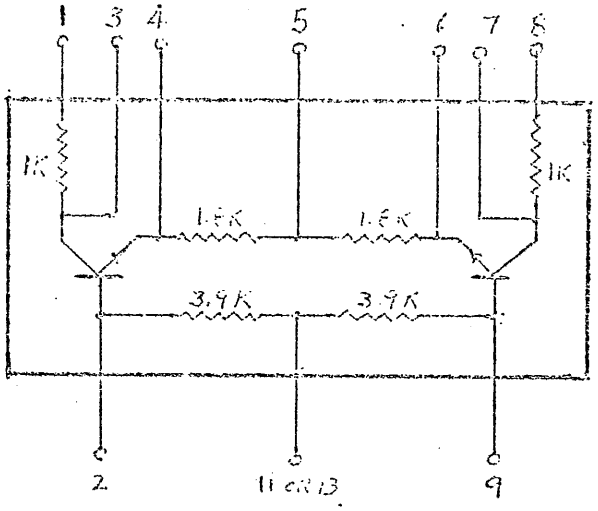
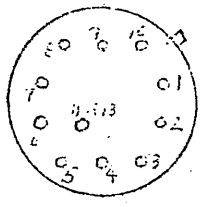
LAYOUT



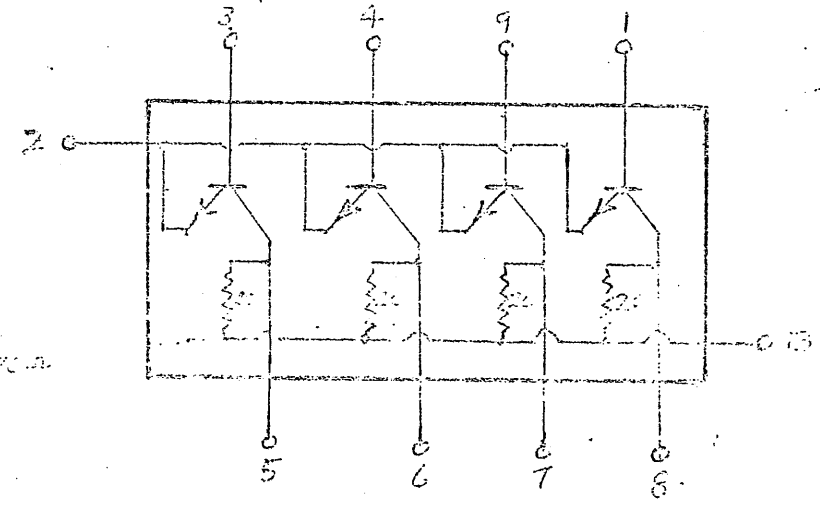
12V ± 5%

GF40175

SAME PIN



PIN SIDE OF CAN



5V

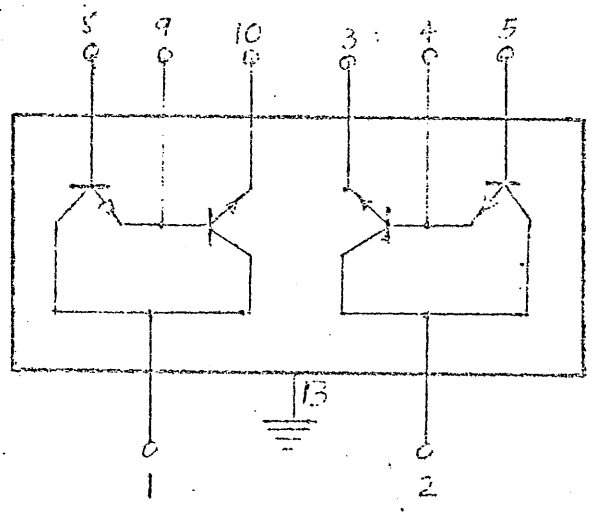
THRU 12 Ω

GF40182

GF40173 HAS NO INTERNAL RESISTORS.

PIN CONFIGURATION IS SAME AS GF40175

GF40174 (DARLINGTON)

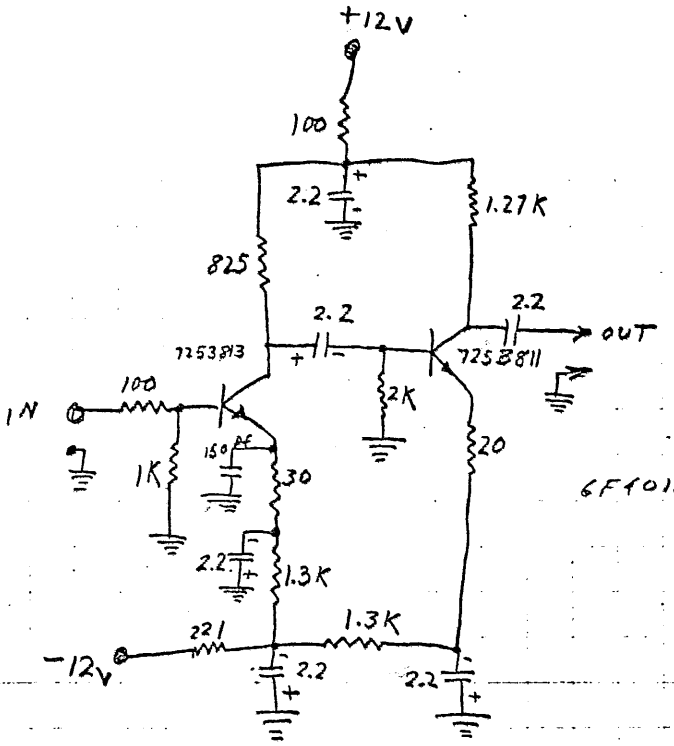


- 16V ea

10 K Ω

PIN 13 TO GND

PIN CONFIGURATION IS SAME AS GF40175



GF40155

7253813 - GF40155 — A2397

7253811 — GF40153 — A2467

	GF40154	GF40155
BV_{CBO} =	11V	25
BV_{CEO} =	8V	21
BV_{EBO} =	5V	4
LV_{CEO} =	7.5V	12
h_{FE} =	40—250	90-3
V_{CE} (SAT) =	.35V	
V_{BE} (SAT) =	.8V	
C_{cb} =	8.6 mmf	1.5mm
C_{ib} =	5.5 mmf	
f_T =	600 MHz	

A2414S

GF40181 GA54002	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CBO} (10 ua)	11	-	9.5	-	Volts
BV_{CES} (10 ua)	6.5	-	6.0	-	Volts
BV_{EBO} (10 ua)	5.0	-	4.5	-	Volts
LV_{CEO} (5 ma)	6.5	-	6.0	-	Volts
I_{CBO} (5 V)	-	0.03	-	0.5	uamp
I_{EBO} (1.5 V)	-	0.03	-	0.5	uamp
$V_{BE(sat)}$ (1, 9ma) h_{FE} (.5 V, 9 ma)	.8 90	.9 300	75	-	
V_{BE} (SAT) (.5 V, 9 ma)	.77	.83	.75	.85	Volt
C_{cb} (5 V, 100 KC)	-	2.2	-		uuf
C_{ib} (0.5 V, 100 KC)	-	1.8	-		uuf
f_T (3 V 12 ma, 300 mc)	600	-		-	mc
t_s (5, 5, 5 ma)	-	4.5	-		nsec
t_r (.7, 1.3, 5 ma)		6.0			nsec

ϕ JA = 550° C/W

ϕ JC = 250° C/W

P_D = 80 MW (25°C)

Case = TO - 18

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Temperature Storage - -65 °C to + 200 °C

Operating Junction Temperature - ____ °C to + 150 °C

21 December 1965

A2409
GF 4015

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CES} (10 ua)	25	-	20	-	Volts
BV_{EBO} (10 ua)	5	-	4	-	Volts
LV_{CEO} (10 ma)	12	-	10	-	Volts
I_{CBO} (10 V)	-	0.03	-	1.0	uamp
I_{EBO} (1.5 V)	-	0.03	-	1.0	uamp
$V_{CE(SAT)}$ (10, 0.5 ma)	-	0.25	-	0.30	Volt
$V_{CE(SAT)}$ (50, 2.5 ma)	-	0.6	-	0.75	Volt
$V_{BE(SAT)}$ (10, 1 ma)	-	0.8	-	0.9	Volt
$V_{BE(SAT)}$ (50, 5 ma)	-	0.9	-	1.0	Volt
h_{FE} (5 V, 10 ma)	30	250	-	-	
h_{FE} (5 V, 50 ma)	30	-	-	-	
C_{cb} (5 V, 100 KC)	-	3.5	-		uuf
f_T (10 V, 10 ma, 100 mc)	400	-	-	-	mc
t_s (5, 5, 5 ma)	-	15	-		nsec

θ_{JA}= 500°C/W

θ_{JC}= 200°C/W

P_D = 250 MW

CASE=

Circuit design is tobe based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Temperature Storage - 65 °C to + 200 °C

Operating Junction Temperature - °C to + 150 °C

17 August 1965

A2414
GF40152

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CBO} (10 ua)	11	-	9.5	-	Volts
BV_{CES} (10 ua)	6.5	-	6.0	-	Volts
BV_{EBO} (10 ua)	5.0	-	4.5	-	Volts
LV_{CEO} (5 ma)	6.5	-	6.0	-	Volts
I_{CBO} (5 V)	-	0.03	-	0.5	uamp
I_{EBO} (1.5 V)	-	0.03	-	0.5	uamp
h_{FE} (2 V, 10 ma)	40	250	-	-	
V_{CE} (SAT) (0.67, 10 ma)	-	0.29	-	0.33	Volt
V_{BE} (SAT) (1, 10 ma)	-	0.9	-	1.0	Volt
C_{ob} (5 V, 100 KC)	-	2.2	-		uuf
C_{ib} (0.5 V, 100 KC)	-	1.8	-		uuf
f_T (3 V. 12 ma, 300 mc)	600	-	-	-	mc
t_s (5, 5, 5 ma)	-	4.5	-		nsec
t_r (.7, 1.3, 5 ma)		6.0			nsec

ϕ JA = 550°C/W

ϕ JC = 250°C/W

P_D = 80 MW (25°C)

Case = TO - 18

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Temperature Storage - 65 °C to + 200 °C

Operating Junction Temperature - ____ °C to + 150 °C

17 August 1965

A2467

GF40153

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CBO} (10 ua)	11	-	9.5	-	Volts
BV_{CES} (10 ua)	6.5	-	6.0	-	Volts
BV_{EBO} (10 ua)	5.0	-	4.5	-	Volts
LV_{CEO} (10 ma)	6.5	-	6.0	-	Volts
I_{CBO} (5 V)	-	0.06	-	0.5	uamp
I_{EBO} (1.5 V)	-	0.06	-	0.5	uamp
h_{FE} (2V, 20 ma)	40	250	-	-	
$V_{CE(SAT)}$ (1.35, 20 ma)	-	0.29	-	0.33	Volt
$V_{BE(SAT)}$(2, 20 ma)	-	0.9	-	1.0	Volt
C_{cb} (5 V, 100 KC)	-	4.2	-		uuf
C_{ib} (0.5 V, 100 KC)	-	2.8	-		uuf
f_T (3 V, 24 ma, 300 mc)	600	-		-	mc
t_s (5, 5, 5 ma)	-	4.5	-		nsec
t_r (1.4,2.6,10 ma)		6.0			nsec

θJA = 550 °c/w

θJC = 250 °c/w

P_D = 100 MW (25°c)

CASE = TO - 18

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Temperature Storage - 65 °C to + 200 °C

Operating Junction Temperature - ____ °C to + 150 °C

17 August 1965

A2468
GF40154

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CBO}(10 ua)	11	-	9.5	-	Volts
BV_{CES}(10 ua)	8	-	7.5	-	Volts
BV_{EBO} (10 ua)	5.0	-	4.5	-	Volts
LV_{CEO} (20 ma)	7.5	-	7.0	-	Volts
I_{CBO} (5 V)	-	0.12	-	1.0	uamp
I_{EBO} (1.5 V)	-	0.12	-	1.0	uamp
h_{FE} (2 V, 40 ma)	40	250	-	-	
V_{CE} (SAT) (50, 2.5 ma)	-	0.35	-	0.4	Volt
V_{BE}(SAT) (50, 5 ma)	0.75	0.9	0.70	1.0	Volt
C_{cb} (5 V, 100 KC)	-	8.6	-		uuf
C_{ib} (0.5 V, 100 KC)	-	5.5	-		uuf
f_T (3 V, 48 ma, 300 mc)	600	-		-	mc
t_s (5,5,5 ma)	-	4.5	-		nsec
t_r (2.8,5.2,20 ma)		6.0			nsec

θJA = 550 °c/w

θJC = 250 °c/w

P_D = 150 MW (25 °c)

CASE = To-18

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Storage Temperature - 65 °C to + 200 °C

Operating Junction Temperature - °C to + 150 °C

17 August 1965

A2397 - GF40155

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CES} (10 ua)	21	—	17	—	Volts
BV_{CBO} (10 ua)	25	—	21	—	Volts
BV_{EBO} (10 ua)	4	—	3	—	Volts
LV_{CEO} (5 ma)	12	—	10	—	Volts
I_{CBO} (5 v)	—	0.01	—	0.5	uamp
I_{EBO} (1.5 v)	—	0.01	—	0.5	uamp
h_{FE} (5 v, 5 ma)	90	300	75	—	
C_{ob} (5 v, 100 KC)	—	1.5	—		uuf
r_T (5 v, 5 ma, 300 mc)	800	—		—	mc

θ_{JA} = 550°C/W

θ_{JC} = 250°C/W

P_D = 100 mw

Case = TO-18

Storage Temperature 65 °C to 200 °C

Operating Junction Temperature ____ °C to 150 °C

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

17 August 1965

A2397M - MATCHED PAIR
GF40179

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CES} (10 ua)	21		17		Volts
BV_{CBO} (10 ua)	25		21		Volts
BV_{EBO} (10 ua)	4		3		Volts
LV_{CEO} (5 ma)	12		10		Volts
I_{CBO} (5 v)		.01		0.5	uamp
I_{EBO} (1.5 v)		.01		0.5	uamp
h_{FE_1} (5 v, 5 ma)	90	300	75	330	
h_{FE_2} (5 v, 5 ma)	90	300	75	330	
$\frac{h_{FE_1}}{h_{FE_2}}$	.8	1.2	.75	1.25	
$\lvert V_{BE_1} - V_{BE_2} \rvert$ @ (5 v, 5 ma)		≤ 10		≤ 20	mv Volts
C_{cb} (5v, 100 KC)		1.5			uuf
f_t (5 v, 5 ma, 300 mc)	800				mc

θ_{JA} = 550°C/W

θ_{JC} = 250°C/W

PD = 100 mw

Case = TO-18

Circuit Design is to be based on End-of-Life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Storage Temperature - 65 °C to 125 °C

Operating Junction Temperature _____ °C to 125 °C

A2520

GF 40176

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CES} (10ua)	25	-	21	-	Volts
BV_{EBO} (10 ua)	5.0	-	4.5	-	Volts
LV_{CEO} (50 ma)	15	-	13	-	Volts
I_{CBO} (10 V)	-	0.1	-	2.0	uamps
I_{EBO} (1.5 V)	-	0.1	-	2.0	uamps
$V_{CE(SAT)}$ (250, 12.5 ma)	0.13	0.35	0.1	0.5	Volt
$V_{BE(SAT)}$ (250, 15 ma)	-	1.0	-	1.2	Volts
h_{FE} (5 V, 250 ma)	40	250	-	-	
t_s (100, 100, 100 ma)	-	20	-		nsec
t_f (20, 20, 100 ma)	-	15	-		nsec
C_{cb} (5 V, 100 KC)	-	12	-		uuf
f_T (5 V, 100 ma, 100 mc)	400	-		-	mc

θ_{JA} = 500 °C/W

θ_{JC} = 200 °/W

P_D = 250 MW (25 °C)

CASE = TO-18

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

Storage Temperature - 65 °C to + 200 °C

Operating Junction Temperature - ____ °C to + 150 °C

17 August 1965

GF 40177

	Specification Limit		End-of-Life Limit		Unit
	Min.	Max.	Min.	Max.	
BV_{CES} (100 μa)	25	-	21	-	Volts
BV_{EBO} (10 μa)	4.5	-	4.0	-	Volts
LV_{CEO} (50 ma)	16	-	15	-	Volts
I_{CBO} (10 V)	-	1.0	-	10	μamps
I_{EBO} (1.5 V)	-	0.5	-	2.0	μamps
$V_{CE(SAT)}$ (750, 37.5 ma)	0.15	0.50	0.1	0.6	Volt
$V_{BE(SAT)}$ (750, 75 ma)	0.75	1.05	0.7	1.2	Volts
h_{FE} (5 V, 750 ma)	35	250	-	-	
C_{cb} (5 V, 100 KC)	-	24	-		~~mmf~~
C_{ib} (1.5 V, 100 KC)	-	44	-		uuf
f_T (5 V, 200 ma, 100 mc)	400	-		-	mc
t_s (100, 100, 100 ma)	-	12	-		nsec
t_r (100, 50, 1000 ma)	-	10	-		nsec

θ_{JA} = 250° C/W

θ_{JC} = 60°C/W

P_D = 2W at 25° C Infinite Heat Sink

CASE =

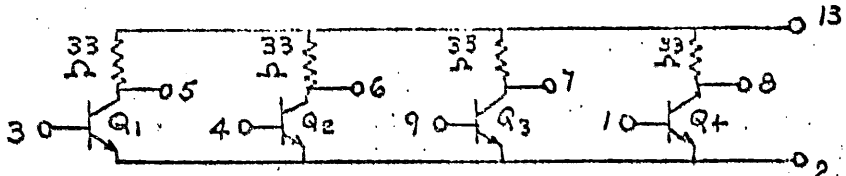
Storage Temperature - 65 °C to + 200 °C

Operating Junction Temperature - ____ °C to + 150 °C

Circuit design is to be based on end-of-life limits. Under no circumstances should the specification limits or product distributions be used for circuit design.

21 December 1965

A2557 - GF 40173
4 Transistors/Can



Q_1; Q_2, Q_3 & Q_4
A2546

	PIN #	INITIAL MIN.	INITIAL MAX.	E. O. L. MIN.	E. O. L. MAX.	UNIT
BV_{CES} (100 ua) gnd pins 3,4,9,1 & 2	(13 to 2)	20		17		Volts
BV_{EBO}(10 ua)	2,3	4.5		4		Volts
	2,4	4.5		4		Volts
	2,9	4.5		4		Volts
	2,1	4.5		4		Volts
I_{EBO} (1.5 V)	2,3		.5		2	uamps
	2,4		.5		2	uamps
	2,9		.5		2	uamps
	2,1		.5		2	uamps
I_{CBO} (10 V)	5,3		1.5		12	uamps
	6,4		1.5		12	uamps
	7,9		1.5		12	uamps
	8,1		1.5		12	uamps
V_{CE} (SAT)	2,3,5		.50		.6	Volts
(750, 37.5 ma)	2,4,6		.50		.6	Volts
	2,9,7		.50		.6	Volts
	2,1,8		.50		.6	Volts
V_{BE} (SAT)	2,3,5	.75	1.05	.7	1.2	Volts
(750, 75 ma)	2,4,6	.75	1.05	.7	1.2	Volts
	2,9,7	.75	1.05	.7	1.2	Volts
	2,1,8	.75	1.05	.7	1.2	Volts
V_{BE}(SAT)@(750 ma, 100 ma)	2,3,5		1.1		1.3	Volts
	2,4,6		1.1		1.3	Volts
	2,9,7		1.1		1.3	Volts
	2,1,8		1.1		1.3	Volts
C_{ob}(5V, 100 KC)			28			pf
C_{ib} (1.5V, 100 KC)			40			pf
* t_r (100,50, 1000 ma)					10	nsec
R_c (100 ma)	5,13	29	37			Ohms
	6,13	29	37			Ohms
	7,13	29	37			Ohms
	8,13	29	37			Ohms

θ_{JC} = 40°C/W

* Not Finalized

21 December 1965

θ_{JA} = 125°C/W

PD =

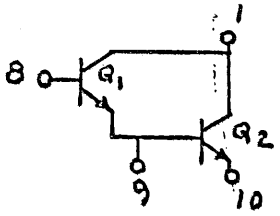
CASE =

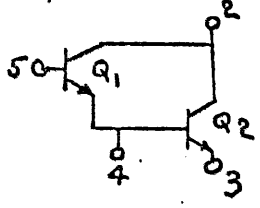
Storage Temperature - 65 °C to + 150 °C

Operating Junction Temperature - ____ °C to + 100 °C
(Maximum Average)

Operating Junction Temperature (Peak) 150 °C.

A2558 - GF40174
DARLINGTON 2/CAN





Q_1 = A2409D

Q_2 = A2546

	Pin #	Initial Min.	Initial Max.	E.O.L. Min.	E.O.L. Max.	Unit
BV_{EBO} (10 ua)	9 to 8	4.5		4		Volts
	10 to 9	4.5		4		Volts
	4 to 5	4.5		4		Volts
	3 to 4	4.5		4		Volts
BV_{CES} (100 ua)	1 to 8, 9, 10	23		19		Volts
	2 to 5, 4, 3	23		19		Volts
I_{EBO} (1.5 v)	9 to 8		.1		2	ua
	10 to 9		.5		2	ua
	4 to 5		.1		2	ua
	3 to 4		.5		2	ua
I_{CES} (10 v)	1 to 8, 9, 10		1		12	ua
	2 to 5, 4, 3		1		12	ua
V_{CE} (SAT) (750, 2.5 ma)	1, 10, 8	.85	1.2	.8	1.4	Volts
	2, 3, 5	.85	1.2	.8	1.4	Volts
V_{BE} (SAT) (750,7.5 ma)	1, 10, 8	1.5	1.9	1.4	2.1	Volts
	2,3, 5	1.5	1.9	1.4	2.1	Volts
Cob (100 Kc, V_{CB} = 5 v)			7		8	pf
t_1 (25, 25, 1000 ma)		6.5	9.5	6.0	10.5	nsec
* t_s (10,10,10 ma)	1,8,9,10		13		14	nsec
	2,5,4,3		13		14	nsec

θ_{JC} = 40°C/W θ_{JA} = 150°C/W PD = CASE =

Storage Temperature - 65 °C to + 150 °C

Operating Junction Temperature - _____ °C to + 100 °C Maximum Average

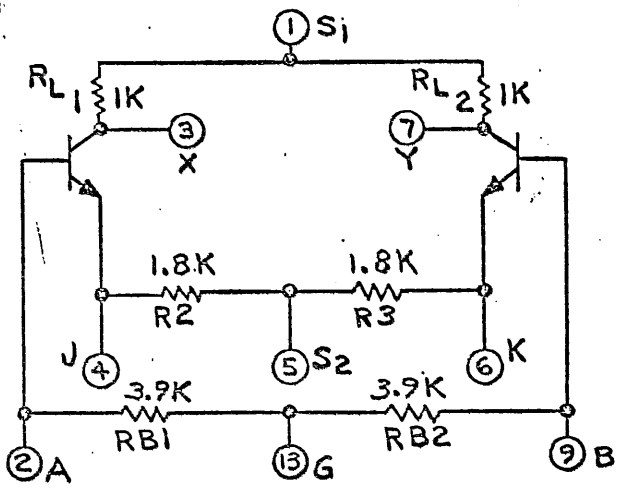
150 °C Peak

* - not finalized

17 August 1965

GF40178

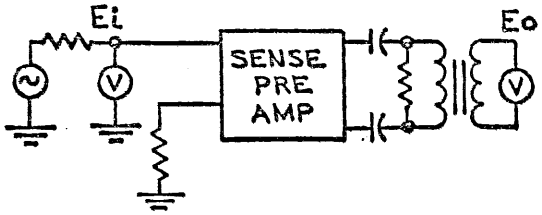
EMITTER COMPENSATED AMPLIFIER
(MATCHED DIFFERENTIAL AMPLIFIER STAGES)



	Specification Limit		E.O.L.		Unit
	Min.	Max.	Min.	Max.	
1) V_{SIG} @ I_{SIG} = 10 ua	18		14		Volts
2) V_{BK}, V_{AJ} @ I_{S2G} = 10 ua	4		3		Volts
3) LV_{XJ}, LV_{YK} @ I_{S1} to I_{S2} = 5 ma	12		10		
4) I_{S1G} @ V_{S1G} = 5 V		20		1000	namp
5) Voltage Gain - (Ad)* @ E_i (diff) = 3 mv (RMS)max. PRR = 10 Kc to 100 Kc SINE WAVE	90	100	80	100	

$$A_d = \frac{E_o \text{ (diff) @ 200}\Omega}{E_i \text{ (diff) @ 0 }\Omega}$$

*Emitter Resistor of 2nd Stage Adjusted for Gain.



For Details See Drawing #7036423.

21 December 1965

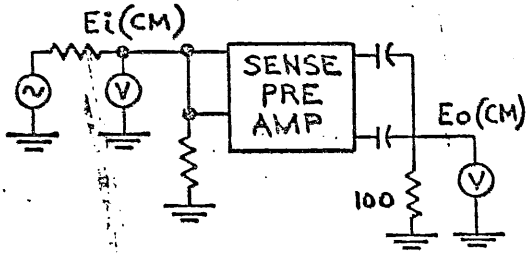
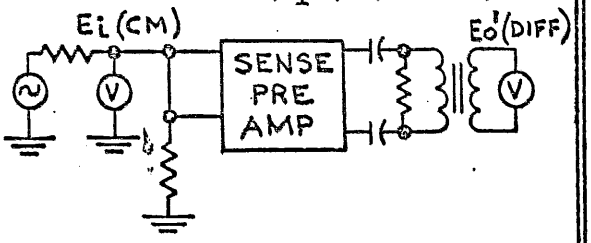
	Specification Limit		E.O.L.		Unit
	Min.	Max.	Min.	Max.	
6) Common Mode Gain - (A_{CM}) @ E_i (CM) = 120 mv (RMS) PRR = 10 Kc to 100 Kc SINE WAVE $A_{CM} = \frac{E_o \text{ (CM) @ 100 } \sim}{E_i \text{ (CM) @ 0 } \sim}$		1/35			
					
For Details See Drawing #7036423.					
7) Common Mode Noise - (F_{CM}) @ E_i (CM) = 120 mv (RMS) PRR = 10 Kc to 100 Kc SINE WAVE $^{**}F_{CM} = \frac{E_o^1 \text{ (diff) @ 200 } \sim}{(E_i \text{ (CM) @ 0} \sim)}$		1/8			
					
For Details See Drawing #7036423.					
* 8) $^{**}t_r$ (10-90%) output pulse e in ≤ 3 mv step tri ≤ 1 nsec, PW = 10-30 nse V_{cc} = 12 v ± 3%, V_{ee} = - 12 v ± 3%		7			nsec

Figure 1

* Not Finalized

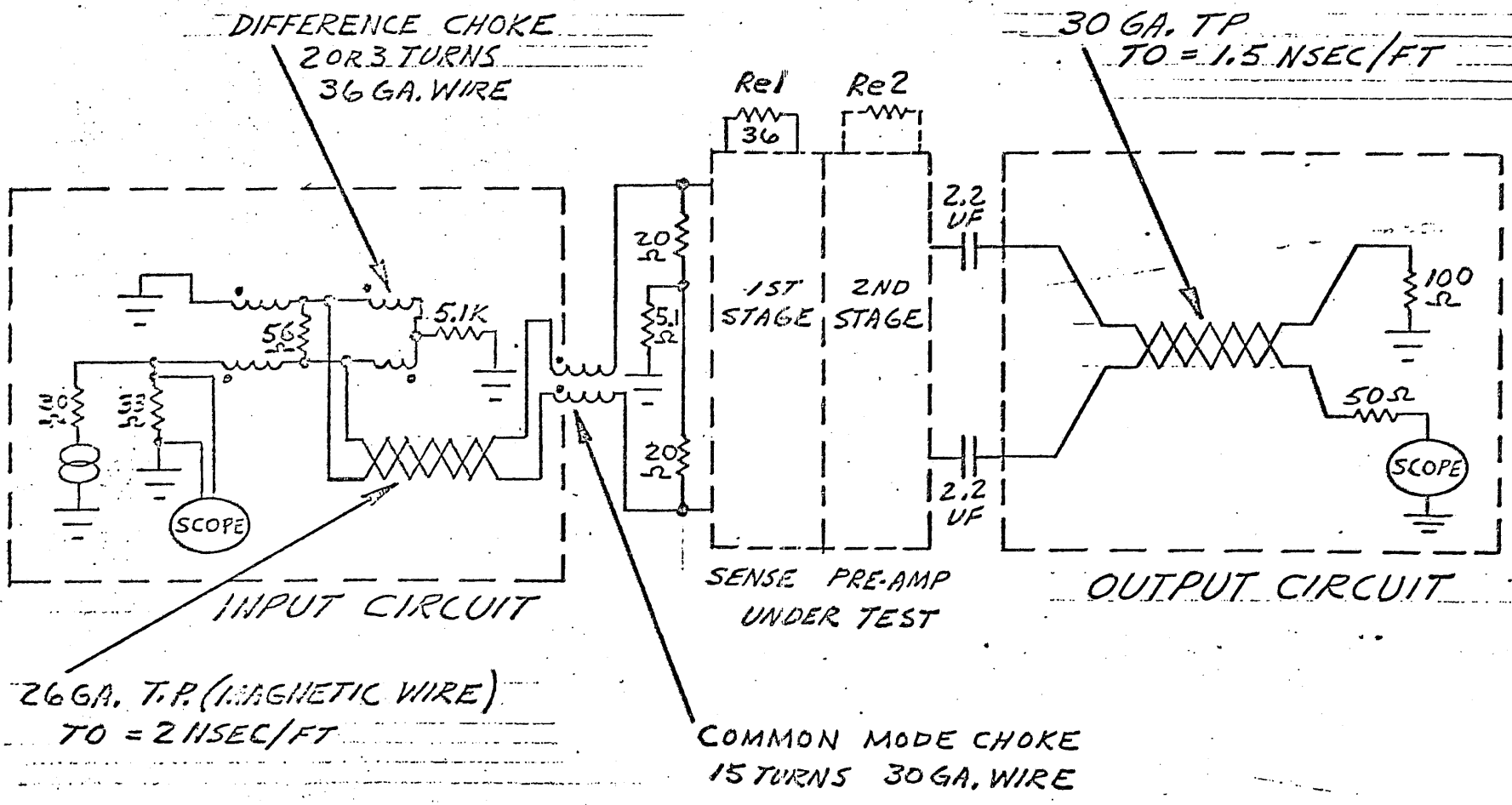

DIFFERENCE CHOKE
2 OR 3 TURNS
36 GA. WIRE
30 GA. TP
TO = 1.5 NSEC/FT
Re1
Re2
36
2.2 UF
20 Ω
5.1 Ω
1ST STAGE
2ND STAGE
5.1K
56 Ω
100 Ω
50 Ω
SCOPE
SCOPE
2.2 UF
20 Ω
INPUT CIRCUIT
SENSE PRE-AMP UNDER TEST
OUTPUT CIRCUIT
26 GA. T.P. (MAGNETIC WIRE)
TO = 2 NSEC/FT
COMMON MODE CHOKE
15 TURNS 30 GA. WIRE

FIGURE - 1