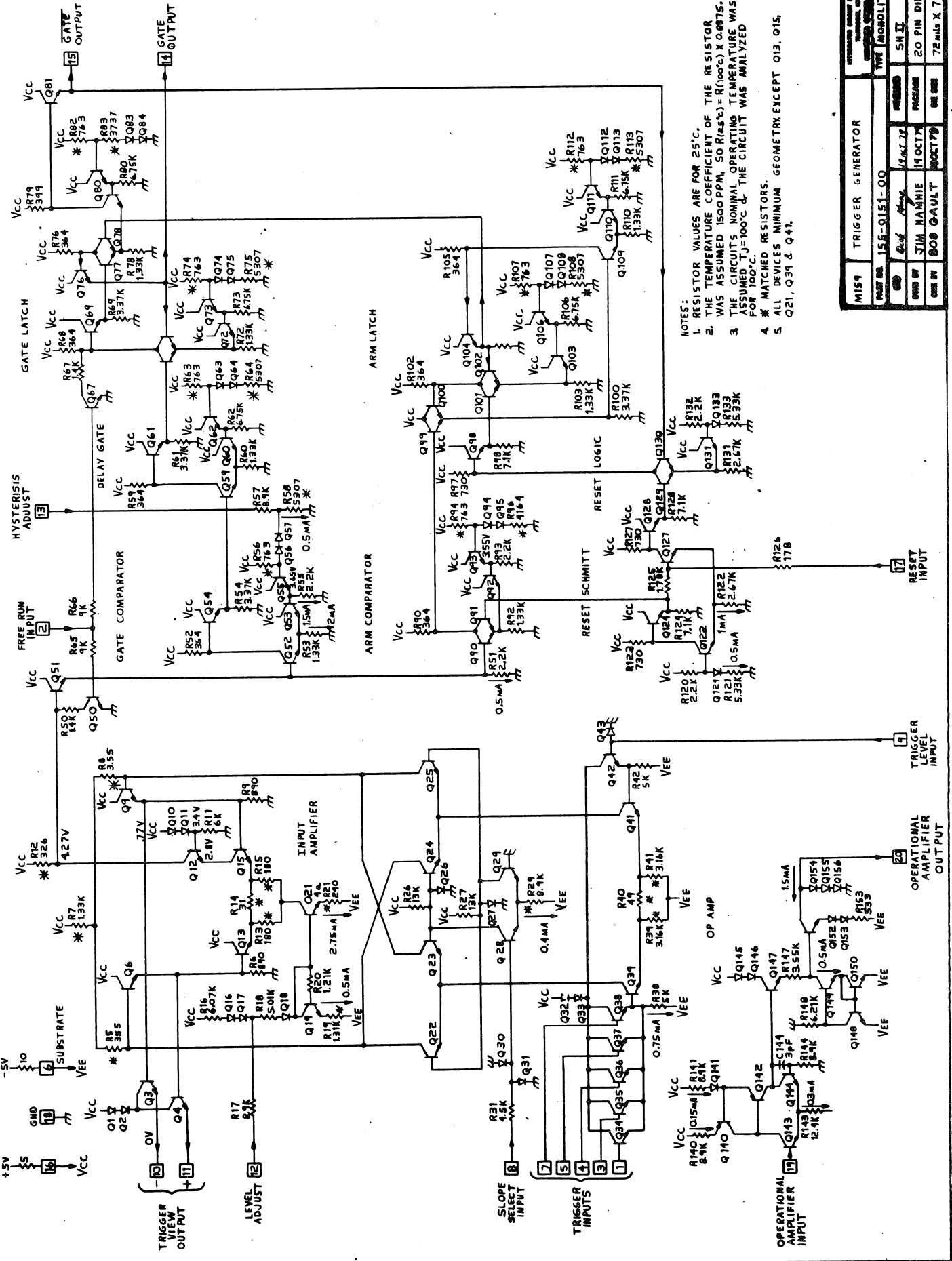
PROCESS SHF II

POWER SUPPLY. $V_{CC} +5V, V_{EE} -5V$

PACKAGE 20 Pin DIP
(Kovar-Copper-Kovar)

DESIGNER Gerald McMorrow

INSTRUMENT USAGE 465M



- NOTES:
1. RESISTOR VALUES ARE FOR 25°C.
 2. THE TEMPERATURE COEFFICIENT OF THE RESISTOR WAS ASSUMED 150PPM, SO $R_{(25^\circ C)} = R_{(100^\circ C)} \times 0.9975$.
 3. THE CIRCUIT'S NOMINAL OPERATING TEMPERATURE WAS ASSUMED 100°C & THE CIRCUIT WAS ANALYZED FOR 100°C.
 4. * MATHED RESISTORS.
 5. ALL DEVICES MINIMUM GEOMETRY EXCEPT Q13, Q15, Q21, Q39 & Q41.

M159 TRIGGER GENERATOR	
PART NO.	159-0151-00
REV.	1
DATE	1/24/72
DESIGNED BY	JIM MAMIE
PACKAGE	20 PIN DIP
CHECKED BY	BOB GAULT
DATE	08/07/70
SIZE	72 MILS X 72 MILS
MATERIALS LIST	
Q1-Q15	TI MOSOLITHIC
Q16-Q20	5N11

CHARACTER GENERATOR

155-0023-00 M160
155-0024-00 M161
155-0025-00 M162
155-0026-00 M163
155-0027-00 M164

DESCRIPTION

This integrated circuit was designed to generate the X- and Y- waveforms corresponding to ten different alphanumeric symbols, under control of an external scanning voltage. There are four different sets of symbols, designated by the suffixes -N (numbers), -L (letters), -S (symbols) and -P (prefixes).

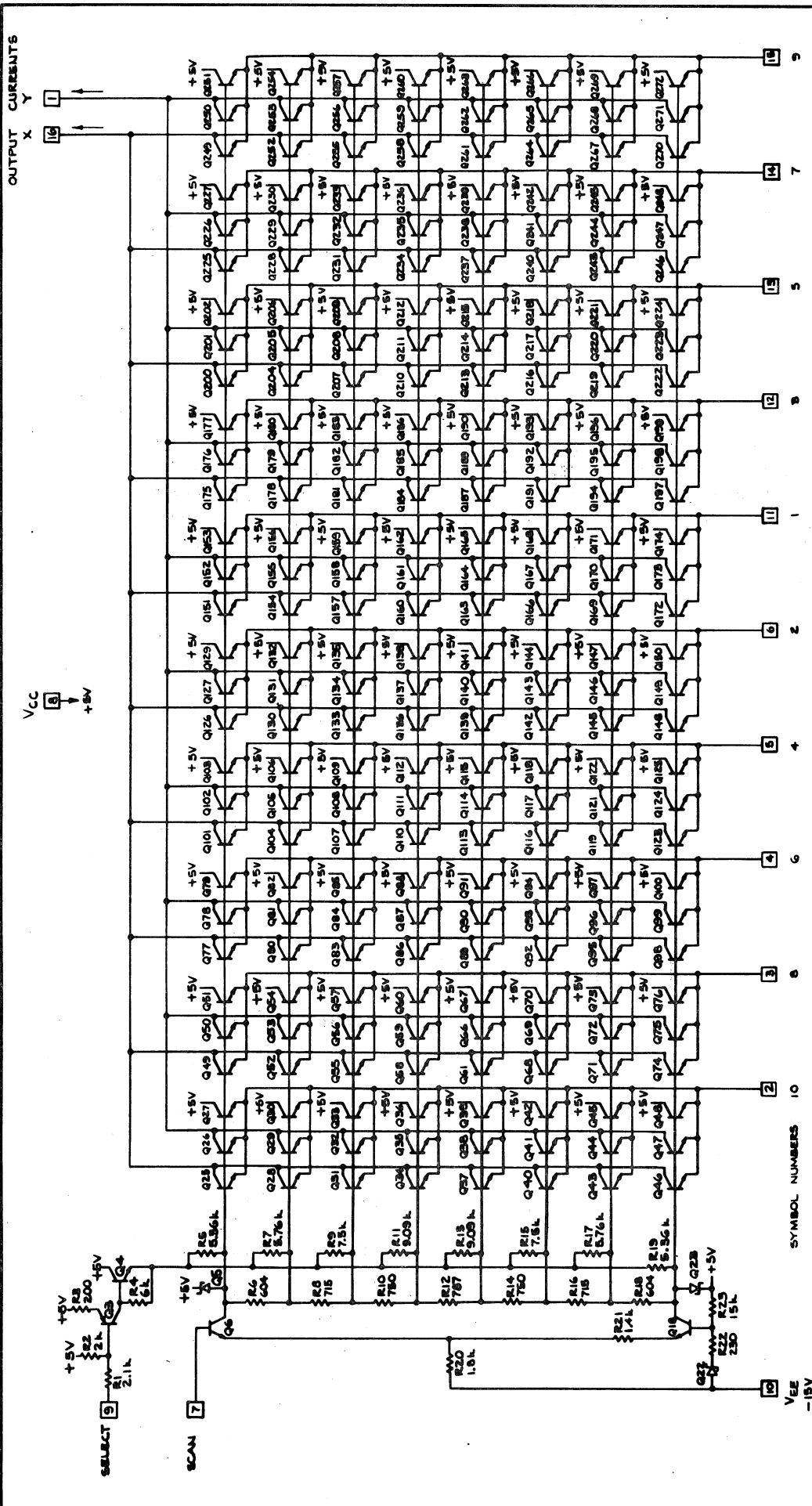
PROCESS 200 Ω /Sq

POWER SUPPLY. V_{CC} +5V, V_{EE} -15V

PACKAGE 16 DIP

DESIGNER Barrie Gilbert

INSTRUMENT USAGE 5403 7603K
5440 7514
5441 7704A
5443 A7704
7313 R7704
7613 7844
7633 7903
7603 7904
7603G 7912
7603H 7504
P7001



SYMBOL NUMBERS 10 9 8 7 6 5 4 3 2 1

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

OUTPUT CURRENENTS X Y

VCC 5 +5V +5V

VEE -15V

SELECT 9

SCAN 7

Q25 THRU Q27

TYPICAL EMITTER CONFIGURATION (90)

SEE TABLE FOR NUMBER OF CONNECTED EMITTERS

ENGR	Mr. H. Anderson	10/13/79	PROCESS	200.02 / □
DWN BY	JIM NAMHIE	10/24/79	PACKAGE	16 PIN DIP
CHK BY	BOB GAULT	10-30-79	DIE SIZE	71 mil X 75 mil
TYPE	MONOLITIC		CHARACTER GENERATOR	MIGXA
INTG. BY	BOB GAULT			
	BEAVERTON, OREGON, U.S.A.			

155-0023-00 MIG0
 155-0024-00 MIG1
 155-0025-00 MIG2
 155-0026-00 MIG3
 155-0027-00 MIG4

PART NO. 155-002X-00

LEGEND GENERATOR

155-0086-00 M165
155-0087-00 M166
155-0088-00 M167
155-0104-00 M169
155-0105-00 M170
155-0135-00 M171

DESCRIPTION

12 x 10 x 4 read only memory coupled to a 4-bit D/A converter with internal precision current sources requiring a single precision external reference. This output is directly compatible with KRO row and column data lines. The ten "memory positions" are scanned by a 4-bit B.C.D coded input which may be 0 to -15 Volt time slot data or T² levels or any combination thereof. The 12 "word" lines are T² compatible only and NEG true. Several "word lines" may be true at one time as long as memory locations (time slots) are not shared.

Intended applications are for encoding of CRT read-out directly with electrically alterable information. Other variations are possible, such as it may be used to multiplex and encode three, 4-bit words.

Programming is accomplished by inexpensive preohmic and emitter mask changes.

PROCESS 200 Ω/Sq

POWER SUPPLY. V_{CC} 0V, V_{EE} -15V

PACKAGE 20 DIP

DESIGNERS. Roger McCoy/Mike Metcalf

INSTRUMENT USAGE 155-0086-00: 7D15 (R)
155-0087-00: 7D15 (C1)
155-0088-00: 7D15/7L13 (C2)
155-0104-00: 7J20 (C3/C3A)
155-0105-00: 7J20 (A/R3)

ROM PROGRAMMING - TIME SLOT

155-0086-00 M165

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

155-0087-00 M166

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

NOTE: The number in the square is in terms of tenths of milli-amp output current. The crossed out area is not used.

ROM PROGRAMMING - TIME SLOT

155-0088-00 M167

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

155-0104-00 M169

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

NOTE: The number in the square is in terms of tenths of milli-amp output current. The crossed out area is not used.

ROM PROGRAMMING - TIME SLOT

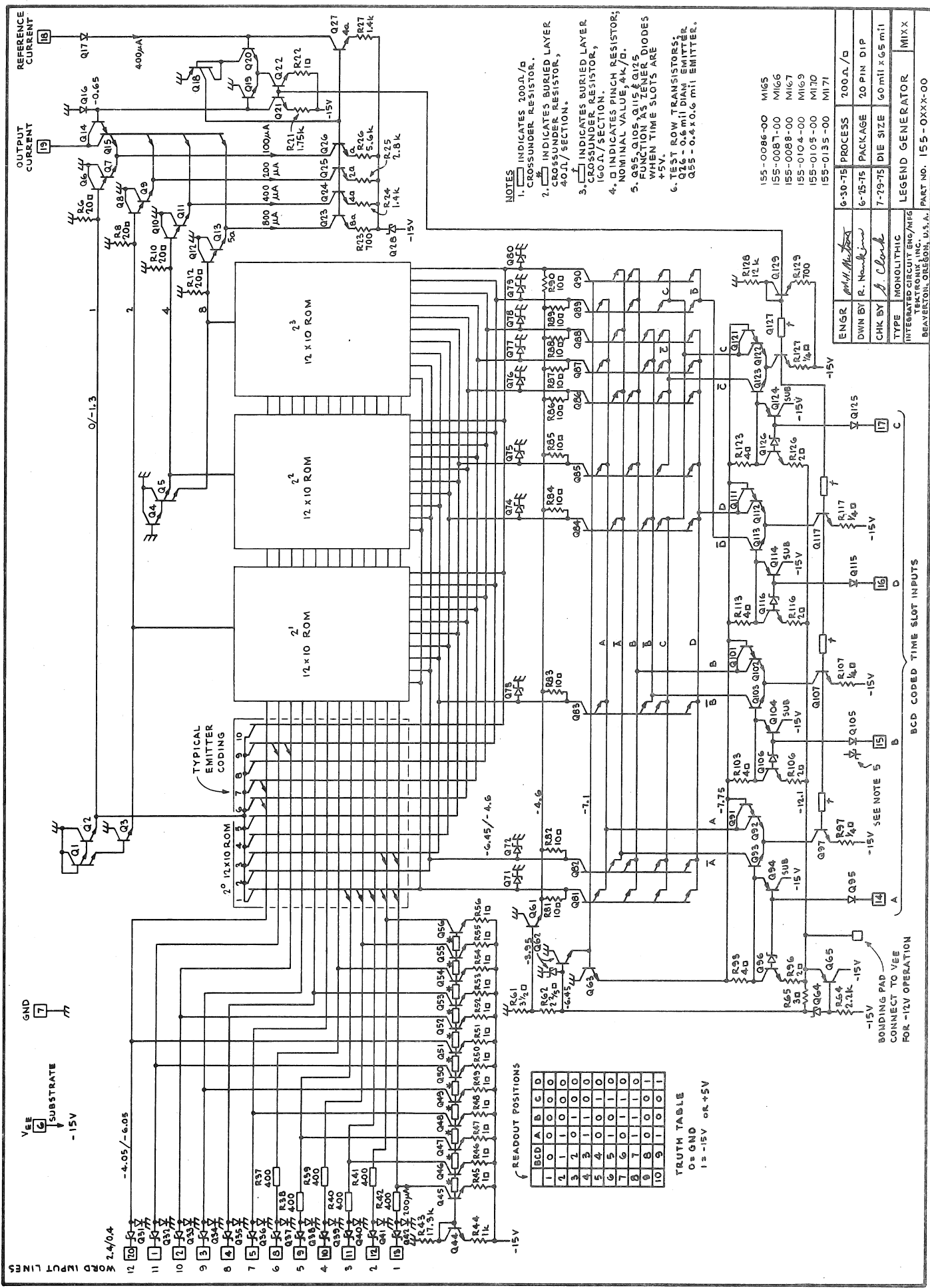
155-0105-00 M170

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

155-0135-00 M171

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1				1	1	1	1									
2				2	2	2	2									
3				4	4	4	4									
4				8	8	8	8									
W	5	1														
	6	2														
O	7							1								
	8							2								
R	9	6														
	10	1														
D	11		10													
	12	10														

NOTE: The number in the square is in terms of tenths of milli-amp output current. The crossed out area is not used.



- NOTES
1. □ INDICATES 200Ω/D CROSSUNDER RESISTOR.
 2. □ INDICATES BURIED LAYER CROSSUNDER RESISTOR, 40Ω/SECTION.
 3. □ INDICATES BURIED LAYER, 160Ω/SECTION.
 4. □ INDICATES PINCH RESISTOR, 160Ω/SECTION.
 5. Q95, Q105, Q115 & Q125 FUNCTION AS TENER DIODES WHEN TIME SLOTS ARE +5V.
 6. TEST ROW TRANSISTORS: Q26 - 0.6 mil DIAM. EMITTER, Q55 - 0.4 x 0.6 mil EMITTER.

155-0086-00	M165
155-0087-00	M166
155-0088-00	M167
155-0104-00	M169
155-0105-00	M170
155-0135-00	M171

ENGR	<i>[Signature]</i>	6-30-75	PROCESS	200Ω/□
DWN BY	R. Newland	6-25-75	PACKAGE	20 PIN DIP
CHK BY	J. Clark	7-29-75	DIE SIZE	60 mil x 65 mil
TYPE	MONOLITHIC		LEGEND GENERATOR	MIX X
INTEGRATED CIRCUIT ENG./MFG.		BEAVERTON, OREGON, U.S.A.		
		PART NO. 155-0XXX-00		

BONDING PAD TO VEE
 CONNECT TO VEE
 FOR -12V OPERATION

BCD CODED TIME SLOT INPUTS

DESCRIPTION

Each M175 integrated circuit contains two complete strobed voltage comparators. A strobed comparator is different from the more familiar continuous duty comparator in that comparison decisions are made only on the strobe edge. This is a high performance component for clock-driven A/D converters, logic analyzer inputs, and digital test systems.

Internally each comparator is arranged in a master-slave configuration which holds the output data valid for a complete clock cycle. Output is a fixed current steered through either collector of a pair of common base NPN transistors. The output current will give sufficient voltage at the remote end of properly terminated transmission lines to accurately drive ECL or TTL differential line receivers. Strobe inputs are level shifted and attenuated differential ECL signals. Only a few hundred millivolts of strobe inputs are needed to operate the comparators. Though full ECL swings can be used, this unnecessarily brings large signal transients onto the die. For the strobe low input, the Master stage functions as a wide-band differential cascode amplifier. The Slave stage now performs as an amplifier in transmitting the decision state of the Master to the outputs. On return to strobe low input, the Slave stage latches and holds these outputs until the next time that the strobe input goes high. Intended voltage supplies are 0.0 volts and -12.0 volts. Intended voltage inputs are -6.38 ± 0.125 volts. Voltage supply and input levels can be shifted together as needed for other applications. In doing so, the user must take care that the strobe inputs and current outputs will function correctly. Wider input voltage swings are allowed within the positive limit of the cascode bias voltage and the negative limit of the current source and switch. Signal distortion and slew rate limiting will occur as usual for a small signal amplifier driven outside of its linear region.

DUAL STROBED COMPARATOR

203-0175-90 M175 (continued)

Comparison Decision Time < 500 pS
Strobe Maximum Repetition Rate (Period) 200 MHz (95 nS)
Input Bandwidth (As An Amplifier) > 800 MHz
Input Resolution Plus Offset ± 5 mV or Less
Input Range. ± 125 mV Around -6.38V
Output 8 mA Through Either Of
Two Common-Base Buffer
Transistors
Power. 1.2 Watts

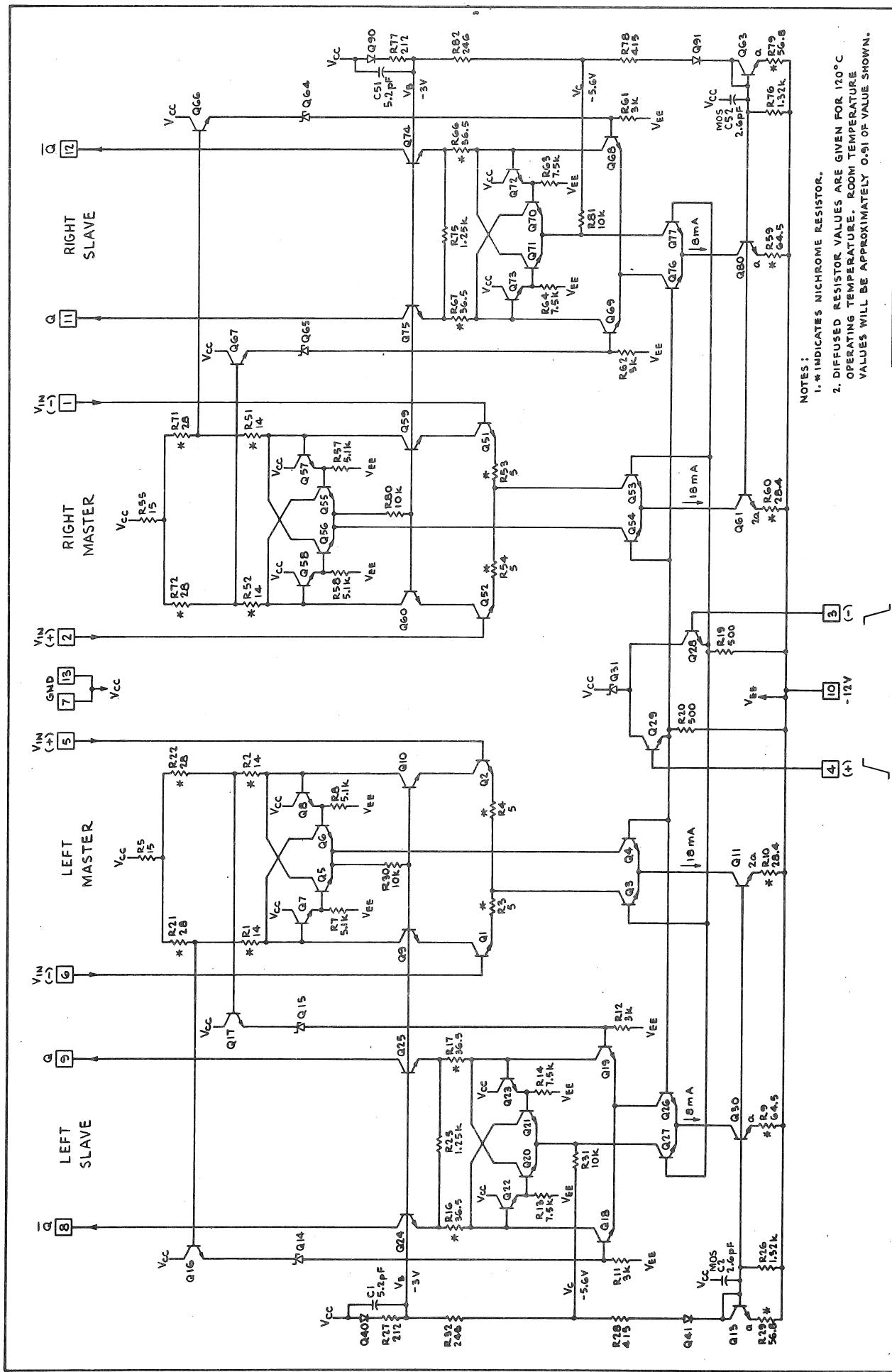
PROCESS SHF III

POWER SUPPLY \emptyset - 12 Volts, 100 mA

PACKAGE Hybrid

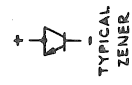
DESIGNER. Steve Wetterling

INSTRUMENT USAGE 7612D



NOTES:
 1. * INDICATES NICHROME RESISTOR.
 2. DIFFUSED RESISTOR VALUES ARE GIVEN FOR 170°C OPERATING TEMPERATURE. ROOM TEMPERATURE VALUES WILL BE APPROXIMATELY 0.91 OF VALUE SHOWN.

ENGR	S. J. Wetzel	13 DEC 76	PROCESS	SHF III
DWY BY	R. H. H. H.	19 OCT 76	PACKAGE	
CHK BY	J. J. J. J.	10 JUN 77	DIE SIZE	49mils X 96mils
TYPE	MONOLITHIC	STROBED COMPARATOR		MI75
INTEGRATED CIRCUIT ENG./MFG.				PART NO. 203-0175-90
DESIGNED BY TEXTRONIX, INC.				



STROBES

DESCRIPTION

The M177A is a 5-Bit DAC designed for use with the 203-0155-90 (M155A) in parallel-serial A/D converter systems. Five precision binarily-scaled current sources are independently switched to either I or \bar{I} according to the ECL digital input word. I and \bar{I} are supplementary current outputs with a voltage compliance of -1.6 to +3.1 volts. Switching is done by an emitter-coupled pair driven differentially by an amplifier which converts the single-ended input to a level-shifted differential drive. Two unswitched LSB current sources are provided for a particular application. Settling time to 8-bits with a 240 Ω , 10 pF load is 15 ns.

A reference current equal to 1/2 I (MSB) is set up with an external resistor, voltage reference, and op-amp. I (MSB) is designed to be 12.8 mA. Binarily-weighted emitter resistors are required and are provided by 155-0167-01 (H710). Maximum accuracy is achieved by functionally trimming these resistors, dropping several volts across them, and operating the outputs into a fixed voltage.

The M177A is operated between ground and -5.2 volts with typical power dissipation of 240 mW depending on usage.

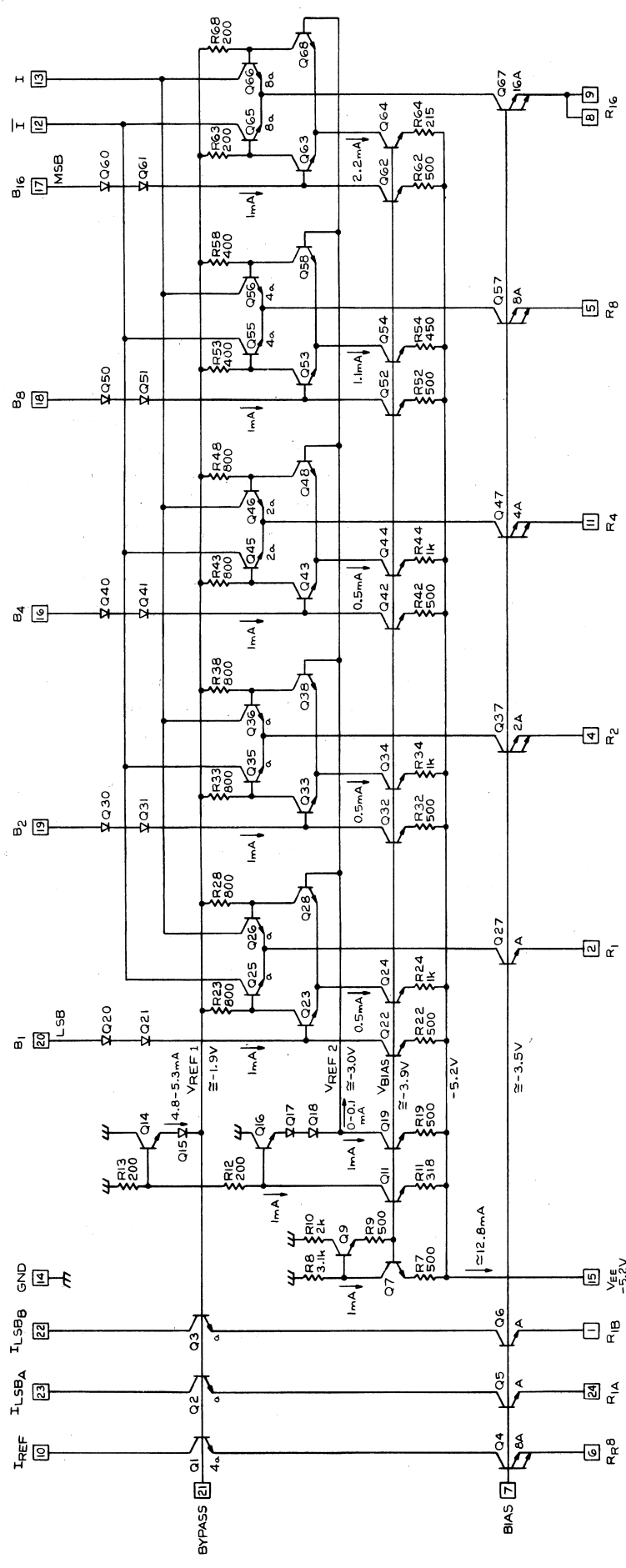
PROCESS SHF II

POWER SUPPLY. -5.2 Volts

PACKAGE 16 Pin TO-8 Can

DESIGNERS. Stew Taylor/Bob Nordstrom

INSTRUMENT USAGE



ENGR	A. S. ...	12-9-76	PROCESS	SHF II
DWNB	J. Langley	11-1-76	PACKAGE	HYBRID
CHK BY	...	3-4-77	DIE SIZE	83mil X 45mil
TYPE	MONOLITHIC	5-BIT D/A CONVERTER		MI77A
INTEGRATED CIRCUIT ENGS/MFG ELECTRONIX, INC. BEAVERTON, OREGON, U.S.A.				
PART NO. 2.03-0177-90				

DESCRIPTION

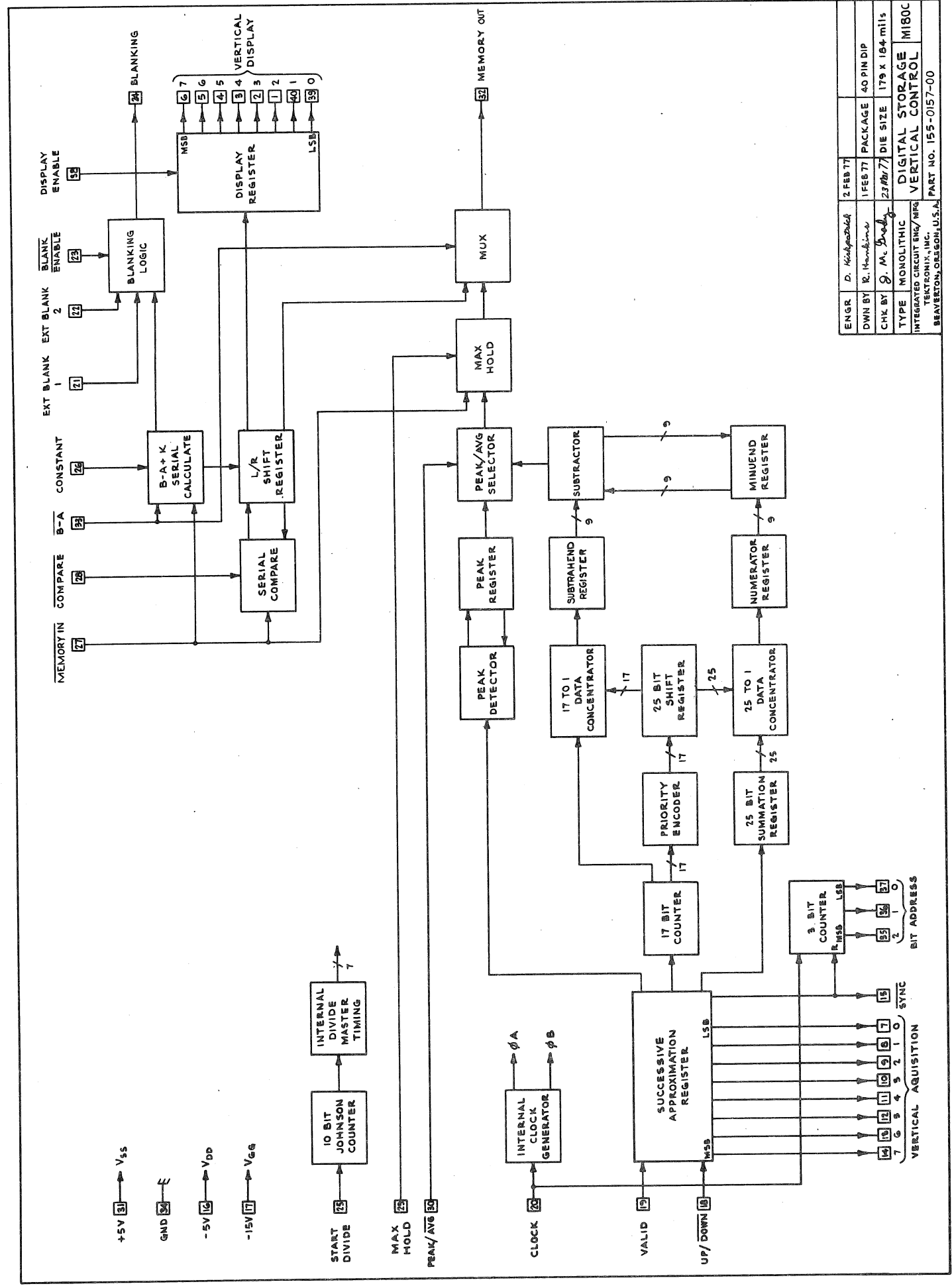
The M180 and M181 acquire a low speed, low repetition rate waveform, store the waveform in a digital form, and then redisplay the waveform at a higher rate. Also, the waveform may be digitally processed to provide several types of displays. The waveform is segmented into 1024 horizontal locations. An eight bit vertical value is computed for each horizontal location and stored in an external RAM. The memory can be split into two smaller memories of 512 locations. One waveform can be retained for comparison with a waveform acquired later.

The M180 constantly digitizes a waveform using the successive approximation technique. All vertical values are summed for a single horizontal location. The number of vertical values is counted. These two numbers are divided giving an average value. Also, the largest vertical value is retained. The process begins anew at each horizontal location. The largest value or the average value is then selected and stored. The selected value can be compared with the current memory content and the larger of the two stored.

The M181 determines the horizontal position using a 10-Bit tracking ADC. A programmable logic array in the M181 controls the display. The user can display either half of the memory, both halves interleaved, or the algebraic difference between the two halves. The M181 controls the addressing of memory. Provisions exist for external circuitry to read and modify the memory.

Either circuit by itself is useless, but the two together form a complete digital package. The memory and the analog portion of the A/D and D/A converters are external.

PROCESS	PSF (AMI MOS)
POWER SUPPLY.	+5/50 mA, -5/50 mA, -15/10 μ A
PACKAGE	40 Pin Dual-In-Line
DESIGNER	Don Kirkpatrick
INSTRUMENT USAGE	7L5 7L13 7L18 49X



ENGR	D. Kishpaugh	2 FEB 77	
DWN BY	R. Hankins	1 FEB 77	PACKAGE 40 PIN DIP
CHK BY	S. M. Brady	23 MAR 77	DIE SIZE 179 X 184 MILS
TYPE	MONOLITHIC		DIGITAL STORAGE M180C
INTEGRATED CIRCUIT ENG/WRG	TEKTRONIX, INC.		VERTICAL CONTROL
	BEAVERTON, OREGON, U.S.A.		PART NO. 155-0157-00

DIGITAL STORAGE HORIZONTAL CONTROL

155-0158-00 M181

DESCRIPTION

This circuit MUST be used with the 155-0157-00 (M180). Refer to 155-0157-00 (M180) for a complete description.

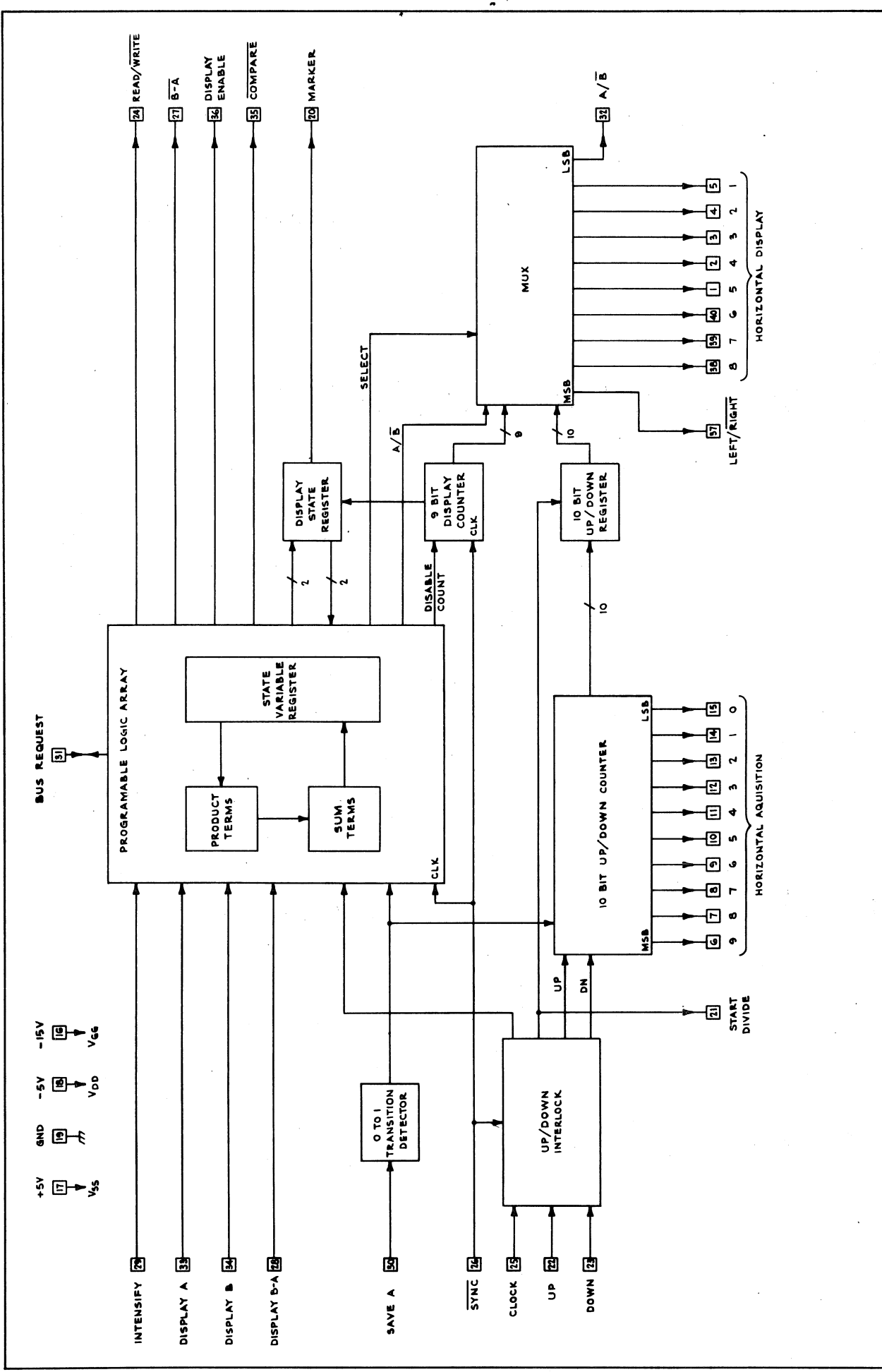
PROCESS PSF (AMI MOS)

POWER SUPPLY. +5/40 mA, -2/40 mA, -15/10 μ A

PACKAGE 40 Pin Dual-In-Line

DESIGNER Don Kirkpatrick

INSTRUMENT USAGE 7L5 7L13
7L18 49X



ENGR.	D. Kalspach	7 FEB 77	PACKAGE	40 PIN DIP
DWN	R. Hunkeler	4 FEB 77	DIE SIZE	130 X 151 mils
CHK	G. McNeely	22 Mar 77	DIGITAL STORAGE	HORIZONTAL CONTROL
TYPE		MONOLITHIC	PART NO. 155-0158-00	
INTEGRATED CIRCUIT BME/MFG		TEKTRONIX, INC.		
BEAVERTON, OREGON, U.S.A.				

DESCRIPTION

When used with an integrator, comparator, and switchable current source, the M187 forms a complete DVM. The integrated circuit can internally divide the output values by 1, 2, 4, or 5. Two output pins indicate when the counters have over-ranged or under-ranged. The frequency of the on-chip clock is determined by an external capacitor and resistor. The output from the integrated circuit is a 10-level current suitable for interfacing with the New Generation Knob Read-Out System.

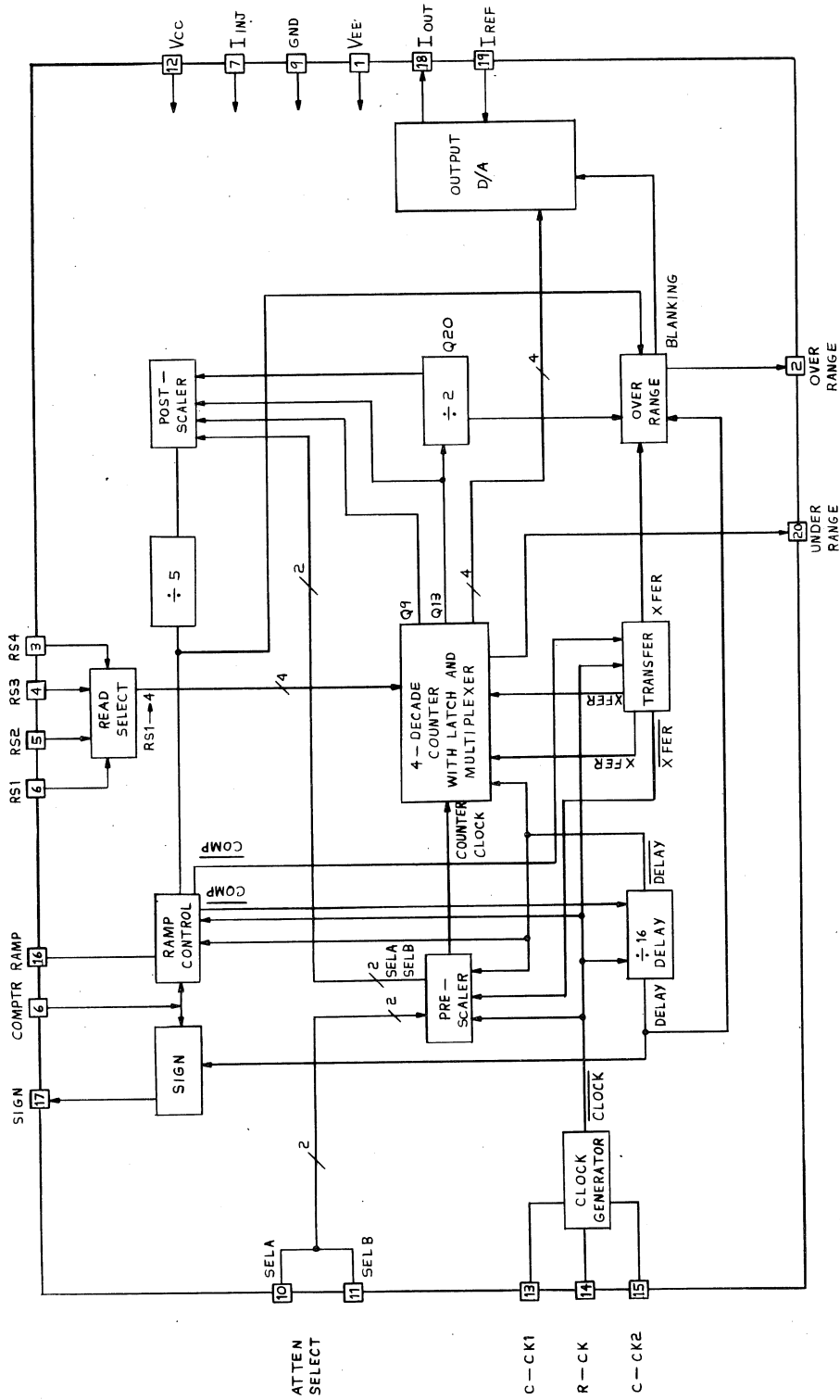
PROCESS I²L

POWER SUPPLY. V_{CC} +5V, V_{EE} -15V

PACKAGE 20 DIP

DESIGNER Don Larson

INSTRUMENT USAGE 7B15



M187	FOUR DECADE D. V. M.	INTEGRATED CIRCUIT DESIGN TECHNICAL, INC. MANUFACTURED, MONROE, U.S.A.	
ENG	JIM NAMHIE	TYPE	MONOLITHIC
DWR BY	BOB GAULT	PROCESS	I ² L
CHK BY	BOB GAULT	PACKAGE	20 PIN DIP
		DIE SIZE	90MILS X 135MILS
PART NO.	155-0185-00	DATE	11-1-79
		REV	10/31/79

DESCRIPTION

The M192 is a multi-standard broadcast television sync generator. It can be programmed for NTSC, PAL, or PAL M timing standards.

Outputs include sync signals required for television broadcasting, timing for various test signals, and a synchronous counter chain from 65H to H. All outputs are derived from a 5 MHz input clock.

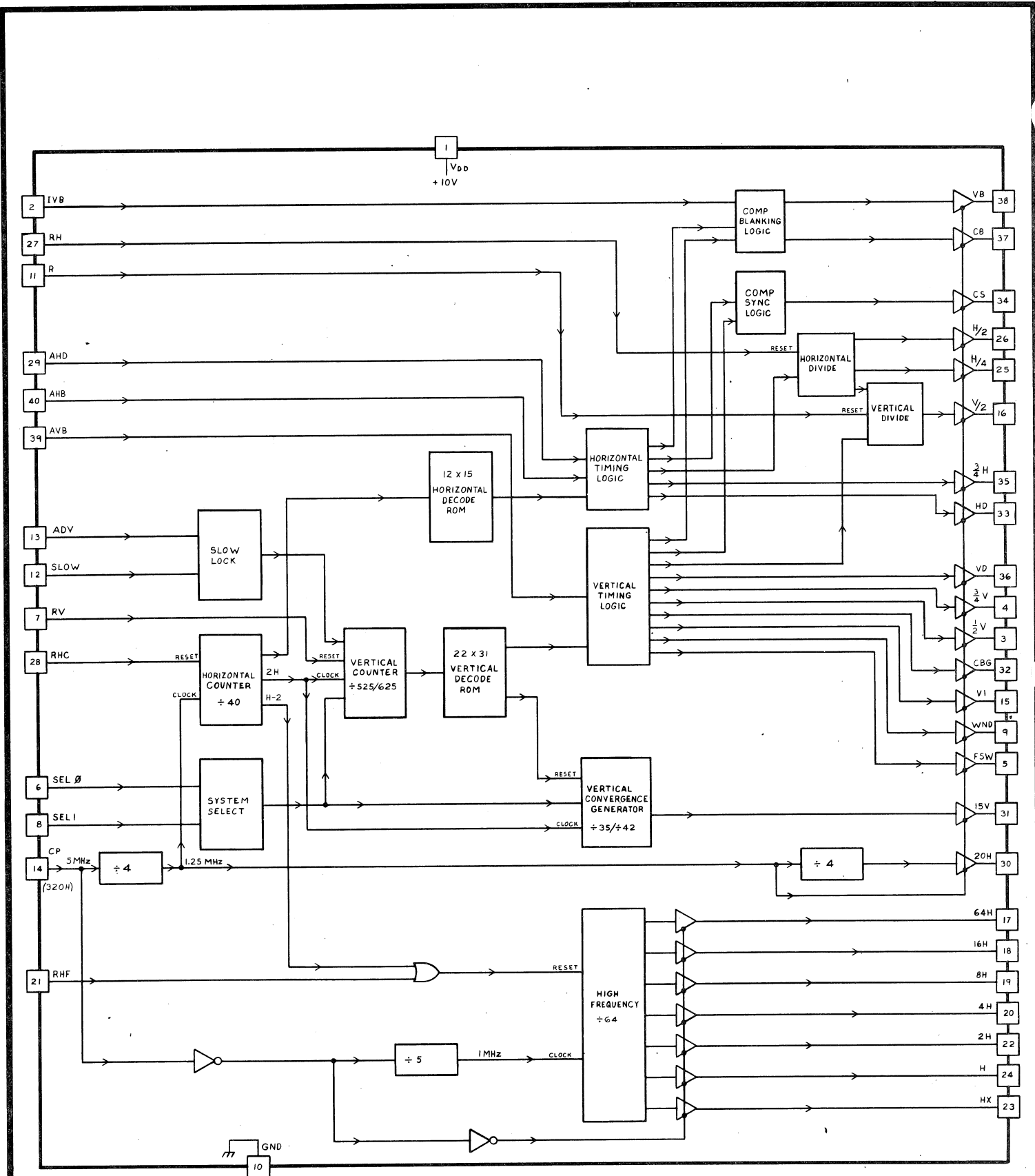
PROCESS CMOS I

POWER SUPPLY. V_{DD} +10 Volts

PACKAGE 40 DIP

DESIGNER Don Larson

INSTRUMENT USAGE 1410 1411
 1412 1470
 1474 143
 3240 (GVG)



MI92 TV SYNC GENERATOR		INTEGRATED CIRCUIT ENG. MFG TENTRONIX, INC. SAVATON, OREGON, U.S.A.	
PART NO. 155-0188-00		TYPE MONOLITHIC	
ENG	<i>W. J. Young</i>	28 SEPT 78	PROCESS CMOS
DWN BY	<i>Wyn Smith</i>	28 SEPT 78	PACKAGE 40-PIN DIP
CHK BY	BOB GAULT	28 SEPT 78	DIE SIZE 172 x 159 mils

DISCRETE DEVICES

BY CIRCUIT NUMBER

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Schottky Diode	204-0677-90	D32
NPN Transistor	204-0565-90	D58
NPN Transistor	204-0566-90	D75
Tear Tab Schottky Diode	204-0553-90	D84
PNP Transistor	204-0625-90	D102
Darlington Photo Transistor	204-0676-90	D113
Diode Array	204-0757-00	D143
NPN Transistor	204-0707-90	D156
NPN Transistor	204-0746-90	D180
Microwave Transistor	204-0753-90	D186
High Current Bipolar Transistor	204-0792-90	D206

DISCRETE DEVICES

BY PART NUMBER

<u>TITLE</u>	<u>CIRCUIT</u>	<u>PART NUMBER</u>
Tear Tab Schottky Diode	D84	204-0553-90
NPN Transistor	D58	204-0565-90
NPN Transistor	D75	204-0566-90
PNP Transistor	D102	204-0625-90
PNP Transistor	D113	204-0676-90
Schottky Diode	D32	204-0677-90
NPN Transistor	D156	204-0707-90
NPN Transistor	D180	204-0746-90
Microwave Transistor	D186	204-0753-90
Diode Array	D143	204-0757-90
High Current Bipolar Transistor	D206	204-0792-90

INTEGRATED CIRCUITS ENGINEERING/MANUFACTURING CONTACTS

BY CIRCUIT NUMBER

<u>ICE CONTACT</u>	<u>ICM CONTACT</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Krishna Verma	Hal Lillywhite	204-0677-00	D32
Krishna Verma	Steve Fierro	204-0565-90	D58
Krishna Verma	Steve Fierro	204-0566-90	D75
Krishna Verma	Hal Lillywhite	204-0553-90	D84
Krishna Verma	Steve Fierro	204-0625-90	D102
Krishna Verma	Steve Fierro	204-0676-90	D113
Krishna Verma	Hal Lillywhite	204-0757-90	D143
Krishna Verma	Steve Fierro	204-0707-90	D156
Krishna Verma	Steve Fierro	204-0746-90	D180
Krishna Verma	Steve Fierro	204-0753-90	D186
Krishna Verma	Steve Fierro	204-0792-90	D206

NPN TRANSISTOR

204-0565-90 D58

DESCRIPTION

A Tek made transistor (NPN) used in the 155-0080-00 (H125). It will carry a reasonably high current (100 mA to 120 mA) and has an f_T near 900 MHz.

Beta (120 mA and 4 Volts) >40
 I_{CES} (at 5 Volts) <70 μ A
 BV_{CEO} (at 1 mA). >35 Volts
 BV_{CBO} (at 1 mA). >50 Volts
 f_T Approximately 900 MHz

DESIGNER Mike Dickman

INSTRUMENT USAGE

NPN TRANSISTOR

204-0566-90 D75

DESCRIPTION

A Tek made transistor (NPN) used in the 7L12 and 7L13 Oscillators. and may be used as an amplifier in the 155-0068-00 (H101). It has an output capacitance (C_{OB}) of about 0.8 pF at 6 volts and an f_T of about 3 GHz.

Beta (5 mA and 5 Volts) 100
 BV_{CBO} (at 1 mA). 15 Volts
 LV_{CEO} (at 1 mA). 8 Volts
 f_T 3 GHz
 C_{OC} (at 6 Volts) 0.8 pF

DESIGNER Mike Dickman

INSTRUMENT USAGE 7L12
7L13

TEAR TAB SCHOTTKY DIODE

204-0553-90 D84

DESCRIPTION

The D84 is a Tear Tab Diode Schottky Diode chip with a die size of 0.030 x 0.045 inches. The maximum allowable forward current is 11 mA

Electrical Parameters

PARAMETER	CONDITIONS	TYPICAL	MIN	MAX
R_f	$I_f = 10 \text{ mA}$	8 Ω		20 Ω
C	\emptyset Bias, 1 MHz	0.1 pF		
V_B	1 μA	8 Volts	5 Volts	

DESIGNER Krishna Verma

INSTRUMENT USAGE S6

PNP TRANSISTOR

204-0625-90 D102

DESCRIPTION

A Tek made transistor (PNP) used as a protection device in the 155-0113-00 (H116) Logic Probe for the 203-0096-90 (M96). It will carry 150 mA at 5 volts and has a very low leakage current.

Beta (150 mA and 5 Volts) >40
I_{CES} (at 25 Volts). <50 μ A
BV_{CEO} (at 100 μ A) >32 Volts
BV_{CBO} (at 100 μ A) >32 Volts

DESIGNER Krishna Verma

INSTRUMENT USAGE

DESCRIPTION

A Darlington photo transistor made using the standard 200 Ω /sq process. The emitter is internally shorted to the substrate while the collectors are isolated so that it may be scribed into common emitter arrays. The device is normally operated open base but a base contact pad is provided. The device responds to visible and infrared radiation with a peak efficiency around 0.7 μm .

Composite Beta (6 Volts, 1 mA). 1,600 to 10,000

I_{CEO} (Dark, $V_{\text{CE}} = 8$ Volts) <0.1 μA

BV_{CEO} (10 μA) Typical. 15 Volts

I_{MAX} > 5 mA

V_{CESAT} (1 mA) Typical. 1.1 Volt

PROCESS 200 Ω /Sq

DESIGNER Bob Nordstrom

INSTRUMENT USAGE

DESCRIPTION

This device was designed as a target for the T7610 EBS Digitizer tube, which is used in the 7612D Waveform Digitizer instrument. The die is approximately 250 x 40 mils. in size and contains 10 adjacent diodes, each 230 mils. long by 1.26 mils. wide, formed by a boron diffusion on an N-Type epitaxial substrate. The active area of the diodes is covered by a pattern of thick and thin aluminum in the form of a digital gray code.

For the Digitizer application, die are attached to an alumina substrate which is mounted on a special header and sealed to an electron tube. In operation the diodes are reverse biased and bombarded by an electron beam. An output signal is obtained from a diode when the beam penetrates a thin metal area. The combined outputs of all of the diodes provides an 8-bit digital code which is dependent on the beam position.

Forward Bias (at 1 mA)	. . . . .	1 Volt Maximum
Reverse Bias Breakdown (at 1 μ A)	. . . . .	30 Volts Maximum
Reverse Leakage (20 Volt Bias)	. . . . .	30 μ A Maximum
Interdiode Leakage (at 10 Volts)	. . . . .	100 μ A Maximum
Diode Capacitance (11.5 Volt Bias)	. . . . .	5 pF Maximum

DESIGNER Ray Hayes

INSTRUMENT USAGE 7612D

NPN TRANSISTOR

204-0707-90 D156

DESCRIPTION

A Tek made transistor (NPN) for high voltage, common base applications requiring a gain bandwidth product of 1 GHz.

P_D ($V_{CE} = 30$ Volts, $T_j = < 200^\circ\text{C}$) 3 Watts*
 f_T ($V_{CE} = 14$ Volts, $I_C = 160$ mA) 1 GHz
 C_{CB} ($V_{CB} = 4$ Volts) 2.5 pF

*Guaranteed safe operating area

DESIGNER Krishna Verma

INSTRUMENT USAGE

NPN TRANSISTOR

204-0746-90 D180

DESCRIPTION

The D180 is a Tek made power (NPN) transistor. It has a totem pole configuration for Z-axis drive in the 7104 and Z-axis drive for RASCAL (IDG).

DC

BV_{CBO} 150 Volts
 I_C 150 mA
 C_{CB} 2.0 pF at 10 Volts
 LV_{CEO} 80 Volts
 h_{FE} (5 Volts, 100 mA). 30
Safe Operating Approximately 5 Watts

RF

f_T 500 MHz, 1.0 GHz
 t_r 700 pS (7904)

DESIGNER Krishna Verma

INSTRUMENT USAGE. 7104
7904

MICROWAVE TRANSISTOR

204-0753-90 D186

DESCRIPTION

The D186 is a Tek made microwave transistor (NPN) with a low noise level.

DC

BV_{CBO}	. . . . .	25 Volts
I_C	. . . . .	70 mA
C_{CB}	. . . . .	0.9 pF at 10 Volts
LV_{CEO}	. . . . .	12 Volts

RF

f_T	. . . . .	7.5 GHz
f_{MAX}	. . . . .	18 GHz
NF	. . . . .	2.5 dB at 2 GHz 4.3 dB at 4 GHz
$|S_{21}|^2$	. . . . .	9 dB at 2 GHz 3 dB at 4 GHz

DESIGNER Krishna Verma

INSTRUMENT USAGE TR501
TR502

HIGH CURRENT BIPOLAR TRANSISTOR

204-0792-90 D206

DESCRIPTION

The D206 is a NPN high current bipolar silicon transistor. It is designed and developed as a CCD clockdriver for fast clock rate. However, this device can be used in microwave power amplifier and oscillator application.

DC

BV_{CBO}	35 Volts
I_C	400 mA
LV_{CEO}	15 Volts
C_{CB} (at 4 Volts)	7 pF

RF

f_T (5 Volts, 150 mA)	Approximately 4 GHz
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DESIGNER Krishna Verma

INSTRUMENT USAGE

HYBRID CIRCUITS

BY CIRCUIT NUMBER

<u>TITLE</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
Vertical Output Amplifier	155-0125-00	H074B
Vertical Output Amplifier	155-0115-00	H106A
Vertical Output Amplifier	155-0168-00	H126
Diode Leveler	155-0107-00	H204
Trigger Circuit	155-0150-00	H473
Horizontal Clamp Amplifier	155-0179-00	H475
Vertical Output Amplifier	155-0175-00	H476
Horizontal Output	155-0176-00	H477
Horizontal Output	155-0178-00	H488
Input Protection Circuit	155-0180-00	H489
5-Channel Data Acquisition	155-0137-00	H493
Input Amplifier	155-0181-00	H500
4-Bit Parallel A/D Converter MSB	155-0165-00	H508-1
4-Bit Parallel A/D Converter	155-0165-01	H508-2
Diode Pulse Shaper	155-0182-00	H575
Vertical Preamplifier Gain Switch	155-0161-00	H616
Differential Detector	155-0183-00	H672
5-Bit ECL D/A Converter	155-0167-01	H710
8-Bit D/A Converter	155-0169-00	H719

HYBRID CIRCUITS

BY PART NUMBER

<u>TITLE</u>	<u>CIRCUIT</u>	<u>PART NUMBER</u>
Diode Level	H204	155-0107-00
Vertical Output Amplifier	H106A	155-0115-00
Vertical Output Amplifier	H074B	155-0125-00
5-Channel Data Acquisition	H493	155-0137-00
Trigger Circuit	H473	155-0150-00
Vertical Preamplifier Gain Switch	H616	155-0161-00
4-Bit Parallel A/D Converter MSB	H508-1	155-0165-00
4-Bit Parallel A/D Converter	H508-2	155-0165-01
5-Bit ECL D/A Converter	H710	155-0167-01
Vertical Output Amplifier	H126	155-0168-00
8-Bit D/A Converter	H719	155-0169-00
Amplifier	H476	155-0175-00
Vertical Output Amplifier	H477	155-0176-00
Horizontal Output	H488	155-0178-00
Horizontal Clamp	H475	155-0179-00
Input Protection Circuit	H489	155-0180-00
Input Amplifier	H500	155-0181-00
Diode Pulse Shaper	H575	155-0182-00
Differential Detector	H672	155-0183-00

HYBRID CIRCUITS ENGINEERING/MANUFACTURING CONTACTS

BY CIRCUIT NUMBER

<u>HCE CONTACT</u>	<u>HCM CONTACT</u>	<u>PART NUMBER</u>	<u>CIRCUIT</u>
David A. Miller	Jim Wood	155-0125-00	H074B
Oscar Olson	Pete McReynolds	155-0115-00	H106A
David A. Miller	Pete McReynolds	155-0168-00	H126
Dale Hartman	Dan Murphy	155-0107-00	H204
David A. Miller	Jim Wood	155-0150-00	H473
David A. Miller	Dan Murphy	155-0179-00	H475
David A. Miller	Dan Murphy	155-0175-00	H476
David A. Miller	Dan Murphy	155-0176-00	H477
David A. Miller	Jim Wood	155-0178-00	H488
David A. Miller	Dan Murphy	155-0180-00	H489
Oscar Olson	Pete McReynolds	155-0137-00	H493
David A. Miller	Dan Murphy	155-0181-00	H500
David A. Miller	Pete McReynolds	155-0165-00	H508-1
David A. Miller	Pete McReynolds	155-0165-01	H508-2
David A. Miller	Jim Wood	155-0182-00	H575
David A. Miller	Pete McReynolds	155-0161-00	H616
David A. Miller	Jim Wood	155-0183-00	H672
David A. Miller	Pete McReynolds	155-0167-01	H710
Oscar Olson	Pete McReynolds	155-0169-00	H719

VERTICAL OUTPUT AMPLIFIER

155-0125-00 H074B

DESCRIPTION

The H074B is a hybrid consisting of an Integrated Circuit (M080) and two discrete transistors. Output amplifier for Pulse Generator
Equivalent band pass - 200 MHz.

Refer to 203-0080-90 M080

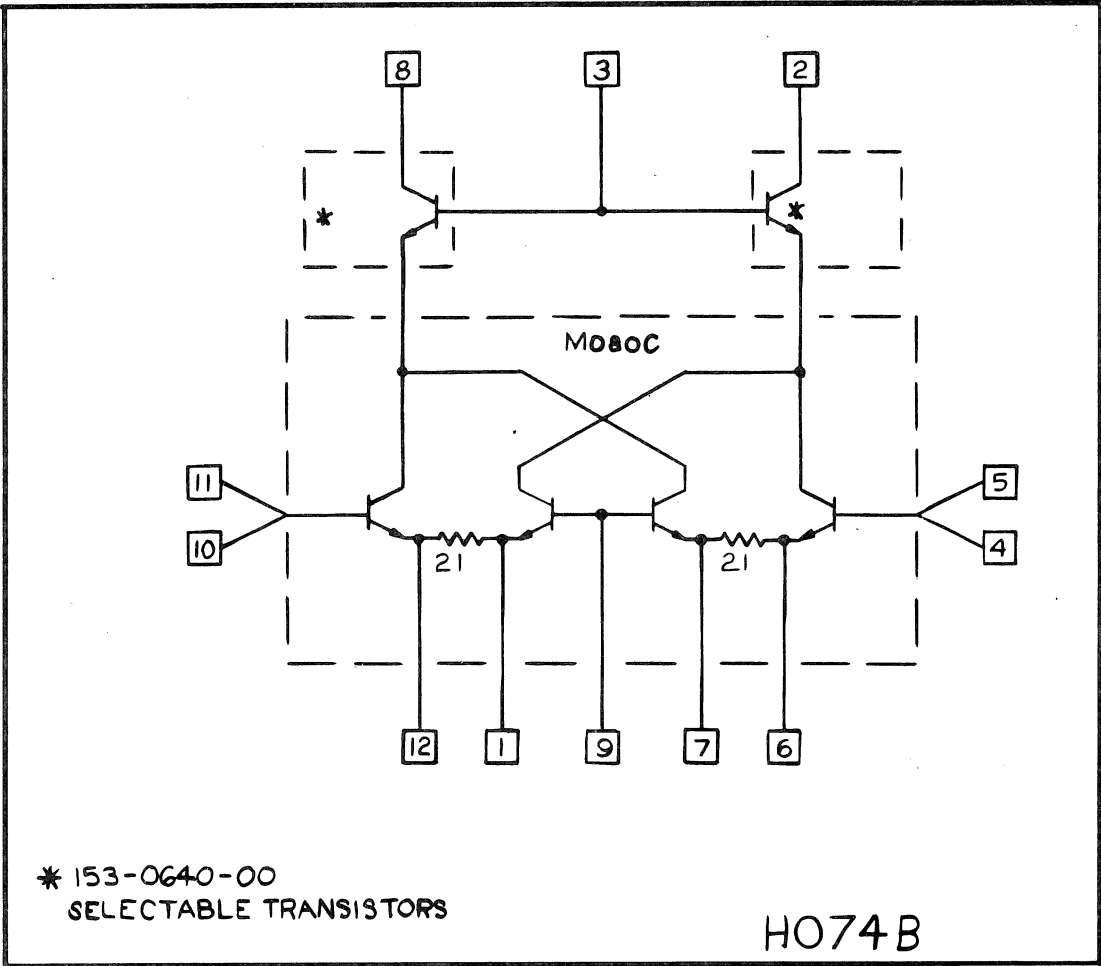
PROCESS Thick-Film

POWER SUPPLY. \pm 15 Volts and +40 Volts

PACKAGE 12 Pin T0-8

DESIGNER Mike Reiney

INSTRUMENT USAGE PG502



**OUTLINE DRAWING NOT
AVAILABLE AT THIS TIME**

VERTICAL OUTPUT AMPLIFIER

155-0115-00 H106A

DESCRIPTION

The H106A is a Integrated Circuit/Transistor Hybrid designed specifically as a Vertical Deflection Plate Driver in a CRT enabling a bandwidth of DC to 100 MHz.

Refer to 203-0089-90 M089

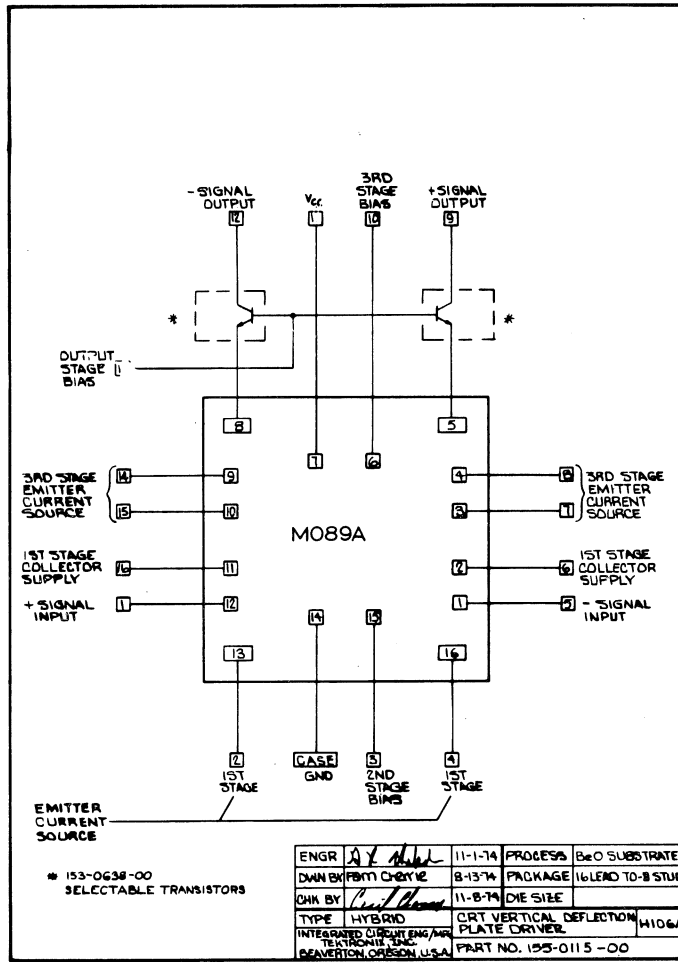
PROCESS Thin-Film

POWER SUPPLY. +15 Volts

DESIGNER Oscar Olson

PACKAGE T0-8

INSTRUMENT USAGE 464
465B
466



**OUTLINE DRAWING NOT
AVAILABLE AT THIS TIME**

VERTICAL OUTPUT AMPLIFIER

155-0168-00 H126

DESCRIPTION

The H126A is a Integrated Circuit/Transistor Hybrid designed specifically as a Vertical Deflection Plate Driver for the 475A Portable Oscilloscope. The bandwidth required by this instrument is DC to 250 MHz.

Refer to 203-0102-90 M102

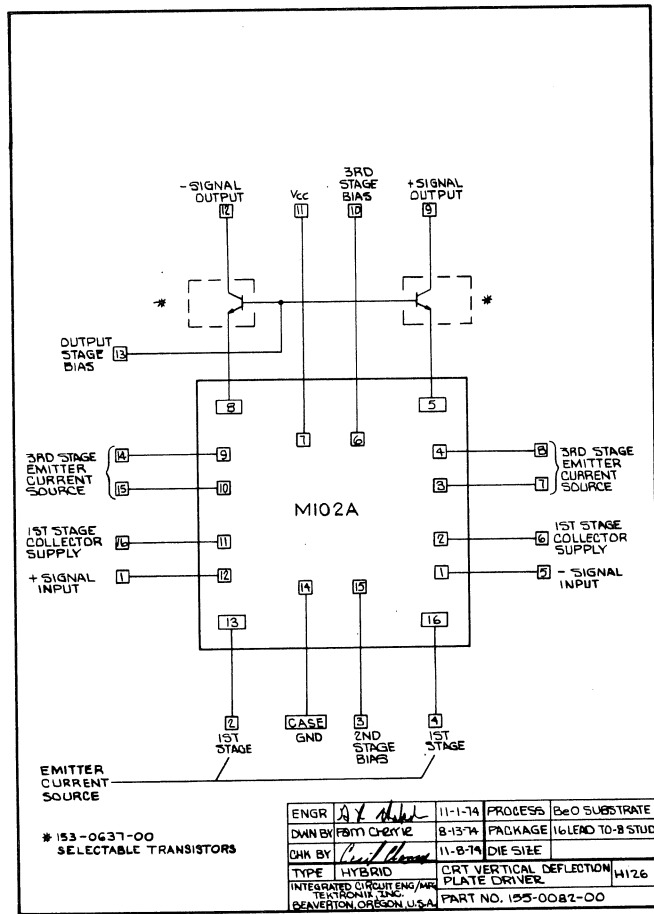
PROCESS Thin-Film

POWER SUPPLIES +15 Volts, +55 Volts

PACKAGE 16 Pin TO-8

DESIGNER Einar Traa

INSTRUMENT USAGE 475A



**OUTLINE DRAWING NOT
AVAILABLE AT THIS TIME**

DIODE LEVELER

155-0107-00 H204

DESCRIPTION

The H204 is a leveling circuit whose DC output is approximately equal to the peak-to-peak voltage at its input leveling point. The H204 circuitry provides frequency response compensation for the SG503 attenuator circuit board and 50 Ω cable.

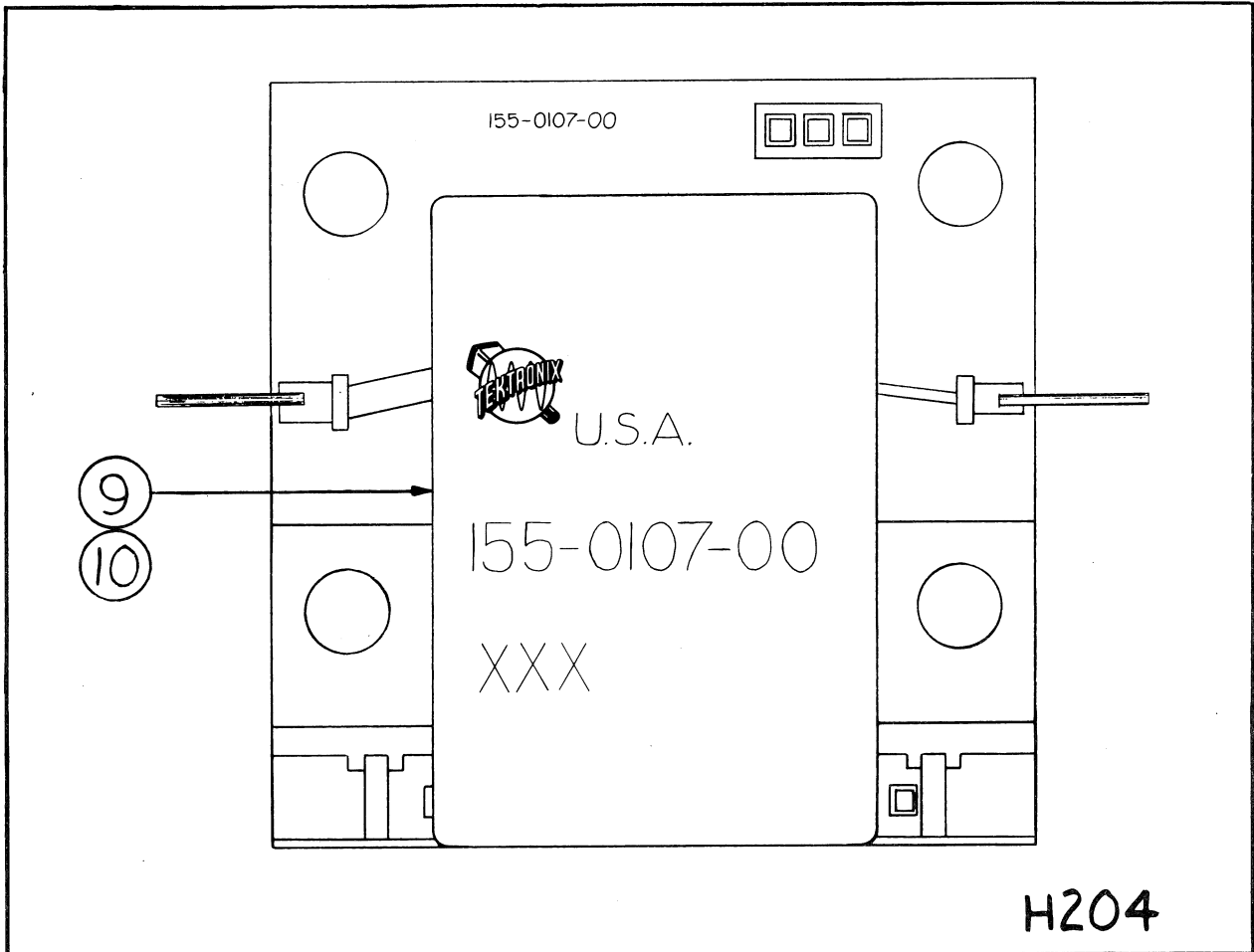
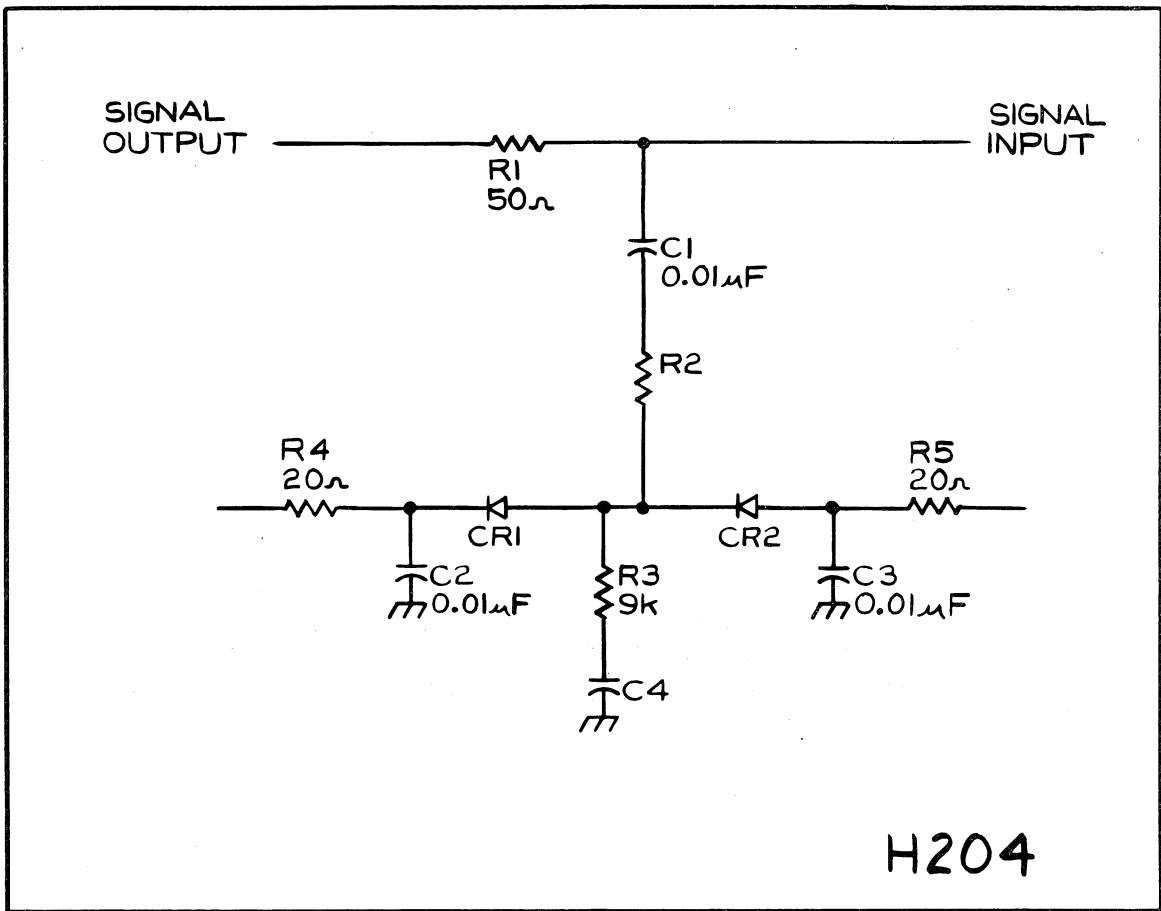
PROCESS Thick-Film

POWER SUPPLY.

PACKAGE

DESIGNER Dale Hartman

INSTRUMENT USAGE SG503



TRIGGER CIRCUIT

155-0150-00 H473

DESCRIPTION

The H473 is a Hybrid Integrated Trigger Circuit to be used in high frequency applications. The circuit consists of a SHF III monolithic mounted on a 1.22 cm square alumina substrate.

Refer to 203-0122-90 M122

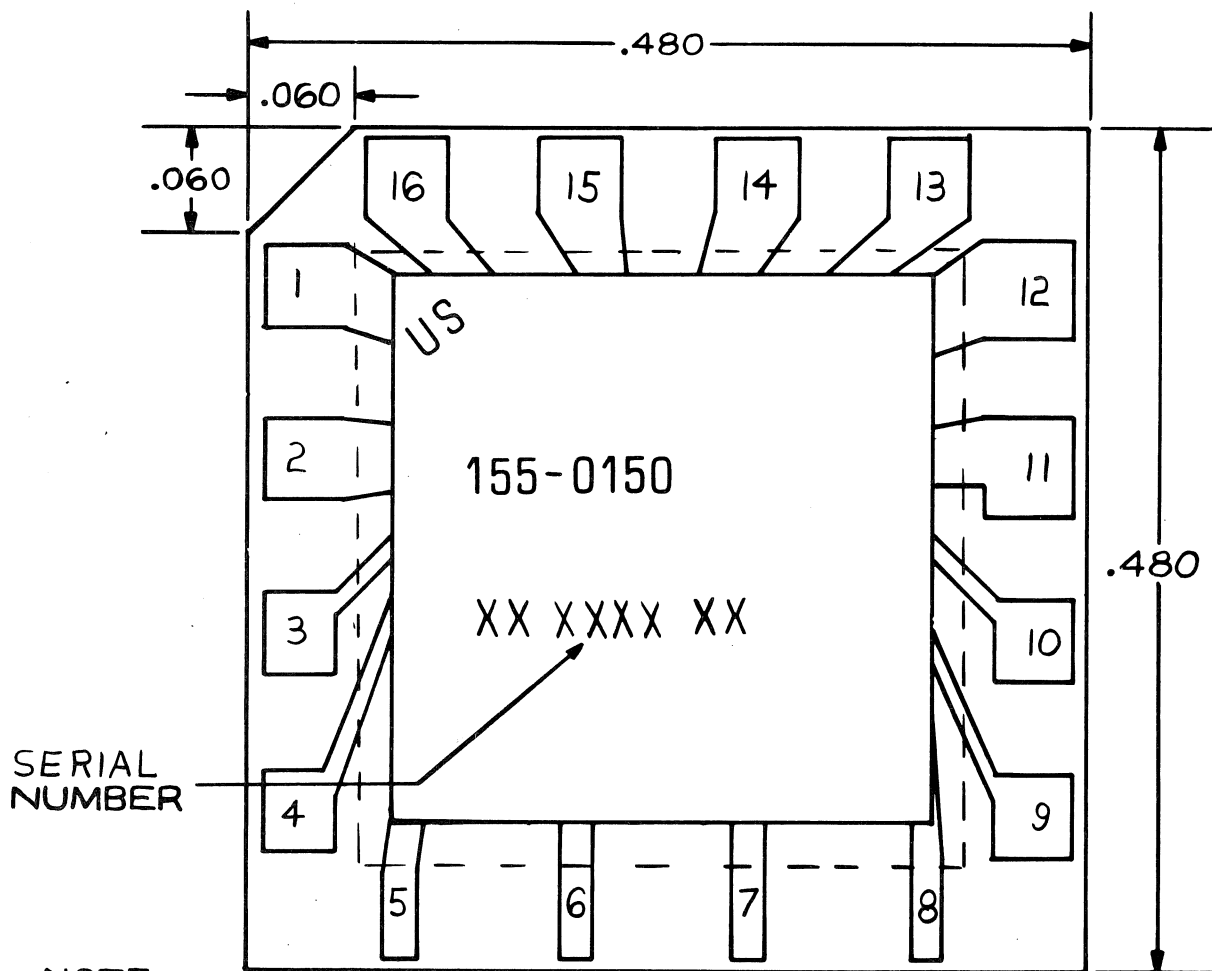
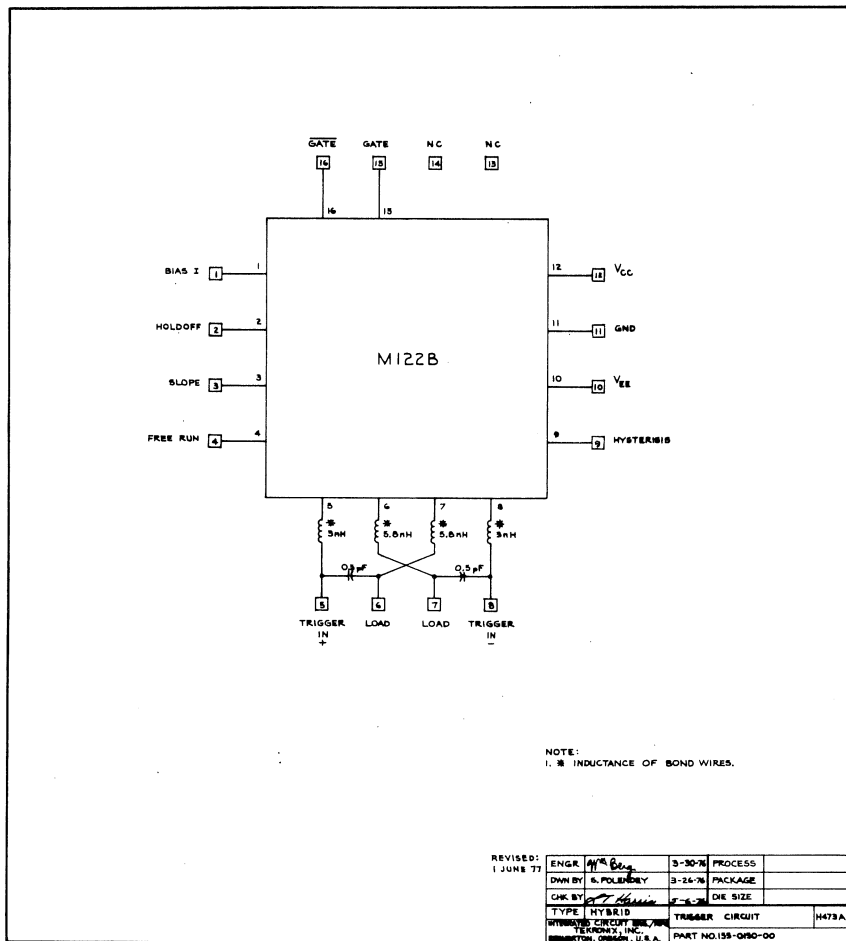
PROCESS Thin-Film

POWER SUPPLY. ± 5 Volts

PACKAGE 16 Lead QUIP

DESIGNER Walt Ainsworth

INSTRUMENT USAGE 7B10
7B15
7B92A



NOTE:
DIMENSIONS ARE REFERENCE ONLY.

DESCRIPTION

The H475 is a symmetrical soft clamp designed for use in a 50 Ω push-pull system. The point at which clamping occurs is externally controllable and a transistor is included on the hybrid to allow temperature compensation of the clamp point.

When used in the 50 Ω system, the 50 Ω environment is maintained except when clamping occurs. The hybrid has an insertion loss of approximately 3 dB.

Refer to 203-0196-90 M196.

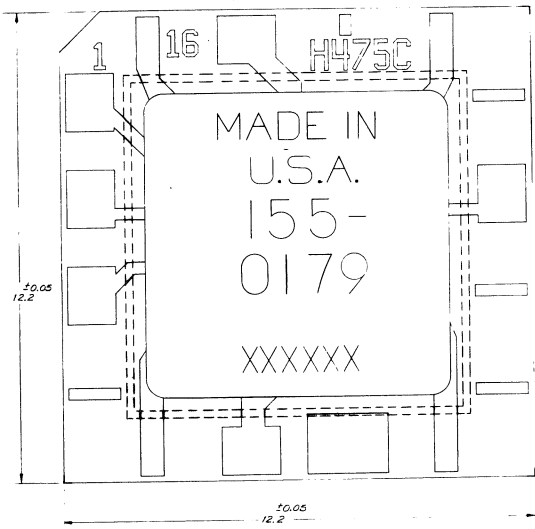
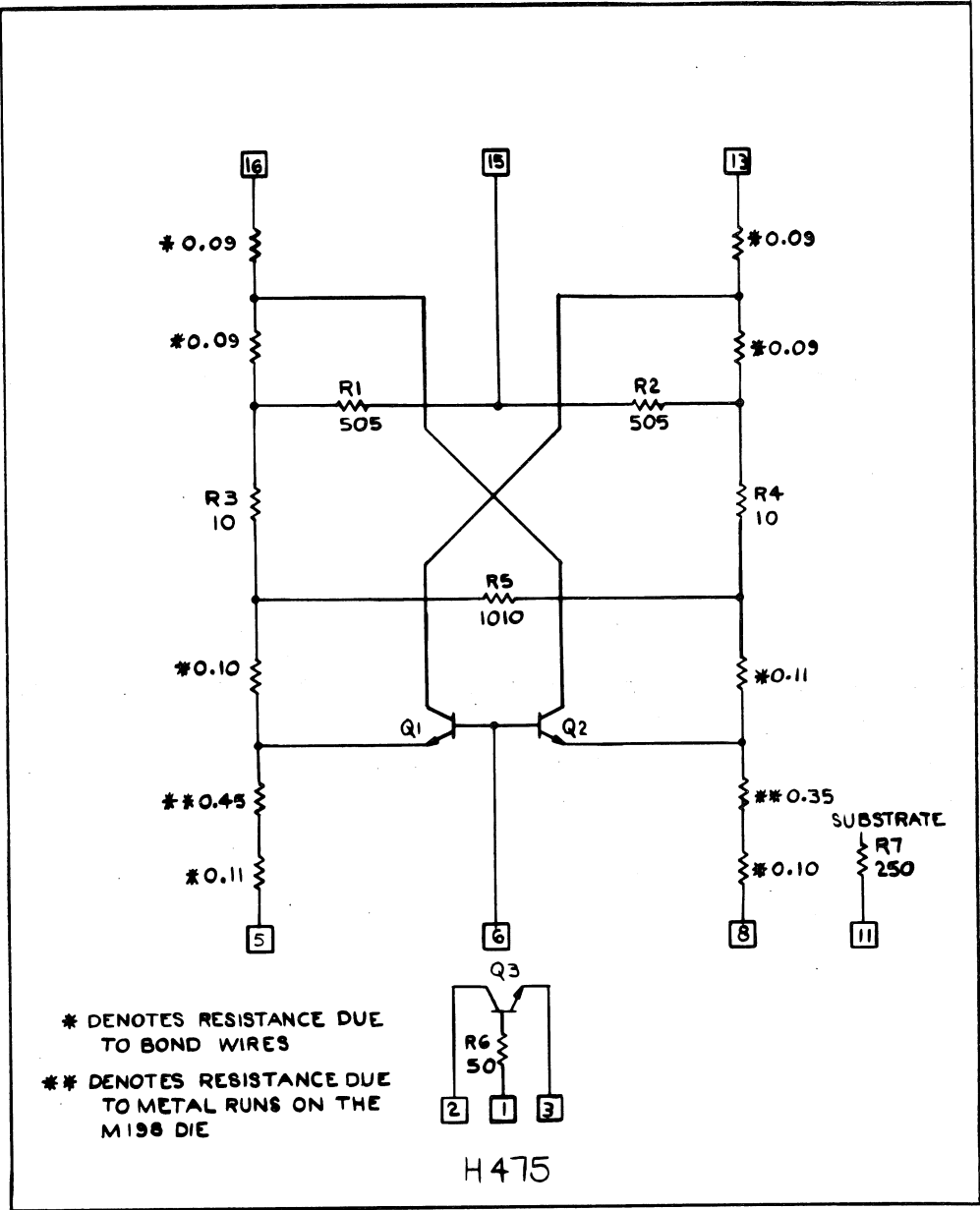
PROCESS Thin-Film

POWER SUPPLY.

PACKAGE 1.22 cm Square
Alumina Substrate

DESIGNER Dave Morgan

INSTRUMENT USAGE 7104



AMPLIFIER

155-0175-00 H476

DESCRIPTION

The H476 is a versatile high speed hybrid amplifier using a M178 integrated circuit. The circuit can provide a gain of 4.6 (13.3 dB) from a 50 Ω push-pull source without an output termination into a load of 50 Ω per side. Alternatively the circuit may be configured to provide a gain of 2.3 (7.3 dB) with an output termination of 50 Ω per side and into a load of 50 Ω per side. Risetime is less than 140 ps in either configuration.

By adjusting the ratio between two DC currents, the gain may be made to vary linearly from \emptyset to 2.3 or 4.6. There is no invert mode built in. An emitter pick-off provides a third output signal with a fixed gain of 0.5. The input common mode voltage appears on Pin #12.

Refer to 203-0178-90 M178

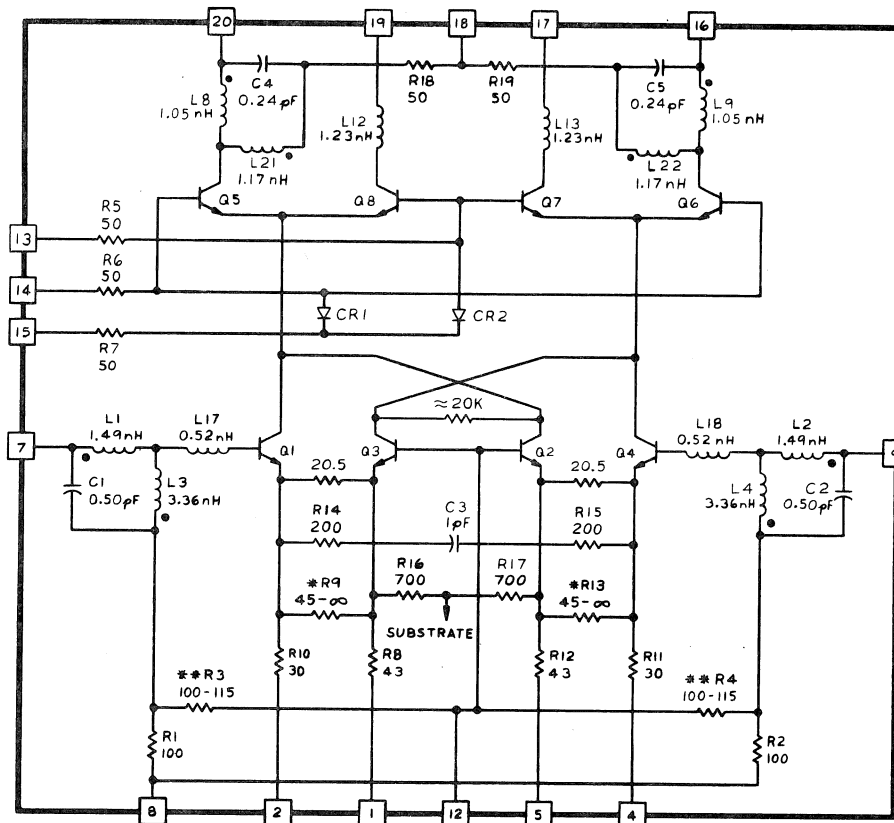
PROCESS Thin-Film

POWER SUPPLY.

PACKAGE 1.75 cm Hypcon System

DESIGNER John Addis

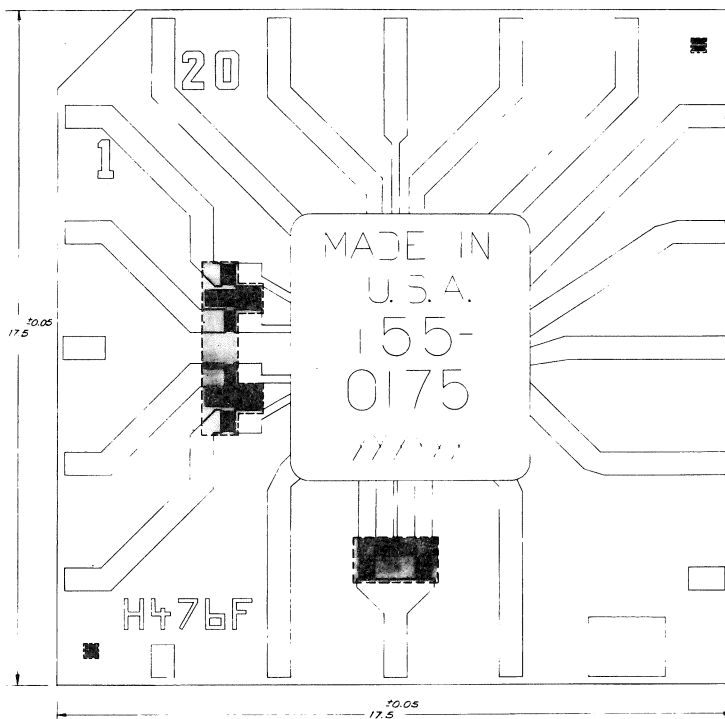
INSTRUMENT USAGE 7104
7A29



NOTES:

- L1 IS COUPLED TO L4 $M=0.308nH$
- L2 IS COUPLED TO L3 $M=0.308nH$
- L8 IS COUPLED TO L21 $M=0.165nH$
- L9 IS COUPLED TO L22 $M=0.165nH$
- * TRIMMED FOR GAIN
- ** TRIMMED FOR $R_{IN} = 50\Omega$
- Q1, Q2, Q3, AND Q4 ARE $2 \times (1.7\mu \times 50\mu)$ DEVICES
- Q5, Q6, Q7, AND Q8 ARE $2 \times (2.5\mu \times 50\mu)$ DEVICES
- CR1 AND CR2 ARE $2 \times (2.5\mu \times 12.5\mu)$ DEVICES

H476		AMPLIFIER		INTEGRATED CIRCUIT ENG MFG TEKTRONIX INC BEAVERTON OREGON U.S.A.	
PART NO. IS5-0175-00				TYPE HYBRID	
ENG	John L. Adde	2-11-78	PROCESS	SHF III	
DWN BY	Wynn Smith	8-18-78	PACKAGE	1.75 cm HYPCON	
CHK BY	BOB GAULT	9-11-78	DIE SIZE	42 x 54 mils	



VERTICAL OUTPUT AMPLIFIER

155-0176-00 H477

DESCRIPTION

The H477 is a wideband (DC to 2 GHz) differential-in/differential-out amplifier consisting of an M196 integrated circuit. The hybrid develops ± 10 volts across 200Ω and is used as a vertical CRT driver.

Refer to 203-0196-90 M196

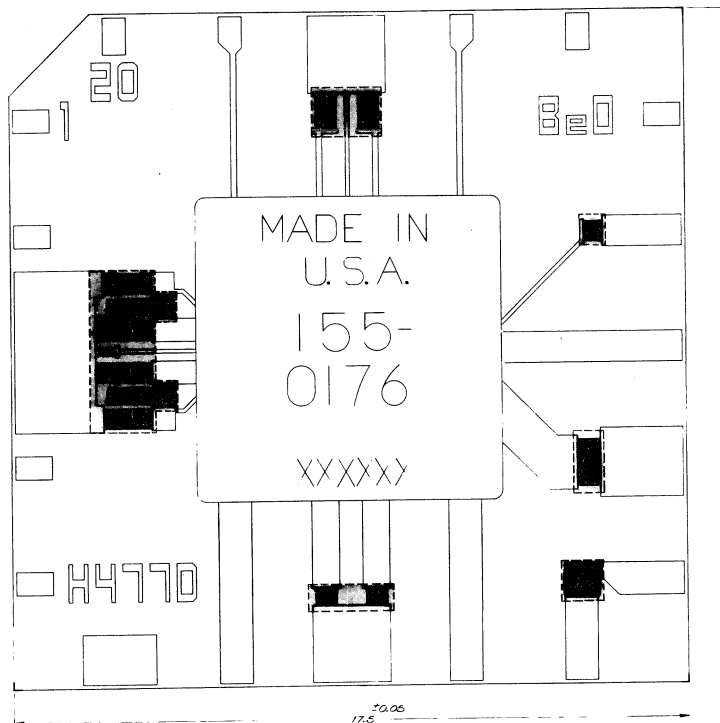
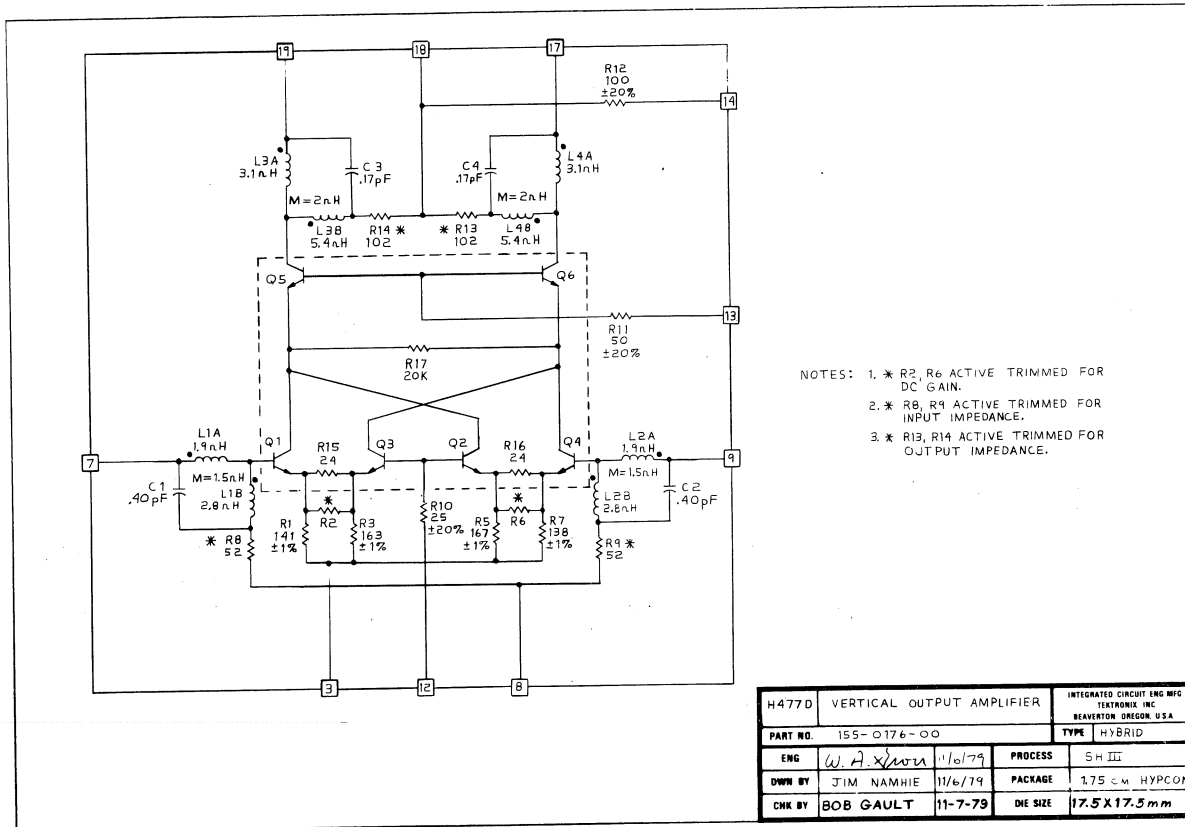
PROCESS Thin-Film

POWER SUPPLY.

PACKAGE 1.75 cm BeO Substrate

DESIGNER W.A Gross

INSTRUMENT USAGE 7104



DESCRIPTION

The H488 is a Linear Amplifier designed for use as a CRT Driver. It has an input impedance of 50 Ω per side and is designed to operate into a 365 Ω differential load. It has a current gain of 3.3 and is not back terminated. The device uses T-coils at the input and inductive peaking at the output. Its risetime is approximately 0.5 ns.

The H488 has a 20 K Ω resistor on each output. These provide low capacitance pick-offs of the output waveform for use in a feed-back circuit around the hybrid.

The f_T doubler section of circuitry is built using SHF III devices. The grounded base output devices are D156's.

Refer to 204-0707-90 D156

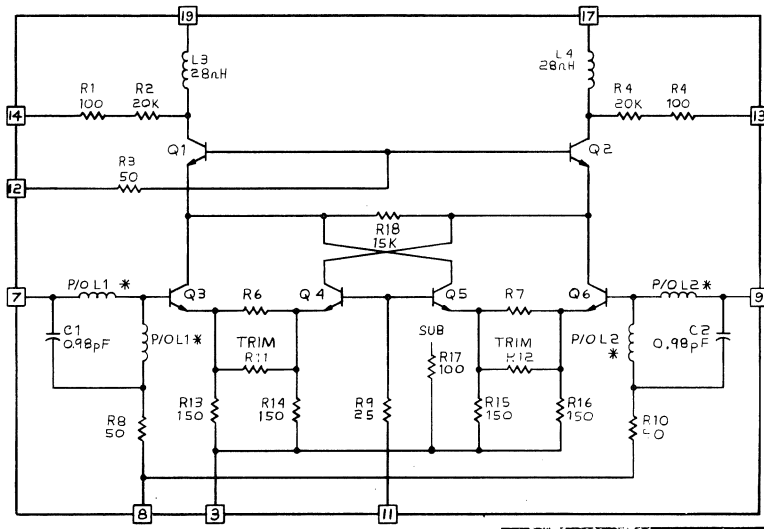
PROCESS Thin-Film

POWER SUPPLY.

PACKAGE 1.75 cm² Hypcon System

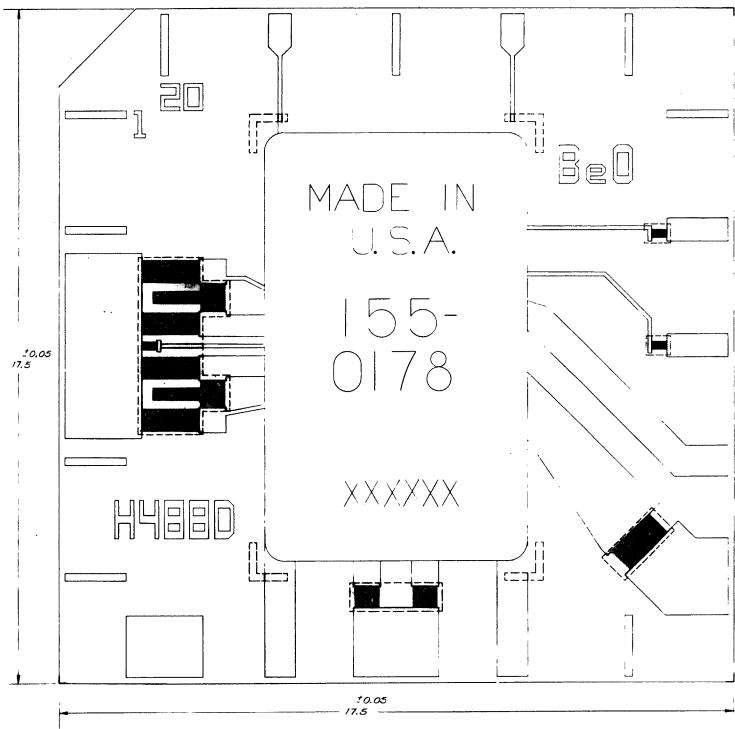
DESIGNER Dave Morgan

INSTRUMENT USAGE 7104



NOTE:
 1. * L1 TOTALS 7nH.
 2. * L2 TOTALS 7nH.

H488	HORIZONTAL OUTPUT	INTEGRATED CIRCUIT ENG MFG TEKTRONIX INC BEAVERTON OREGON USA		
PART NO.	155-0178-00	TYPE	HYBRID	
ENG	Dev & Marger	2.79	PROCESS	SH III
DWN BY	JIM NAMHIE	11/9/79	PACKAGE	13/4EM ² HYPCON
CHK BY	BOB GAULT	11-9-79	DIE SIZE	42 X 42 MILS



INPUT PROTECTION CIRCUIT

155-0180-00 H489

DESCRIPTION

The H489 is a hybrid input protection circuit designed to prevent the destruction of amplifiers having a 50 Ω input impedance by the accidental application of signals as large as ± 100 volts. Bandwidth is approximately 7 GHz and impedance match is maintained in both directions with approximately 1 dB loss of signal amplitude. Stored charge is approximately 200 picocoulombs.

An auxillary disconnection system such as a relay disconnect must be used to protect the H489 from long term application of overload signals. No heat sink is required.

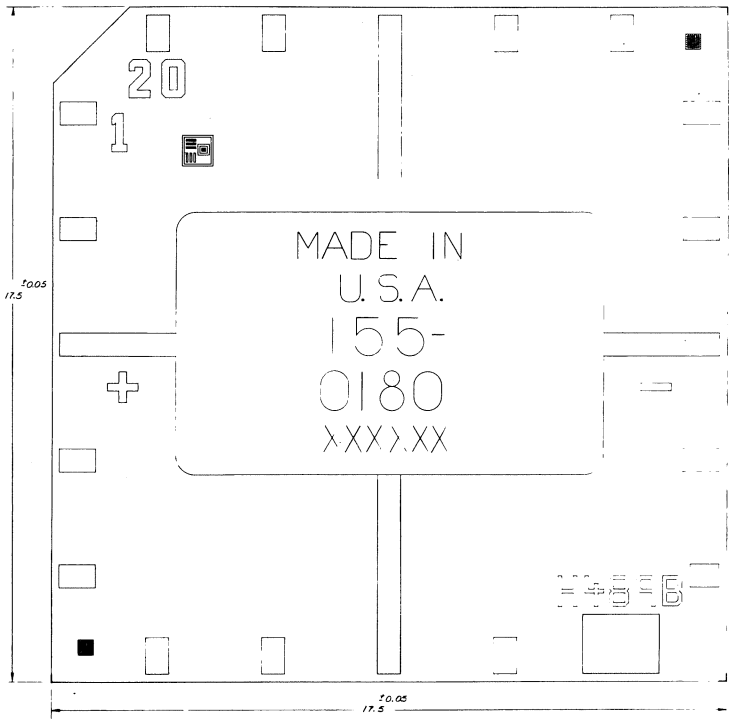
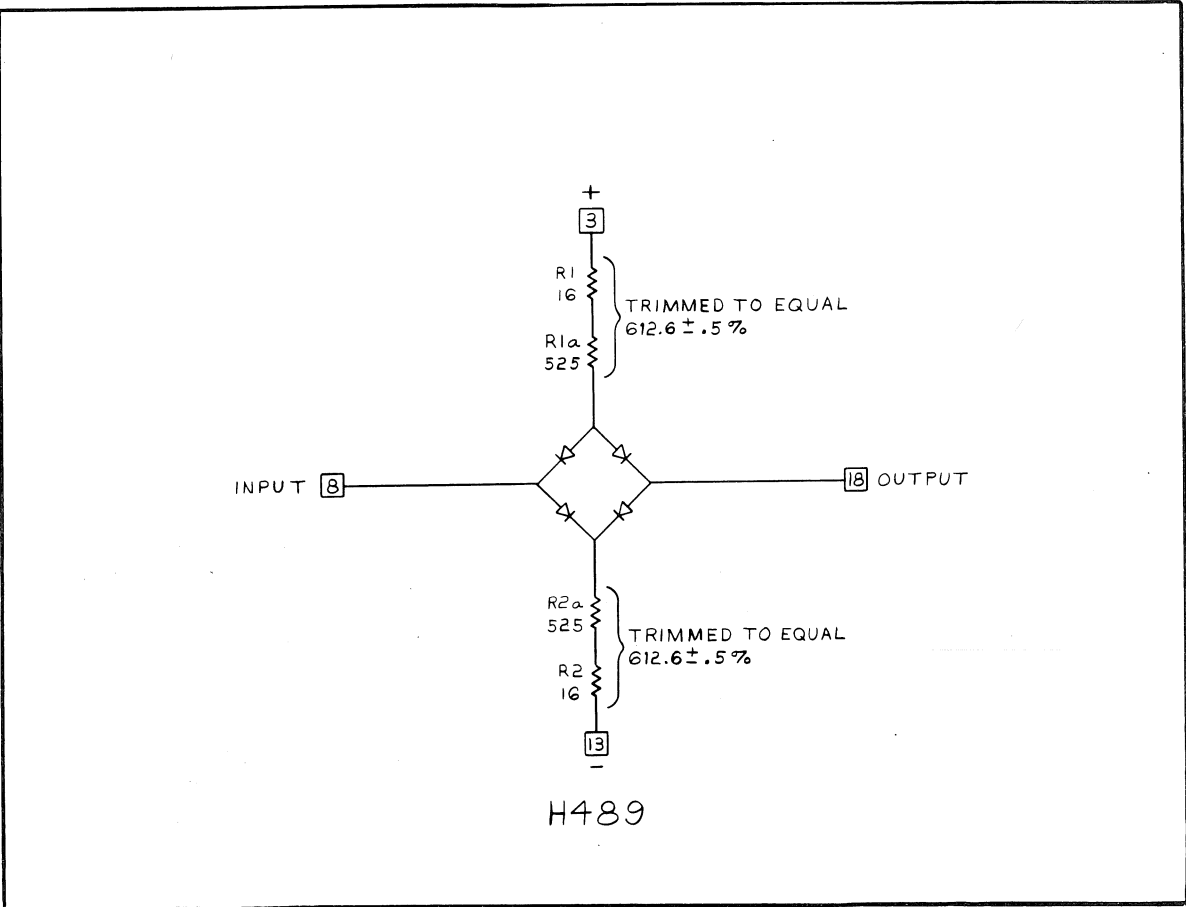
PROCESS Thin-Film

POWER SUPPLY. ± 13.5 Volts

PACKAGE 1.75 cm Hypcon System

DESIGNER John Addis

INSTRUMENT USAGE 7A29



DESCRIPTION

The H493 is a 5-Channel Data Acquisition hybrid featuring high speed, high input impedance, variable thresholds, and a differential ECL output.

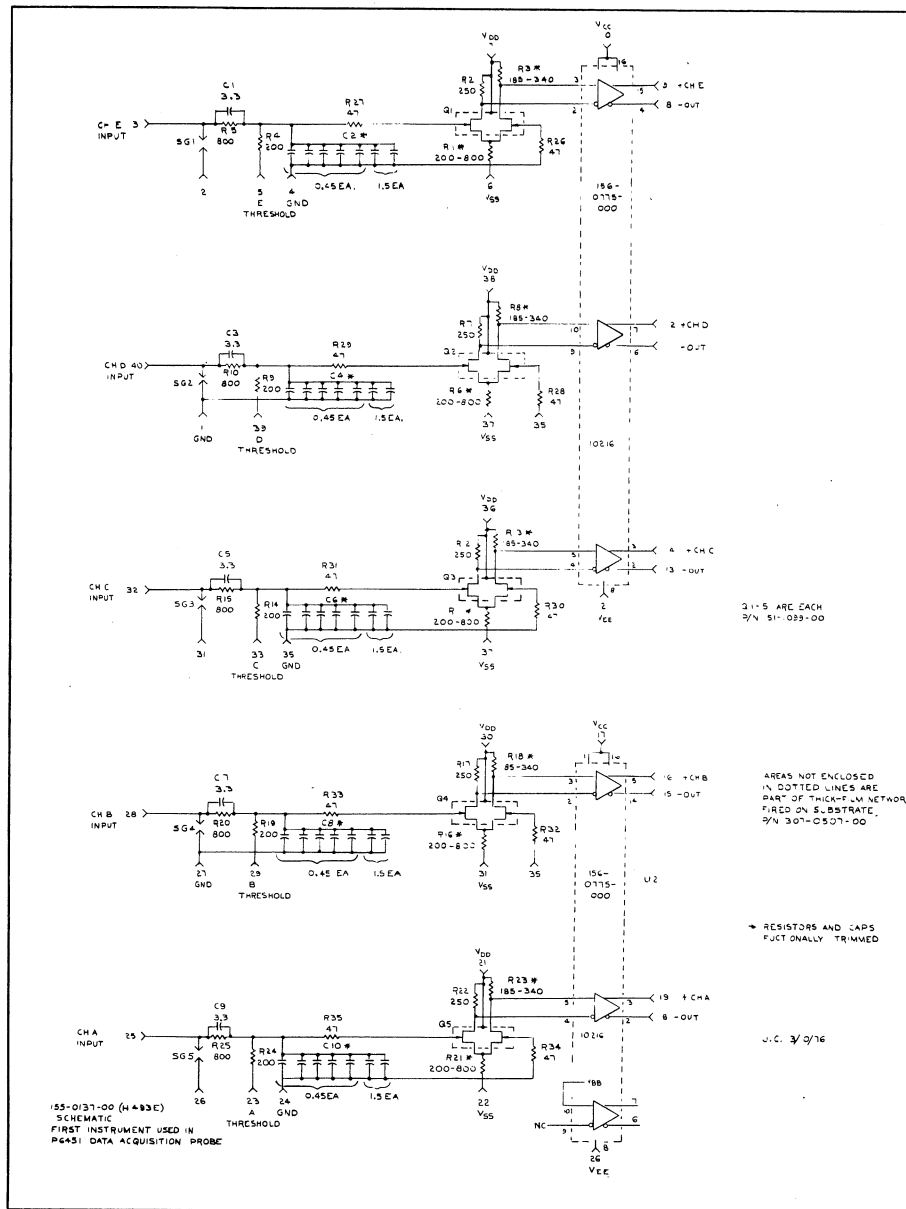
PROCESS Thick-Film

POWER SUPPLY.

PACKAGE

DESIGNER Oscar Olson

INSTRUMENT USAGE P6451



OUTLINE DRAWING NOT
 AVAILABLE AT THIS TIME

INPUT AMPLIFIER

155-0181-00 H500

DESCRIPTION

The H500 is a versatile high-speed hybrid amplifier using a M199 integrated circuit. The circuit has a single-ended 50 Ω input and push-pull outputs with a gain of up to 3.55 into a push-pull 50 Ω load. The gain may be varied from 3.55 to \emptyset and inverted to -3.55 by adjusting the ratio of two DC currents. At full gain, the rise-time is 180 ps or less, but appreciable loss of bandwidth occurs at lower gains.

Refer to 203-0199-90 M199

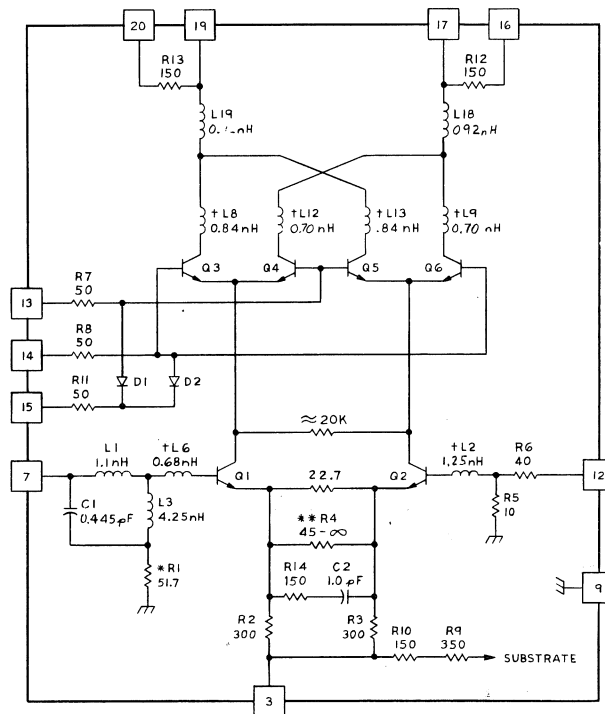
PROCESS Thin-Film

POWER SUPPLY

PACKAGE 1.75 cm² Hypcon System

DESIGNER John Addis

INSTRUMENT USAGE 7A29

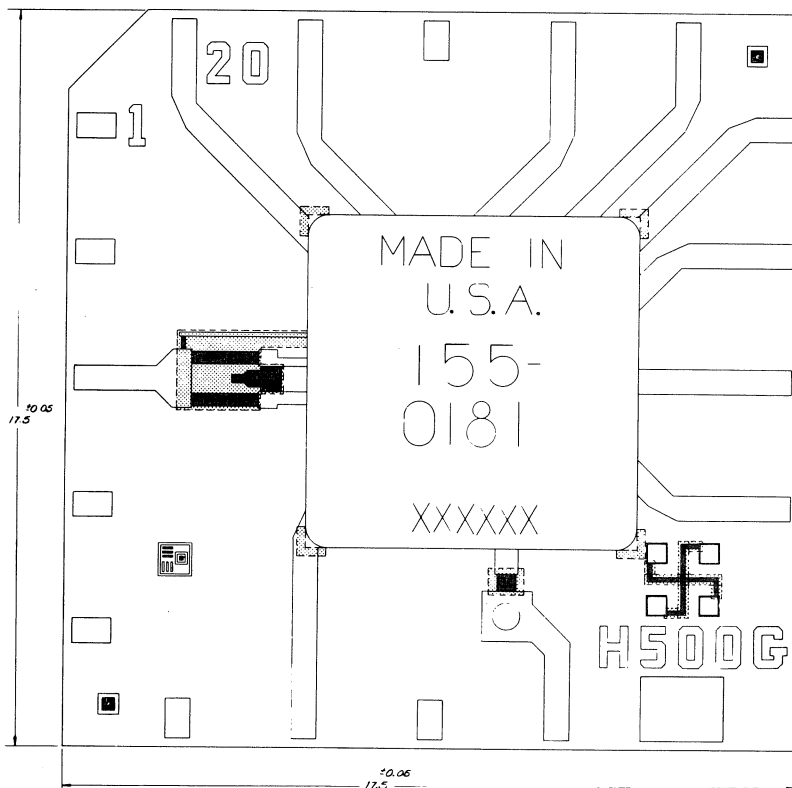


NOTES:
 † PARASITIC INDUCTANCES

* TRIMMED FOR $R_{IN} \approx 50\Omega$
 ** TRIMMED FOR GAIN

Q1, Q2 EMITTER AREAS = $2 \times (1.7\mu \times 50\mu)$
 Q3, Q4, Q5, Q6 EMITTER AREAS = $2 \times (1.7\mu \times 50\mu)$
 D1, D2 EMITTER AREAS = $2 \times (1.7\mu \times 12.5\mu)$

H500G INPUT AMPLIFIER		INTEGRATED CIRCUIT ENG MFG TEKTRONIX, INC BEAVERTON, OREGON, U.S.A.	
PART NO. 155-0181-00		TYPE HYBRID	
ENG	<i>John Adams</i>	8-27-80	PROCESS SHF III
DWN BY	<i>Bob Gault</i>	6-25-80	PACKAGE 1.75 cm HYPCON
CHK BY	BOB GAULT	8-27-80	DIE SIZE 54 x 42 mils



DESCRIPTION

The H508-1 is a 17 level (4-bit plus over-range) digitizer. The substrate contains 17 Thin-Film $10 \Omega/\text{Sq}$ Nichrome resistors and one M155 integrated circuit. The approximately equal resistors (about 15Ω each) are connected in series and are individually functionally trimmed to provide equal voltage increments between each output transition. Functional trimming permits an initial partial nulling out of errors due to offsets and base currents in the integrated circuit.

The H508-1 is designed for a full scale voltage of 3.072 or 192 mV per transition. VRP and V16 are shorted together. (The H508-2 is designed for a full scale voltage of 192 mV or 12 mV per transition. V16 is not connected to the hybrid resistor string and must be biased externally to VRP or higher. Voltage references are brought out for transitions 2, 7, and 12. These are used for the H508-2 ADC 820 application).

Refer to 203-0155-90 M155

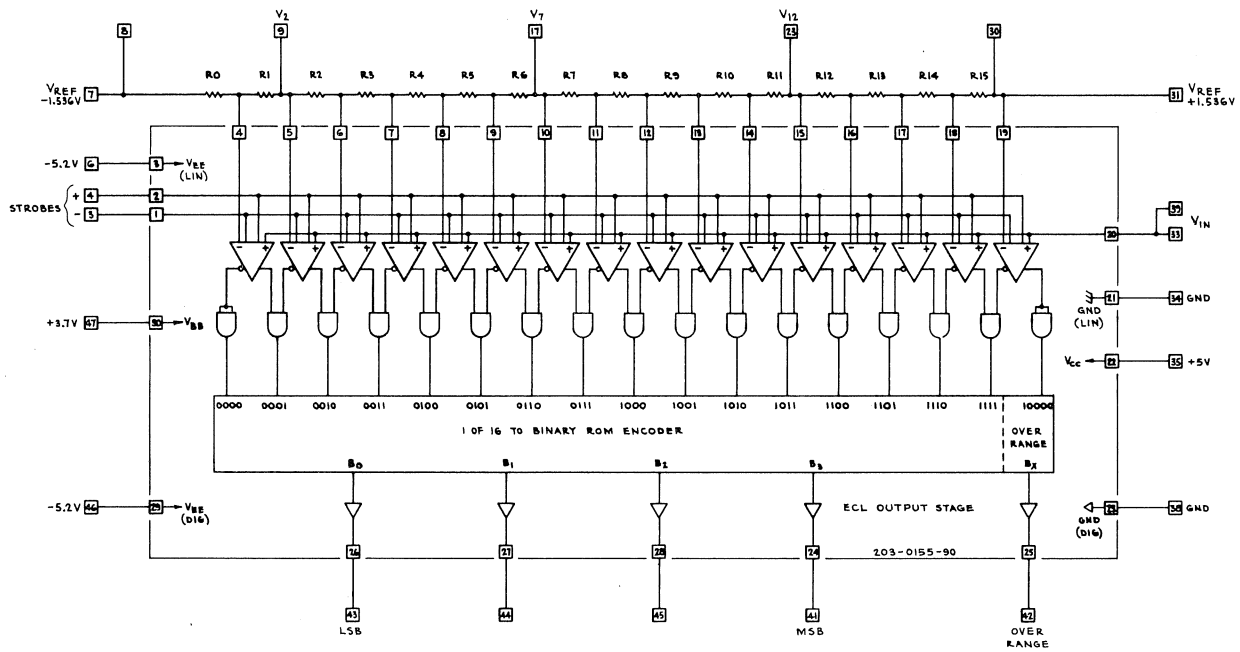
PROCESS Thin-Film

POWER SUPPLIES $V_{CC} +5V$, $V_{EE} -5.2V$

PACKAGE QUIP

DESIGNER Bob Nordstrom

INSTRUMENT USAGE ADC 820



NOTES:
 1. RESISTORS R0, R1, ... R15 ARE APPROXIMATELY 15Ω EACH. THEY ARE FUNCTIONALLY TRIMMED SO THAT ADJACENT WORD TRANSITIONS WILL BE SPACED 192 mV WITH A RESISTOR STRING CURRENT OF APPROXIMATELY 12.8 mA CORRESPONDING TO A FULL SCALE VOLTAGE OF 3.072 V.

ENGR	<i>[Signature]</i>	4-29-77	PROCESS	
DWN BY	Ben Handman	4-19-77	PACKAGE	48 PIN TEKFORM 35000
CHK BY		5-26-77	SUB SIZE	.7" X .7"
TYPE	HYBRID		4-BIT PARALLEL A/D CONVERTER, MSB	H508-1
INTEGRATED CIRCUIT DIV./MFG	TEKTRONIX, INC., BEAVERTON, OREGON, U.S.A.		PART NO.	155-0165-00

OUTLINE DRAWING NOT AVAILABLE AT THIS TIME

DESCRIPTION

The H508-1 is a 17 level (4-bit plus over-range) digitizer. The substrate contains 17 Thin-Film $10 \Omega/\text{Sq}$ Nichrome resistors and one M155 integrated circuit. The approximately equal resistors (about 15Ω each) are connected in series and are individually functionally trimmed to provide equal voltage increments between each output transition. Functional trimming permits an initial partial nulling out of errors due to offsets and base currents in the integrated circuit.

The H508-2 is designed for a full scale voltage of 192 mV or 12 mV per transition. V16 is not connected to the hybrid resistor string and must be biased externally to VRP or higher. Voltage references are brought out of transitions 2, 7, and 12. designed for a full scale voltage of 192 mV or 12 mV per transition. ed externally to VRP or higher. Voltage references are brought out application).

Refer to 203-0155-90 M155

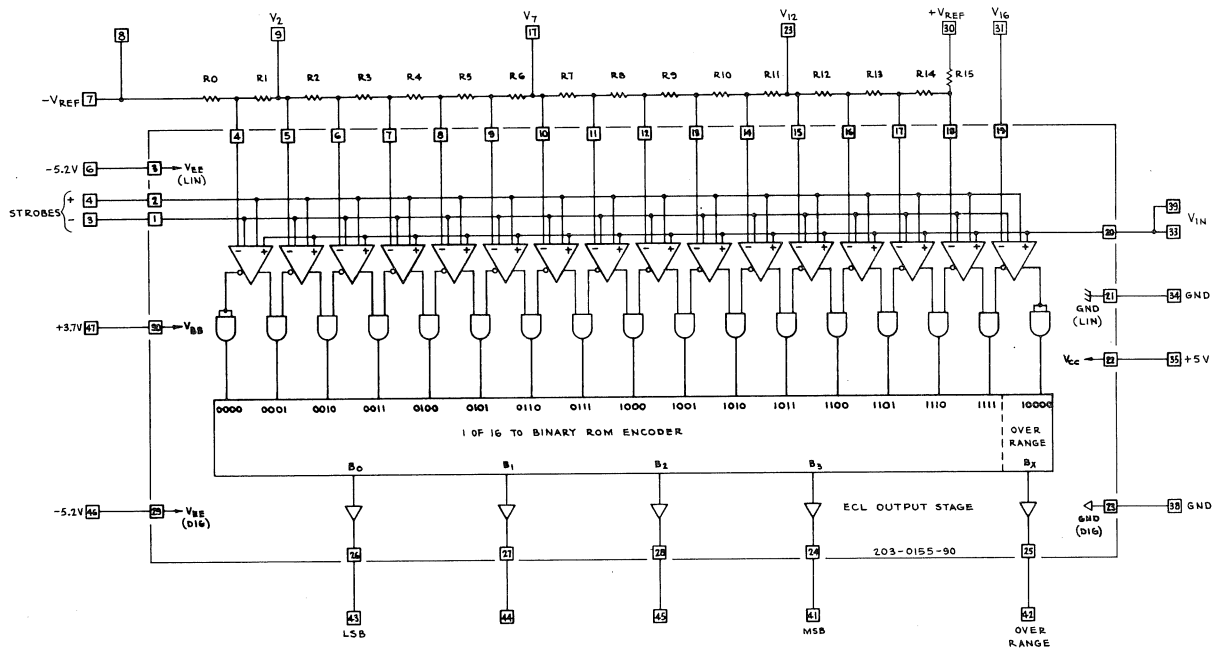
PROCESS Thin-Film

POWER SUPPLIES $V_{CC} +5V$, $V_{EE} -5.2V$

PACKAGE QUIP

DESIGNER Bob Nordstrom

INSTRUMENT USAGE ADC 820



NOTES:

1. RESISTORS R0, R1, ... R15 ARE APPROXIMATELY 15 Ω EACH. THEY ARE FUNCTIONALLY TRIMMED SO THAT ADJACENT WORD TRANSITIONS WILL BE SPACED 12 mV WITH A RESISTOR STRING CURRENT OF APPROXIMATELY 0.8 mA CORRESPONDING TO A FULL SCALE VOLTAGE OF 192 mV.

2. POS. VREF - NEG. VREF = 192 mV.

ENGR	<i>R. Handberg</i>	4-15-77	PROCESS	
DWBY	<i>Ron Handberg</i>	4-19-77	PACKAGE	48 PIN TEKFORM 55000
CHK BY			SUB S1E	7" X 7"
TYPE	HYBRID		4-BIT PARALLEL A/D CONVERTER, LSB	H508-2
INTEGRATED CREDIT DIV./MFG. TEKTRONIX, INC. BEAVERTON, OREGON, U.S.A.			PART NO. 155-0165-01	

OUTLINE DRAWING NOT AVAILABLE AT THIS TIME

DIODE PULSE SHAPER

155-0182-00 H575

DESCRIPTION

The H575 is a Schottky Barrier diode pulse shaping circuit. Differential outputs with risetime of less than 150 ps are produced when the appropriate drive signal is applied. Amplitude is variable to a maximum of 500 mV side-to-side.

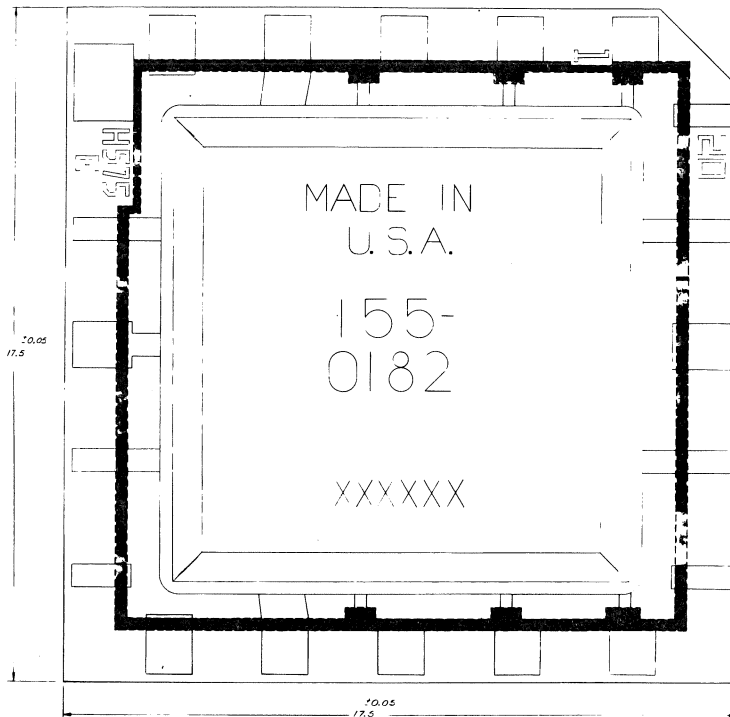
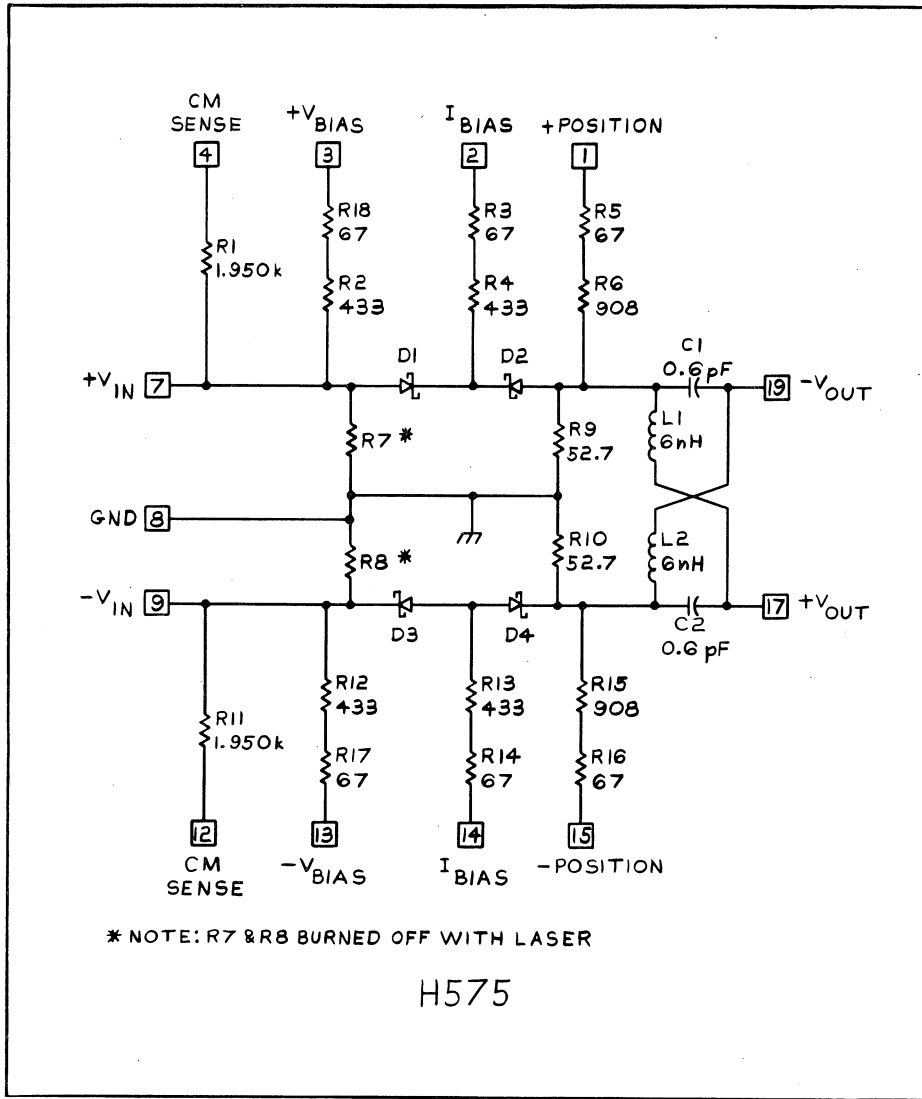
PROCESS Thin-Film

POWER SUPPLIES ± 15 Volts

PACKAGE 1.75 cm Hypcon System

DESIGNER Art Metz

INSTRUMENT USAGE 067-0587-02



DESCRIPTION

The H616 is a hybrid circuit using one M130 integrated circuit. External circuit connections are made through Berg pins along one edge. The camswitch contact pads are incorporated to provide for gain switching function. The circuit incorporated gain switching for 5 mV/div and 20 mV/div deflection factors, 2.5:1 variable gain, inversion, positioning, trigger pick-off, and channel switch. Two circuits re used to provide dual trace operation in the SC504. An overall system bandwidth of at least 80 MHz is achieved.

Refer to 203-0130-90 M130

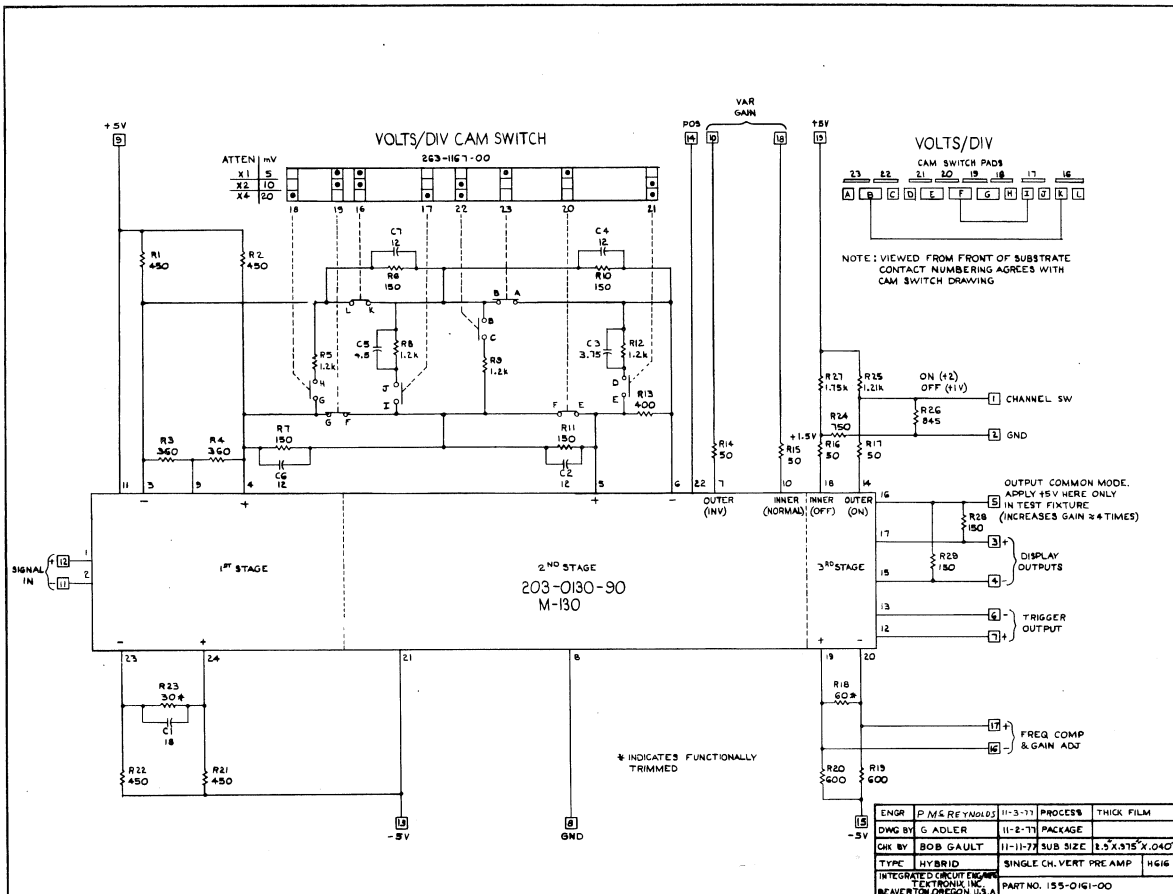
PROCESS Thick-Film

POWER SUPPLY. ± 5 Volts

PACKAGE SIP

DESIGNER

INSTRUMENT USAGE SC504



**OUTLINE DRAWING NOT
 AVAILABLE AT THIS TIME**

DIFFERENTIAL DETECTOR

155-0183-00 H672

DESCRIPTION

The H672 is a Schottky Barrier diode detector for use in a differential leveling loop. Detected output is proportional to the signal voltage from side-to-side rather than from side-to-ground. The usable frequency is from 3 MHz to 1.5 GHz. High frequency response can be controlled by a DC input.

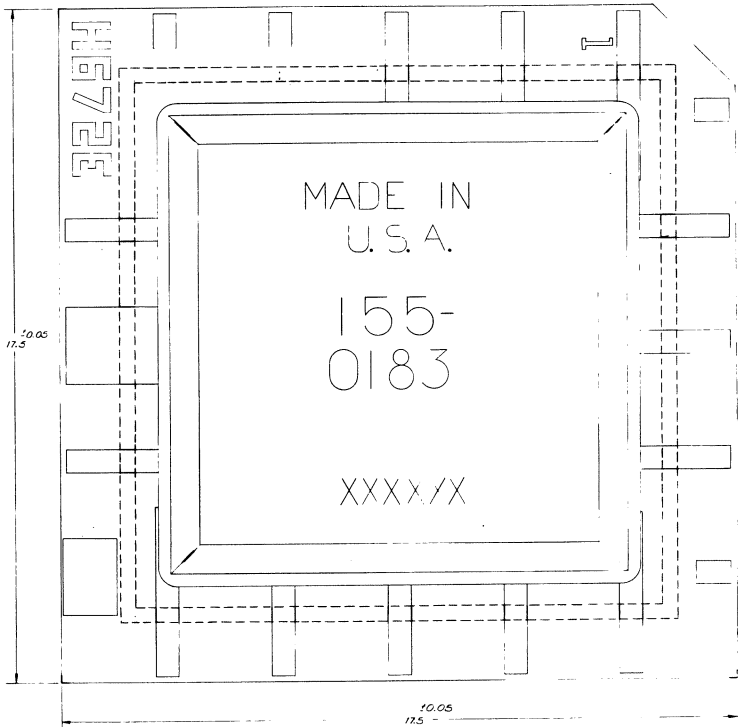
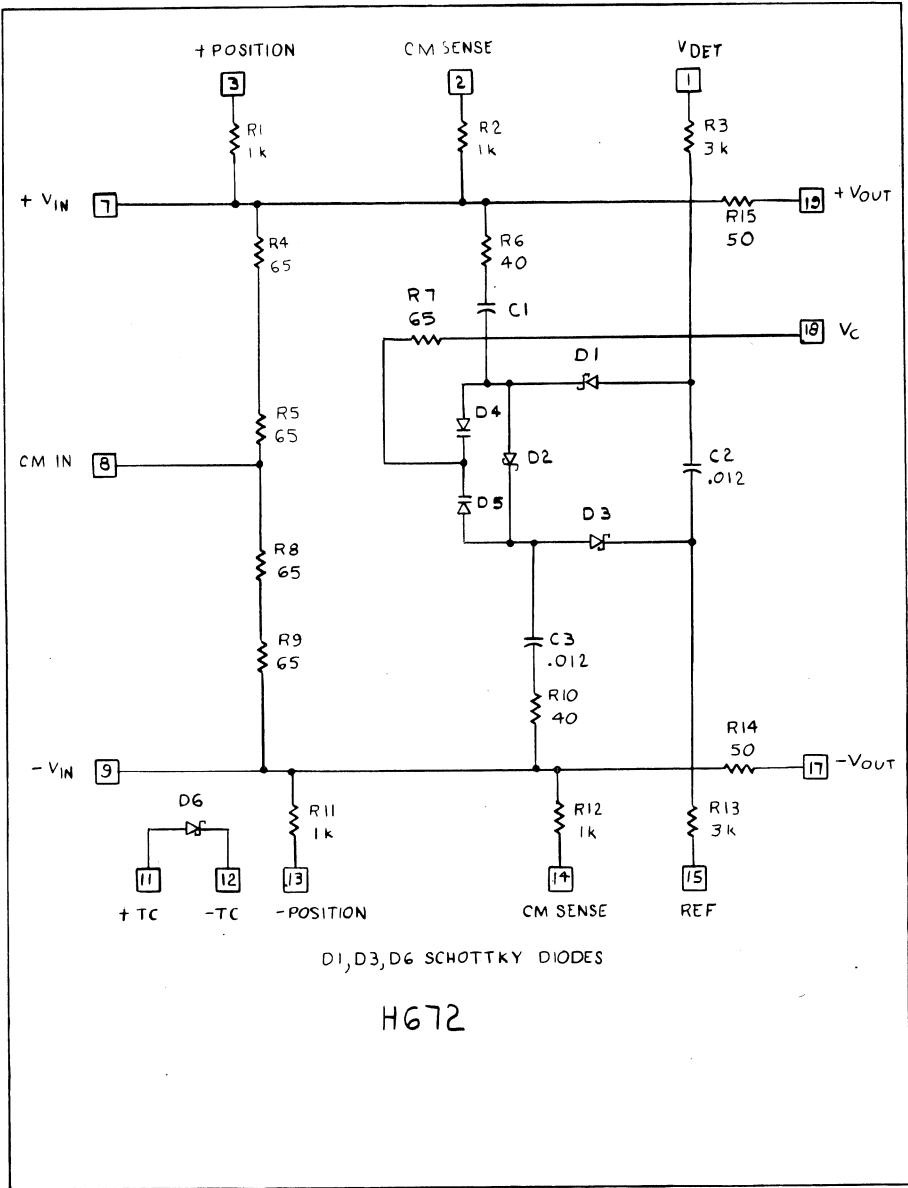
PROCESS Thin-Film

POWER SUPPLIES ± 15 Volts, +5 Volts

PACKAGE 1.75 cm Hypcon System

DESIGNER Art Metz

INSTRUMENT USAGE 067-0587-02



DESCRIPTION

The H710 is designed for use with the M177 in a parallel-serial system. It is also possible to construct a 10-Bit DAC using two H710's. The hybrid contains Nichrome resistors with a sheet resistance of $50 \Omega/\text{sq}$. R_p sets the reference current and is trimmed to $480 \Omega/\text{sq}$. R_A is a pull-up load resistor trimmed to be $0.25 R_p$. Binarily-scaled emitter resistors are functionally trimmed to set-up precision current sources. These are trimmed while measuring the output current at Pin #5. Two unswitched current sources approximately equal to 1LSB are provided. One is connected to the output, the other is available as an open collector. The emitters of these two current sources are brought out so that they can be adjusted or disabled.

The part is designed to operate with a reference of +3.072 volts or ± 1.536 volts. Full scale output current is then 25.6 mA. A -5.2 volt digital supply is needed to set-up the reference current. Digital inputs are ECL compatible and sink 1 mA each.

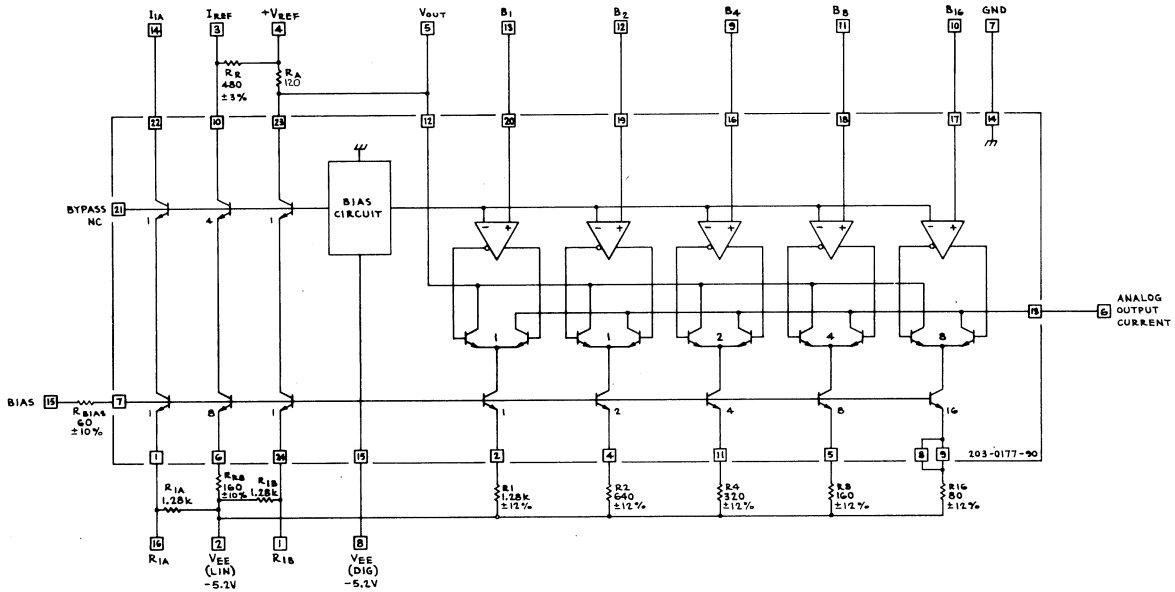
The H710 is tested to have linearity between $\pm 0.05\%$ ($\pm 1/2$ LSB at 10 bits). More specifically, the four LSB currents ratio binarily to the MSB current within $\pm 0.05\%$ of full scale where full scale is defined to be twice the MSB current. Differential non-linearity is also tested so that each 1-bit transition causes an output change of $1/32$ of full scale $\pm 0.05\%$ full scale. A final check of overall linearity is made by testing that the sum of the absolute values of each bit current error is less than 0.1% of full scale. This guarantees an overall non-linearity of less than $\pm 0.05\%$.

The trimming and testing of the hybrid is done with the output at a constant potential in order to minimize non-linearity due to variable DAC output conductance. Theory and some testing indicate that an output compliance of 3 volts will affect linearity in a "smooth" fashion by less than 0.05% of full scale.

Settling time to $\pm 1/2$ LSB with 10 pF load capacitance is typically 15 nS for 8-bits.

Refer to 203-0177-90 M177

PROCESS	Thin-Film
POWER SUPPLY.	
PACKAGE	T0-8
DESIGNER	Bob Nordstrom
INSTRUMENT USAGE	ADC 820



- NOTES:**
1. R_g IS TRIMMED SO THAT $V(\text{PIN } 10) = -750\text{mV} \pm 50\text{mV}$.
 2. R_A IS TRIMMED TO RATIO TO R_g .
 3. R_{1A} , R_{1B} , R_8 AND R_{16} ARE TRIMMED SO THAT THEIR RESPECTIVE OUTPUT CURRENTS SCALE APPROXIMATELY TO THE REFERENCE CURRENT.
 4. R_1 , R_2 AND R_4 ARE TRIMMED SO THAT THEIR RESPECTIVE OUTPUT CURRENTS SCALE ACCURATELY TO THE CURRENT THROUGH R_8 .
 5. FOR RATIO AND SCALING TOLERANCE SEE LASER TRIM SPECIFICATION.

ENGR	<i>[Signature]</i>	4-29-77	PROCESS	
DWN BY	<i>[Signature]</i>	4-21-77	PACKAGE	16 PIN TO-8 LG.
CHK BY	<i>[Signature]</i>	5-26-77	SUB SIZE	.5" X .5"
TYPE	HYBRID		5 BIT D/A CONVERTER	H710
HYBRID CIRCUIT ENG/NPN			PART NO. 155-0167-01	
TEKTRONIX, INC.			BEAVERTON, OREGON, U.S.A.	

**OUTLINE DRAWING NOT
AVAILABLE AT THIS TIME**

8-BIT D/A CONVERTER

155-0169-00 H719

DESCRIPTION

This D/A converter hybrid consists of an eight section 75 Ω ladder network with eight input transistors and eight emitter resistors of 250 Ω each.

The input terminals are intended to be connected to external diodes and with these diodes, the circuit is compatible with ECL circuitry.

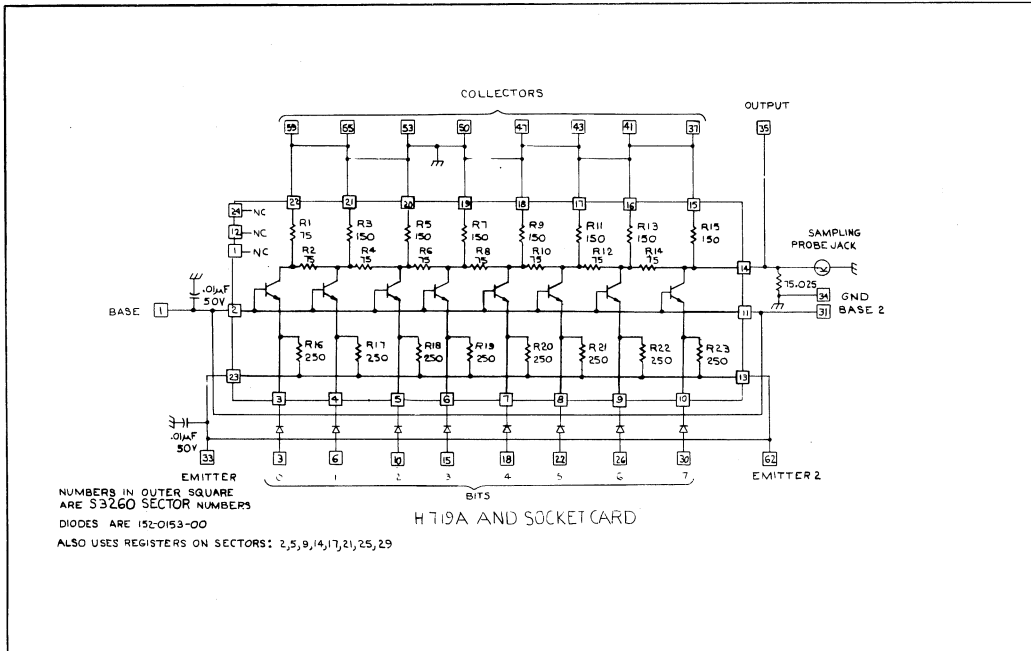
PROCESS Thin-Film

POWER SUPPLY. -5.8 Volts

PACKAGE 24 Pin DIP

DESIGNER Oscar Olson

INSTRUMENT USAGE DAC 850T



**OUTLINE DRAWING NOT
AVAILABLE AT THIS TIME**