INSTRUCTION MANUAL

Model GBR

Three-Phase Battery Chargers

GOULD

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Three-Phase Battery Chargers

THIS MANUAL COVERS SERIAL NO. 531646 AND HIGHER

GOULD

Index

Note — If special features or options are supplied, refer to the addendum

SECTION I Installation

1.1 UNPACKING

Check battery charger for any signs of shipping damage prior to installation. Pay particular attention to internal components for looseness. Since all Gould battery chargers are shipped FOB factory, the consignee must file any damage claim with the carrier.

NOTE

In order not to invalidate any claim, do not continue with the installation before filing a claim and before damage has been inspected by a representative of the carrier's insurance company.

1.2 IDENTIFICATION

Verify that the correct model has been received by comparing the name plate data (Figure 1.2) and the specifications detailed in Section IV with the purchase requirements. Also check for compatibility between the charger rating and the battery amp-hour rating.

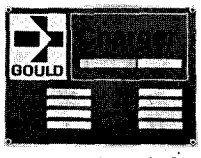


FIGURE 1.2
(typical name plate)

1.3 CHARGER LOCATION

Three-phase models are designed to be floor mounted. However, space beneath the charger must remain clear to ensure a free air flow for proper cooling. If two or more chargers are stacked vertically, the space between chargers must be unobstructed.

CAUTION

In no case should the charger be located in an ambient temperature that exceeds 105°F.

1.4 AC INPUT CONNECTIONS

All local building codes must be observed when connecting the charger to its AC source. Three-phase AC wiring is brought in through a knock-out hole located on the upper right hand side of the cabinet and is terminated at the three upper terminals of the K1 power contactor. The contactor is located in the upper right hand corner of the cabinet.

CAUTION

The orange/green and blue/green control wires connected to the input terminals of the contactor energize the T3 control transformer. Make certain these wires remain connected to the contactor after the AC power wiring is completed.

1.5 INPUT TRANSFORMER CONNECTIONS

Most three-phase model GBR chargers are equipped with a multi-voltage input transformer Before connecting the charger to a power source check the T1 power transformer terminal connections by referring to Drawing B107178 in Section VIII of this manual.

CAUTION

Connecting the charger to the incorrect AC voltage may damage the unit.

1.6 CONTROL TRANSFORMER CONNECTIONS

Control transformer T3 (located below the input contactor) is tapped for various AC input voltages. The Red/Green push-on wire must be connected as shown in Figure 1.6.

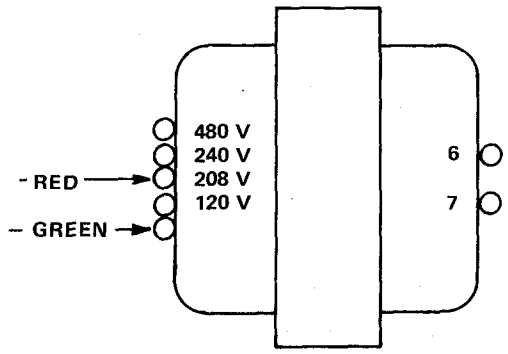


FIGURE 1.6
T3 CONTROL TRANSFORMER

1.7 GROUNDING

Ground the charger cabinet to a suitable terminal by connecting a wire, at least a No. 12 AWG, from the ground screw, located adjacent to the input contactor K1. The grounding wire should be run in as direct a path as possible in order to keep its impedance low. An external tooth lockwasher, used with the grounding screw, will assure a good metal-to-metal contact between the ground wire and the cabinet.

A low impedance ground is important for personnel and equipment safety, especially during an electrical storm.

1.8 DC OUTPUT CONNECTIONS

DC output cables are provided to connect the charger to the battery. The positive battery terminal is connected to the free terminal of the F4 DC output fuse. The negative terminal of the battery is connected to a standoff terminal located after the DC output lead passes through the current limit toroids.

NOTE

The charger will not operate if the battery is reversed or not connected.

SECTION II Operation

2.1 NORMAL OPERATION

The charging cycle is initiated by setting the timer to the NORMAL position. The input contactor is energized and, after a short delay, charging current is supplied to the battery. If the battery is 25% or more discharged, the charger ammeter will indicate maximum current. After a certain interval, determined by the state of discharge of the battery, the charging current will decrease and the battery voltage will be held constant at 2.37 volts per cell.

When the charging current has decreased to approximately 25% of the maximum output, the timer motor is energized and the timer lamp is lighted. The charging cycle is now within two hours of completion.

2.2 EQUALIZE OPERATION

Setting the timer to the EQUALIZE position instead of the NORMAL position will add three hours to the timed portion of the charging cycle. In all other respects, operation is as described in paragraph 2.1.

When the two hour timing cycle is completed, the charger shuts down and the timer lamp is extinguished. The battery is now fully charged.

2.3 OVERVOLTAGE PROTECTION

If, for any reason, the charger output voltage should increase to over 2.75 volts per cell, a voltage sensitive relay circuit (K2) shuts down the charger. To restart the charger after overvoltage shutdown, it is necessary to disconnect the battery from the charger and then reconnect it.

To by-pass the overvoltage protection feature, connect a jumper across terminals 1 and 2 of TB1 (located directly under the K1 contactor).

CAUTION

The battery should be continuously monitored if the overvoltage protection is bypassed in order to prevent damage due to an excessively high voltage.

SECTION III Adjustments

3.1 GENERAL

All required adjustments have been made at the factory so that no additional adjustments should be necessary when installing a charger. However, if certain components are replaced in the field, it may be necessary to check the following adjustments.

3.2 OUTPUT VOLTAGE ADJUSTMENT

The DC output voltage of the rectifier should be adjusted so that the voltage measured at the battery terminals is in accordance with Table 3.2. The adjustment is made by potentiometer R44 located on the control board. Refer to drawings 0034-010-001 and 0034-011-001 in Section VIII for location of R44.

TABLE 3.2
DC VOLTAGE

NO. of CELLS	DC VOLTS
6	14.25
9	21.4
12	28.5
15	35.7
16	38.0
18	42.8
20	47.6
24	57.1

3.3 CURRENT LIMIT

The maximum current the rectifier supplies to a completely discharged battery is determined by resistors in the AS205 circuit. A potentiometer is located on this assembly to reduce the current limit value, when and if required.

TABLE 3.3
CURRENT LIMIT AMPS

AH CAPACITY	MAX. CURRENT LIMIT
300	64A
380	80A
450	95A
540	110A
680	145A
800	170A
1050	224A
1200	256A
1400	298A

3.4 OVERVOLTAGE SHUTDOWN

The overvoltage circuit protects the battery from damage by an excessively high voltage. Adjust potentiometer R76 so that the charger is shut down whenever the output voltage exceeds 2.75 volts per cell. Refer to drawings 0034-010-001 and 0034-011-001 in Section VIII for the location of R76.

To restart the charger after the overvoltage circuit has been activated, disconnect the battery and then re-connect it.

SECTION IV Specifications

GBR 6-300 T-1

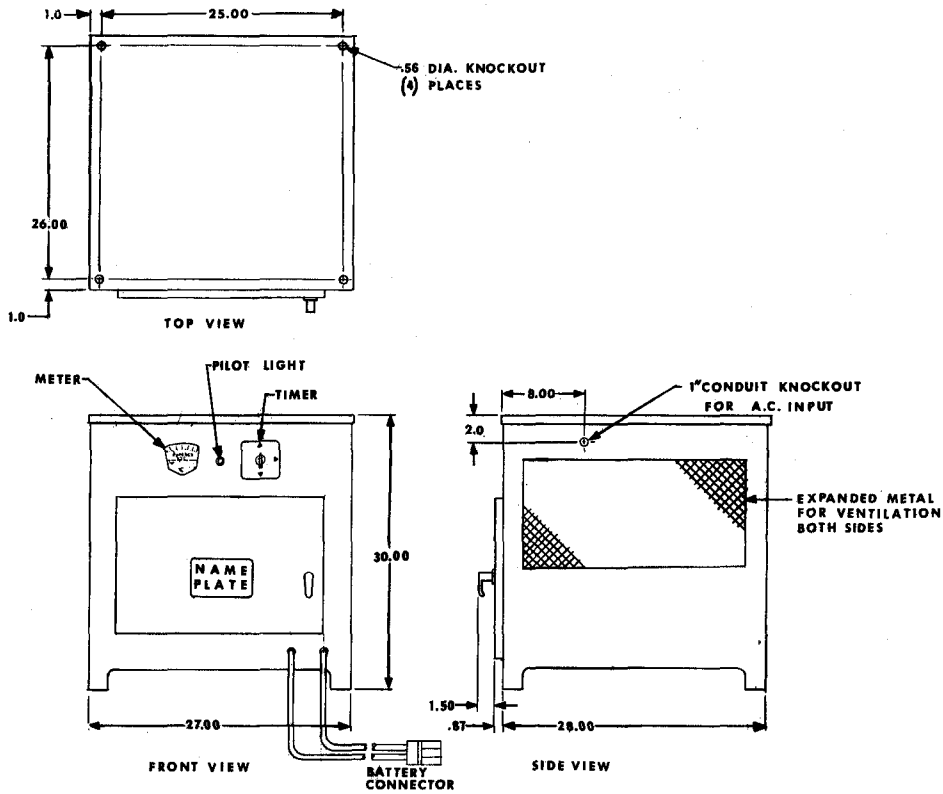
No. of Lead-Acid Cells / Battery Amp Hours

No. of Circuits / Three-Phase

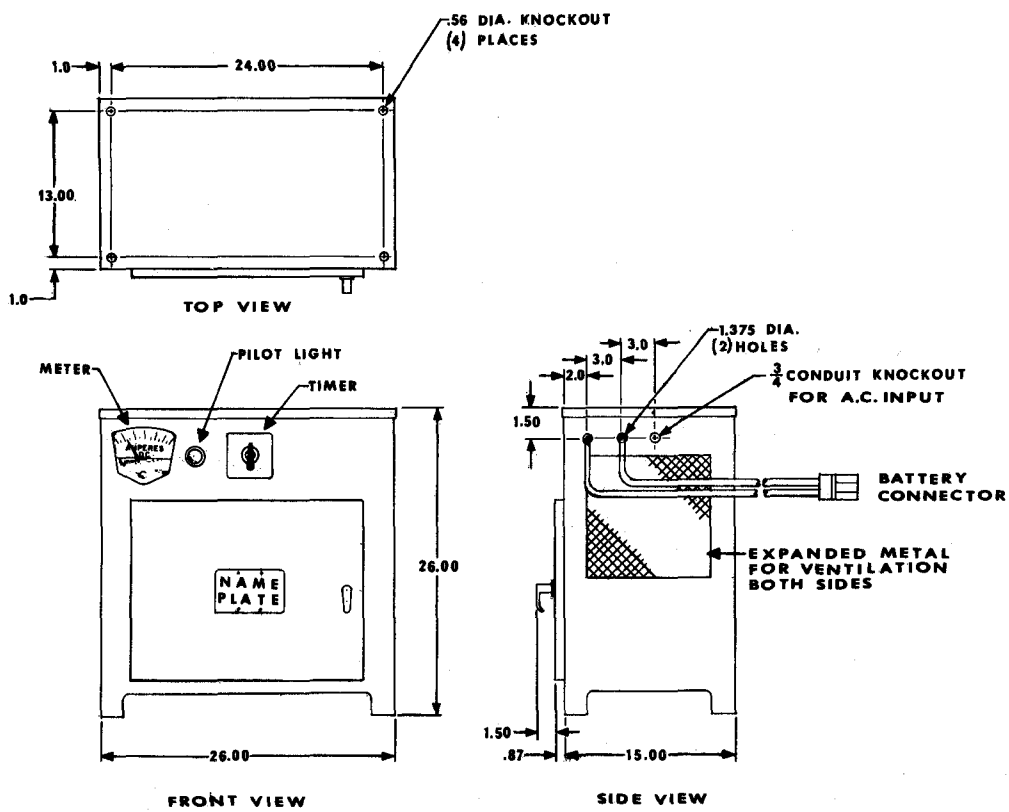
4.1 SINGLE CIRCUIT INPUT–OUTPUT DATA

Model	INPUT DATA 208/240/480V Amps	INPUT DATA 208/240/480V Fuse	INPUT DATA 480/600V Amps	INPUT DATA 480/600V Fuse	Output Data Amps	Output Data Fuse	Cabinet NC	Shipping Weight LBS.
GBR 6- 300 T-1	5/4/2	10/6/3	2/1.6	3/3	64	100	553	190
GBR 6- 380 T-1	6/5/2.5	10/10/6	2.5/2	6/3	80	100	553	190
GBR 6- 450 T-1	7/6/3	10/10/6	3/2.4	6/3	95	150	553	190
GBR 6- 540 T-1	8/7/3.5	10/10/6	3.5/2.8	6/3	110	150	553	195
GBR 6- 680 T-1	10/9/4.5	15/15/6	4.5/3.6	6/6	145	175	553	200
GBR 6- 800 T-1	13/11/5.5	15/15/10	5.5/4.4	10/6	170	200	553	200
GBR 6-1050 T-1	16/14/7	20/20/10	7/5.6	10/10	224	250	553	245
GBR 6-1200 T-1	18/16/8	25/20/10	8/6.4	10/10	256	300	551	310
GBR 6-1400 T-1	22/19/9.5	25/25/15	9.5/7.6	15/10	298	350	551	330
GBR 9- 300 T-1	6/5/4	10/10/6	4/3.2	6/3	64	100	553	200
GBR 9- 380 T-1	7/6/3	10/10/6	3/2.4	6/3	80	100	553	200
GBR 9- 450 T-1	9/8/4	15/10/6	4/3.2	6/6	95	150	553	210
GBR 9- 540 T-1	10/9/4.5	15/15/6	4.5/3.6	6/6	110	150	553	210
GBR 9- 680 T-1	13/12/6	15/15/10	6/4.8	10/6	145	175	553	215
GBR 9- 800 T-1	15/13/6.5	20/15/10	6.5/5.2	10/6	170	200	553	220
GBR 9-1050 T-1	20/17/8.5	25/20/10	8.5/6.8	10/10	224	250	553	240
GBR 9-1200 T-1	23/20/10	30/25/15	10/8.0	15/10	256	300	551	270
GBR 9-1400 T-1	26/23/11.5	30/30/15	11.5/9.2	15/15	298	350	551	300
GBR12- 300 T-1	7/6/3	10/10/6	3/2.4	6/3	64	100	553	200
GBR12- 380 T-1	9/8/4	15/10/6	4/3.2	6/6	80	100	553	200
GBR12- 450 T-1	12/10/5	20/20/10	5/4	10/6	95	150	553	200
GBR12- 540 T-1	14/12/6	20/20/10	6/4.8	10/6	110	150	553	200
GBR12- 680 T-1	16/14/7	30/30/15	7/5.6	15/10	145	175	553	260
GBR12- 800 T-1	20/17/8.5	30/30/15	8.5/6.8	15/10	170	200	553	265
GBR12-1050 T-1	25/22/11	30/30/15	11/9	15/10	224	250	553	275
GBR12-1200 T-1	30/26/13	30/30/15	13/10.5	15/15	256	300	551	350
GBR12-1400 T-1	40/35/17.5	40/40/25	17.5/14	25/20	298	350	551	380
GBR18- 300 T-1	12/10/5	15/15/6	5/4	6/6	64	100	553	225
GBR18- 380 T-1	14/12/6	15/15/10	6/4.8	10/6	80	100	553	230
GBR18- 450 T-1	17/15/7.5	20/20/10	7.5/6.0	10/10	95	150	553	235
GBR18- 540 T-1	20/17/8.5	30/25/15	8.5/6.8	15/10	110	150	553	235
GBR18- 680 T-1	25/22/11	30/25/15	11/9	15/10	145	175	553	260
GBR18- 800 T-1	30/26/13	30/30/15	13/10.5	15/15	170	200	553	295
GBR18-1050 T-1	39/34/17	40/40/25	17/13	20/15	224	250	551	360
GBR18-1200 T-1	46/40/20	60/50/30	20/16	30/20	256	300	551	475
GBR18-1400 T-1	51/44/22	60/50/30	22/17.5	30/20	298	350	553	550
GBR24- 300 T-1	15/13/6.5	20/15/10	6.5/5.2	10/6	64	100	553	250
GBR24- 380 T-1	20/17/8.5	25/20/10	8.5/6.8	10/10	80	100	553	250
GBR24- 450 T-1	23/20/10	30/25/15	10/8	15/10	95	150	553	260
GBR24- 540 T-1	27/24/12	30/30/15	12/9.6	15/15	110	150	553	280
GBR24- 680 T-1	35/30/15	40/35/25	15/12	25/15	145	175	553	290
GBR24- 800 T-1	39/34/17	40/40/25	17/13.5	25/15	170	200	551	320
GBR24-1050 T-1	48/45/22.5	60/50/30	22.5/18	30/20	224	250	551	385
GBR24-1200 T-1	60/52/26	60/60/35	26/21	30/25	256	300	551	470
GBR24-1400 T-1	69/60/30	60/60/35	30/24	30/30	298	350	551	545
GBR36- 540 T-1	38/33/16.5	40/40/25	16.5/13	25/20	110	150	553	350

4.2 CABINET OUTLINE 551



4.3 CABINET OUTLINE 553

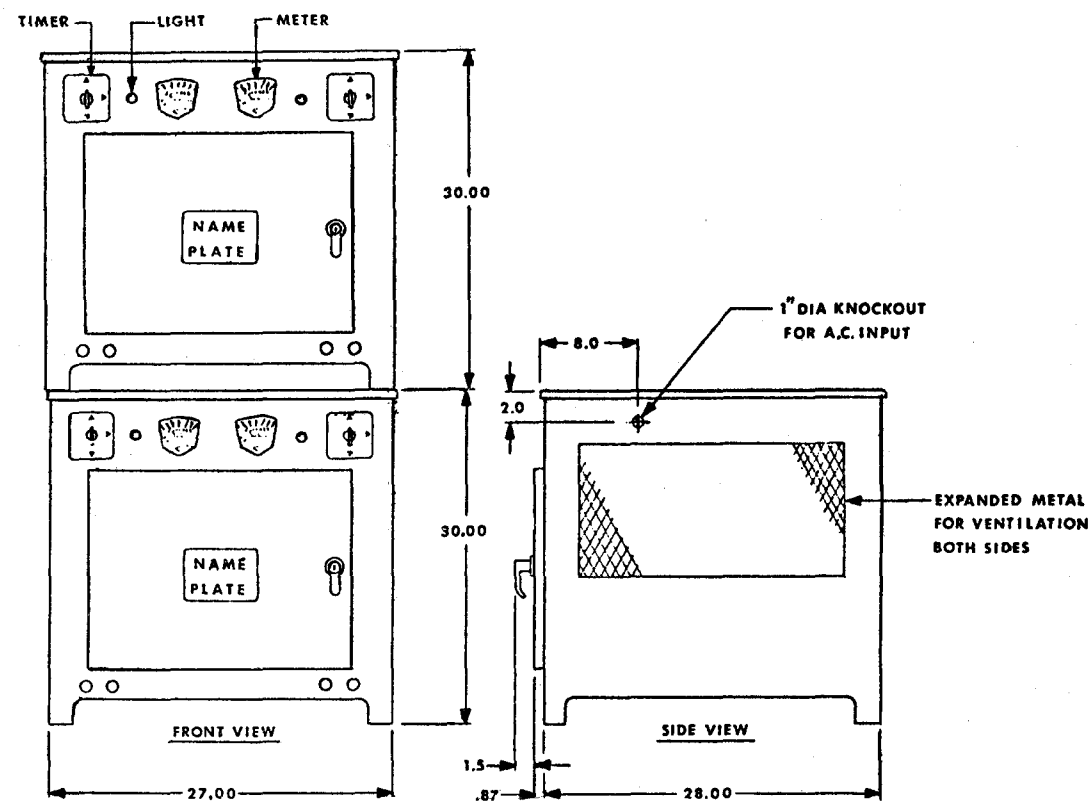


4.4 DOUBLE CIRCUIT INPUT–OUTPUT DATA (PER CIRCUIT)

MODEL	INPUT DATA (Note 1) 208/240/480V Amps	208/240/480V Fuse	480/600V Amps	480/600V Fuse	Output-Data Amps	Output-Data Fuse	Cabinet No.	Shipping Weight Lbs.
GBR 6- 300 T-2	5/4/2	10/6/3	2/1.6	3/3	64	100	552	370
GBR 6- 380 T-2	6/5/2.5	10/10/6	2.5/2	6/3	80	100	552	370
GBR 6- 450 T-2	7/6/3	10/10/6	3/2.4	6/3	95	150	552	370
GBR 6- 540 T-2	8/7/3.5	10/10/6	3.5/2.8	6/3	110	150	552	380
GBR 6- 680 T-2	10/9/4.5	15/15/6	4.5/3.6	6/6	145	175	552	390
GBR 6- 800 T-2	13/11/5.5	15/15/10	5.5/4.4	10/6	170	200	552	390
GBR 6-1050 T-2	16/14/7	20/20/10	7/5.6	10/10	224	250	552	480
GBR 9- 300 T-2	6/5/4	10/10/6	4/3.2	6/3	64	100	552	390
GBR 9- 380 T-2	7/6/3	10/10/6	3/2.4	6/3	80	100	552	390
GBR 9- 450 T-2	9/8/4	15/10/6	4/3.2	6/6	95	150	552	410
GBR 9- 540 T-2	10/9/4.5	15/15/6	4.5/3.6	6/6	110	150	552	410
GBR 9- 680 T-2	13/12/6	15/15/10	6/4.8	10/6	145	175	552	420
GBR 9- 800 T-2	15/13/6.5	20/15/10	6.5/5.2	10/6	170	200	552	430
GBR 9-1050 T-2	20/17/8.5	25/20/10	8.5/6.8	10/10	224	250	552	470
GBR12- 300 T-2	7/6/3	10/10/6	3/2.4	6/3	64	100	552	390
GBR12- 380 T-2	9/8/4	15/10/6	4/3.2	6/6	80	100	552	390
GBR12- 450 T-2	12/10/5	20/20/10	5/4	10/6	95	150	552	390
GBR12- 540 T-2	14/12/6	20/20/10	6/4.8	10/6	110	150	552	390
GBR12- 680 T-2	16/14/7	30/30/15	7/5.6	15/10	145	175	552	510
GBR12- 800 T-2	20/17/8.5	30/30/15	8.5/6.8	15/10	170	200	552	520
GBR12-1050 T-2	25/22/11	30/30/15	11/9	15/10	224	250	552	540
GBR18- 300 T-2	12/10/5	15/15/6	5/4	6/6	64	100	552	440
GBR18- 380 T-2	14/12/6	15/15/10	6/4.8	10/6	80	100	552	450
GBR18- 450 T-2	17/15/7.5	20/20/10	7.5/6.0	10/10	95	150	552	460
GBR18- 540 T-2	20/17/8.5	30/25/15	8.5/6.8	15/10	110	150	552	460
GBR18- 680 T-2	25/22/11	30/25/15	11/9	15/10	145	175	552	520
GBR18- 800 T-2	30/26/13	30/30/15	13/10.5	15/15	170	200	552	580
GBR24- 300 T-2	15/13/6.5	20/15/10	6.5/5.2	10/6	64	100	552	490
GBR24- 380 T-2	20/17/8.5	25/20/10	8.5/6.8	10/10	80	100	552	490
GBR24- 450 T-2	23/20/10	30/25/15	10/8	15/10	95	150	552	510
GBR24- 540 T-2	27/24/12	30/30/15	12/9.6	15/15	110	150	552	550
GBR24- 680 T-2	35/30/15	40/35/25	15/12	25/15	145	175	552	570

NOTE 1 – Multiply the input amps. by 2 to obtain the total combined input.

4.5 CABINET OUTLINE 552



SECTION V Circuit Descriptions

5.1 GENERAL

The charger is a regulated AC to DC rectifier that utilizes silicon controlled rectifiers (SCR's) for voltage control and as the rectifying elements in the full wave bridge circuit. When operating at maximum current output, as during the initial portion of a charging cycle, the SCR gate pulses are so phased that the output voltage decreases to whatever level is required to maintain the charging current to a preset maximum.

As the battery specific gravity increases, battery impedance increases, and a higher rectifier voltage is required to maintain the current at maximum. At some point, the voltage is not sufficient to maintain the current at maximum and it starts to decrease. When the charging current has decreased to approximately 25% of maximum, a transistor operated relay activates the timer which has been preset to either a two or five hour period (Normal or Equalize).

At the end of the timed cycle, switch contacts of the timer open the coil circuit of the AC input contactor and the complete charging cycle is terminated.

5.2 POWER CIRCUIT

A three-phase power transformer, T1, isolates the input AC from the output DC, and also transforms the AC voltage to the correct level for rectification. T1 is energized through contactor K1 and the line fuses F1, F2 and F3.

Control transformer T3 supplies the operating voltage for the contactor K1. The primary of T3 accommodates various voltages by a selection of taps.(see paragraph 1.6).

SCR1, SCR2 and SCR3 (located on the extruded aluminum heat sinks) not only regulate the output voltage but also serve as elements in the bridge rectifier. Silicon diodes CR1, CR2 and CR3 complete the bridge circuit.

Choke L1 limits the peak current through the SCR's and also reduces the AC component of the output current.

5.3 REFERENCE AMPLIFIER

The reference amplifier is a constant current differential amplifier with a zener diode reference. Transistors Q14 and Q15 are connected so that the sum of their collector currents is a constant. However, individual collector currents are dependent on the level and polarity of the differential base voltage. The difference in collector current increases in proportion to the difference in base voltage until one is saturated and the other is cut off. Q14 and Q15 are NPN transistors, therefore the one with the more positive base voltage has the higher collector current.

Zener diode CR22 maintains the base voltage of Q14 at a fixed value, while the voltage divider of R43, R44, R45 and R46 maintains the base voltage of Q15 directly proportional to the charger output voltage. Therefore, any change in output voltage changes the differential voltage between the bases of Q14 and Q15. The resultant change in Q14 collector current through R39 affects the base bias of Q13 which in turn changes the emitter current of Q13. Refer to paragraph 5.4 for a description of the Q13 circuit.

5.4 PULSE GENERATOR

There are three identical pulse generator circuits, one for each phase. A circuit description of one phase will suffice for the other two.

The capacitor C1 charges through Q1 at a rate determined by the signal supplied to the base of Q1 by Q13 of the reference amplifier (see paragraph 5.3). During the charging cycle, Q2 is held off because its emitter is tied to the C1 voltage at a level below the base voltage of Q2. When the C1 charge voltage exceeds the Q2 base voltage, Q2 switches on, C1 discharges through Q2 and a pulse is applied to the primary of the T1 pulse transformer. The voltage developed across the T1 pulse transformer secondary fires the SCR1 pulse SCR (located on the control board) which, in turn, fires the SCR1 power SCR (located on the heat sink).

When Q2 saturates, the voltage drop across R6 turns on Q3, assuring that Q2 will remain saturated until C1 has completely discharged.

The SCR pulses are synchronized to the 60Hz input by Q4. At the start of each positive half cycle, Q4 is biased on by an auxiliary winding of the T1 power transformer so that C1 will remain discharged until the start of each negative half cycle. At the start of the negative half cycle, Q4 is biased off, thereby allowing C1 to begin its charging cycle.

5.5 CURRENT LIMIT CIRCUIT

The current limit circuit decreases the output voltage to a level that prevents the output current from increasing beyond a desired level.

The DC current transformer provides the input signal to the rectifier bridge, so that the output voltage is linearly proportional to the DC current. This voltage is applied to control circuits on 0034-010-001 or 0034-011-001 at diode CR23 so that the voltage drop across resistor R3 of B108510 exceeds the voltage developed across R45 and R46. This action shunts the voltage adjustment bias network of R43, R44, R45 and R46, which results in decreasing the regulated output voltage. This action continues in such a way that the output current does not exceed a preset level selected by the R1, R2, R3 resistor values on the drawing. Reduction of the current limit value is obtained by adjusting R1 on current sensing circuit.

5.6 FINISH-RATE CIRCUIT

Q16 and Q17 are connected as a differential amplifier similar to that of the reference amplifier described in paragraph 5.3. The base voltage of Q16 is determined by the voltage adjustment potentiometer R44, and the base voltage of Q17 is determined by the voltage drop across R3. This drop is directly proportional to the output current (see paragraph 5.5).

When the output current has decreased to 25% of the current limit value, Q17 is saturated and the resultant voltage across R58 provides forward bias to Q19. Q19 collector current then operates the control relay K1, thereby energizing the timer motor.

When the voltage drop across R1, R2, R3 network is less than the voltage drop across R46, diode CR24 is forward biased, thereby connecting the current limit network as a shunt across R46. This alters the voltage adjustment bias network of R43, R44, R45 and R46 in such a way that the output voltage increases. The increase is gradual and continues until the charging cycle is completed.

5.7 HIGH VOLTAGE SHUTDOWN CIRCUIT

Resistive voltage divider R57, R74, R76 and R71 senses the charger output voltage and turns on Q20 whenever the voltage at the wiper of potentiometer R76 exceeds the zener voltage of CR27. Turning on Q20 turns off Q21, thereby de-energizing control relay K2. The contacts of K2 then open the coil circuit of the AC input contactor K1.

When Q20 turns on, it shunts resistors R74, R76 and R71, thereby decreasing the voltage at which Q20 will be biased off. This feature prevents Q20 from turning off again as soon as the output voltage drops due to the K1 contactor dropping out.

R76 is factory set so that K2 drops out at voltages exceeding 2.75 volts per cell. The saturation of Q20 re-calibrates this circuit so that K2 can not be energized until the charger terminal voltage is less than 1.3 volts per cell. This usually necessitates disconnecting the battery from the charger and then reconnecting it in order to re-energize the contactor K1.

SECTION VI Trouble Check List

TROUBLE	POSSIBLE CAUSE	REMEDY
6.1 Input fuse F1, F2 or F3 fails, but output fuse does not fail	A. Excessively high input voltage	A. Check T1 transformer tap per paragraph 1.5
	B. Excessive current limit	B. Refer to paragraph 6.4
	C. T1 primary shorted	C. Replace
	D. Fuse is loose in holder	D. Add a fuse clamp
	E. Incorrect fuse rating	E. Check Section IV for correct rating
	F. One or more shorted power SCR's	F. Replace
	G. One or more shorted diodes	G. Replace
6.2 F1, F2 or F3 input fuse and F4 output fuse fail	A. Two or more shorted power diodes and a shorted power SCR	A. Replace
	B. Grounded inductor L1	B. Replace
	C. Grounded T1 secondary	C. Replace
	D. Grounded ammeter	D. Replace
	E. Shorted thyrector TH1, TH2 or TH3	E. Replace
6.3 Output fuse F4 fails but no input fuse fails	A. Excessive current limit	A. Refer to paragraph 6.4
	B. Fuse F4 is loose in holder	B. Add a fuse clamp
	C. Fuse F4 is incorrect rating	C. Check Section IV for correct rating
	D. Shorted inductor L1	D. Replace
6.4 Incorrect current limit	A. R3 improperly adjusted	A. Refer to paragraph 3.3
	B. Defective current limit circuit	B. Replace
	C. Defective ammeter	C. Replace

TROUBLE	POSSIBLE CAUSE	REMEDY
6.5 Charger does not supply output current when the contactor is energized	A. Battery is fully charged	A. Discontinue charging
	B. Defective current limit control assembly	B. Replace
	C. Battery is sulphated	C. Request assistance from battery manufacturer
	D. Charger rating is not compatible with battery	D. Refer to Section IV
	E. Open power SCR or diode	E. Replace
	F. Charger voltage improperly adjusted	F. Refer to paragraph 3.2
	G. Input transformer T1 is improperly connected	G. Refer to paragraph 1.5
	H. F1, F2 or F3 input fuse failure	H. Refer to paragraph 6.1
	I. Faulty meter	I. Replace
6.6 Charger shuts down before cycle is completed	A. DC output voltage too high	A. Refer to paragraph 6.7
	B. Defective control board	B. Replace
	C. Defective timer	C. Replace
6.7 Contactor K1 does not operate	A. T3 primary is on wrong tap	A. Refer to paragraph 1.6
	B. Defective contactor K1	B. Replace
	C. Open fuse F5	C. Refer to paragraph 6.8
	D. No AC input	D. Check AC service
	E. Overvoltage relay K2 has dropped out	E. Disconnect battery and reconnect
	F. Open battery connector	F. Repair or replace
	G. Defective control board	G. Replace
	H. Timer is in OFF position or defective	H. Reset timer
	I. Battery connection to charger is reversed	I. Turn charger off and connect battery correctly

TROUBLE	POSSIBLE CAUSE	REMEDY
6.8 Fuse F5 fails	A. T3 primary is on wrong tap	A. Refer to paragraph 1.6
	B. Defective contactor K1	B. Replace
	C. Defective transformer T3	C. Replace
6.9 Battery is overcharged	A. Charger output voltage is high	A. Refer to paragraph 3.2
	B. Current limit adjustment is high	B. Refer to paragraph 3.3
	C. Defective control board	C. Replace
	D. Timer cycle is excessive	D. Replace timer
6.10 Battery is undercharged	A. Current limit setting is low	A. Refer to paragraph 3.3
	B. Ampere-Hour rating of battery is higher than charger rating	B. Replace charger with one of higher rating
	C. Charger output voltage is low	C. Refer to paragraph 3.2
	D. Timer cycle is less than two hours	D. Replace timer
	E. Defective control board	E. Replace
	F. Battery is sulphated	F. Request assistance from battery manufacturer
	G. Overvoltage relay K2 has dropped out	G. Refer to paragraphs 2.3 and 3.4
6.11 Timer does not operate	A. Defective timer	A. Replace
	B. Blown control fuse F5	B. Refer to paragraph 6.8
	C. DC output voltage high	C. Refer to paragraph 6.7
	D. Defective control	D. Replace

SECTION VII Replaceable Parts

7.1 GENERAL

The following information must be supplied when ordering a replaceable part in order to ensure that the correct part is supplied:

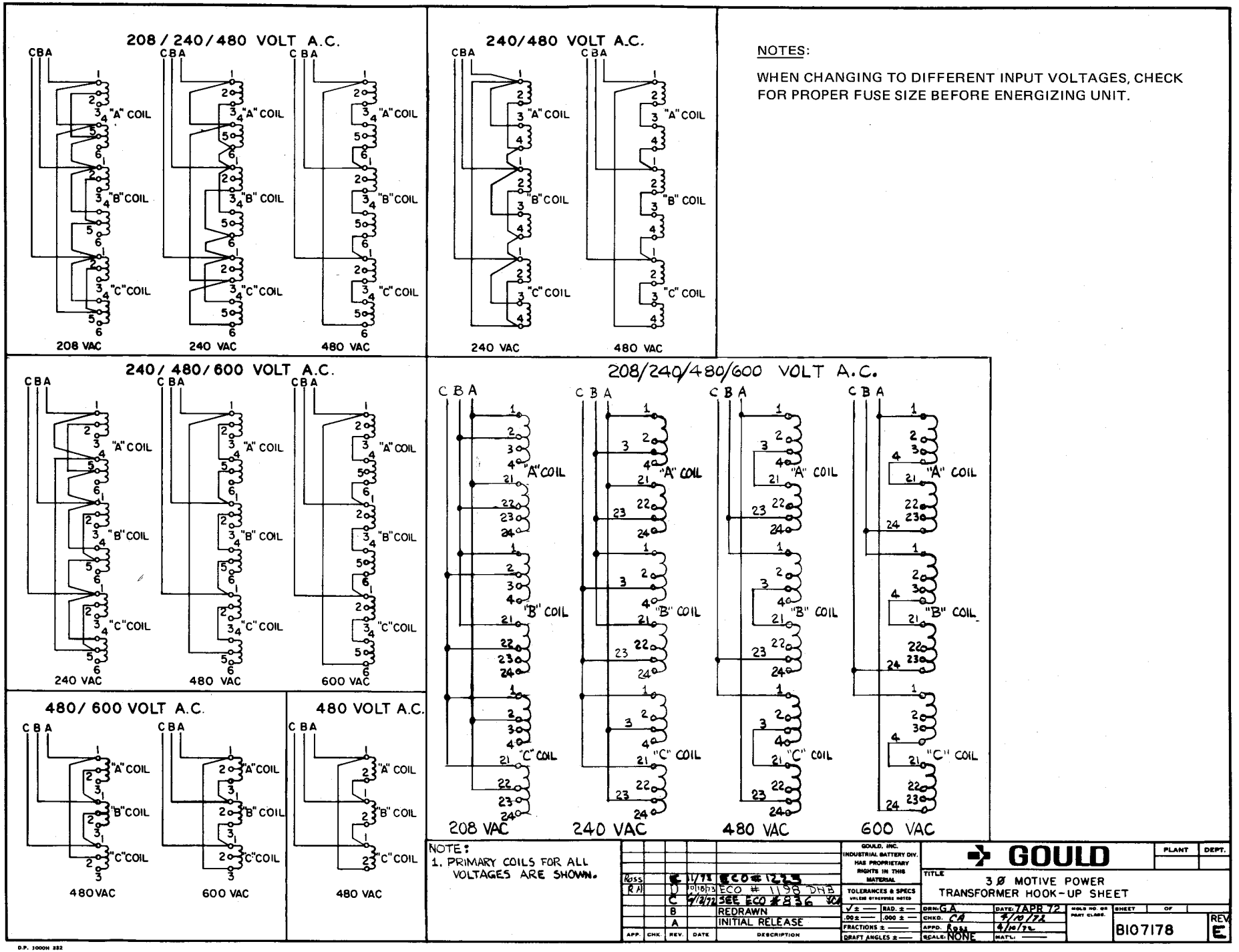
a. Model # of charger
b. Serial # of charger
c. Reference symbol of part
d. Description of part

The quantity of recommended spares should be increased as the number of chargers to be maintained increases. The following chart is the minimum quantity recommended for multiple charger installation.

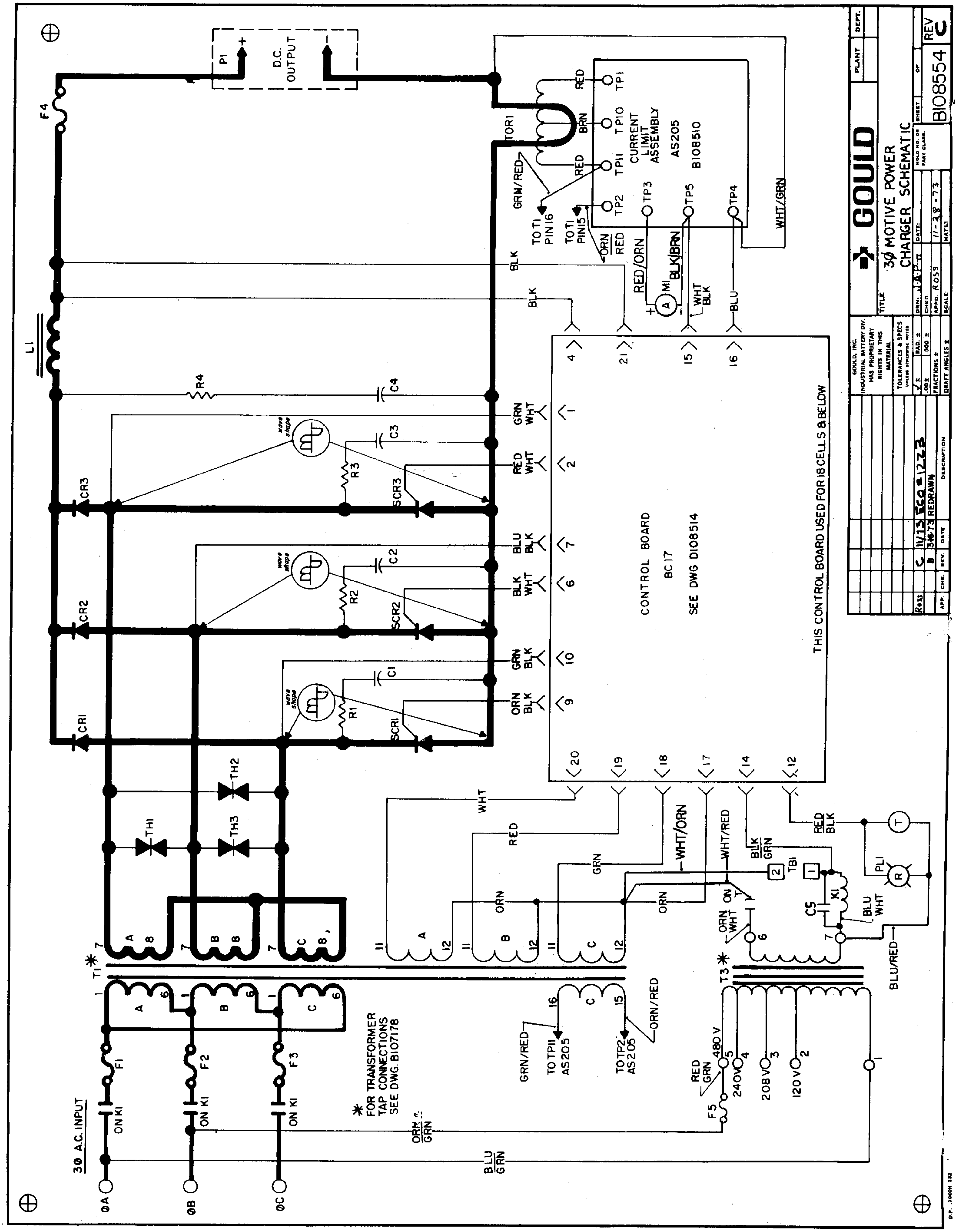
NO. of CHARGERS	NO. of SPARE PARTS KITS
1-3	1
4-10	2
11-25	3
26-50	4
51-100	5

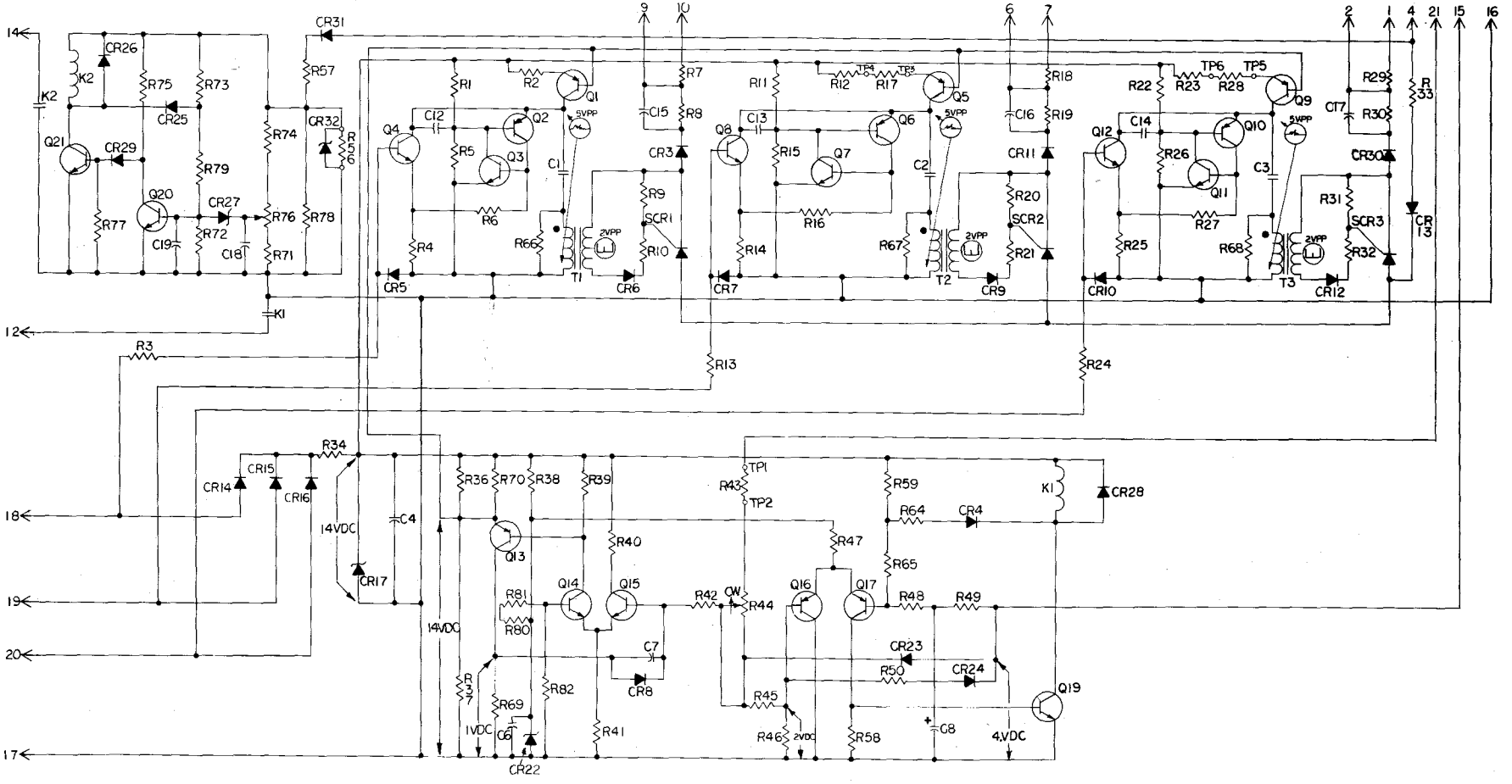
7.2 LIST OF REPLACEABLE PARTS

REFERENCE SYMBOL	DESCRIPTION	QUANTITY USED	QUANTITY RECOMMENDED
BC17	Control Board for 6-18 Cell Chargers	1	1
BC18	Control Board for 20-24 Cell Chargers	1	1
M1	DC Ammeter	1	0
F1,F2,F3	Fuse, Slow-Blow, NOS type or Equal	3	3
F4	Fuse, NON type or Equal	1	2
F5	Fuse, 1 amp Slow-Blow	1	2
SCR1,SCR2,SCR3	Silicon Controlled Rectifier	3	3
CR1,CR2,CR3	Diode	3	3
K1	AC Input Contactor	1	0
T	Timer	1	0
PL1	Timer Pilot Lamp	1	2
L1	Filter Choke	1	0
T1	Power Transformer	1	0
T3	Control Transformer	1	0
TH1,TH2,TH3	Thyrector	3	1


208 / 240 / 480 VOLT A.C.
C B A
"A" COIL
"B" COIL
"C" COIL
208 VAC
240 VAC
480 VAC
240/480 VOLT A.C.
240 VAC
480 VAC
NOTES:
WHEN CHANGING TO DIFFERENT INPUT VOLTAGES, CHECK FOR PROPER FUSE SIZE BEFORE ENERGIZING UNIT.
240/ 480/ 600 VOLT A.C.
240 VAC
480 VAC
600 VAC
208/240/480/600 VOLT A.C.
208 VAC
240 VAC
480 VAC
600 VAC
480/ 600 VOLT A.C.
480VAC
600 VAC
480 VOLT A.C.
480 VAC
NOTE:
1. PRIMARY COILS FOR ALL VOLTAGES ARE SHOWN.
GOULD, INC. INDUSTRIAL BATTERY DIV. HAS PROPRIETARY RIGHTS IN THIS MATERIAL
TOLERANCES & SPECS UNLESS OTHERWISE NOTED
FRACTIONS ±
DRAFT ANGLES ±
APP. CHK. REV. DATE DESCRIPTION
D 10/10/73 ECO # 1150 DHB
C 4/3/72 SEE ECO # 836 JCA
B REDRAWN
A INITIAL RELEASE
GOULD
PLANT DEPT.
TITLE
3 Ø MOTIVE POWER
TRANSFORMER HOOK-UP SHEET
DRN: G.A DATE: 7APR 72
CHKD. CA 4/10/72
APPD. RBM 4/10/72
SCALE: NONE MATL:
SHEET OF
B107178
REV E

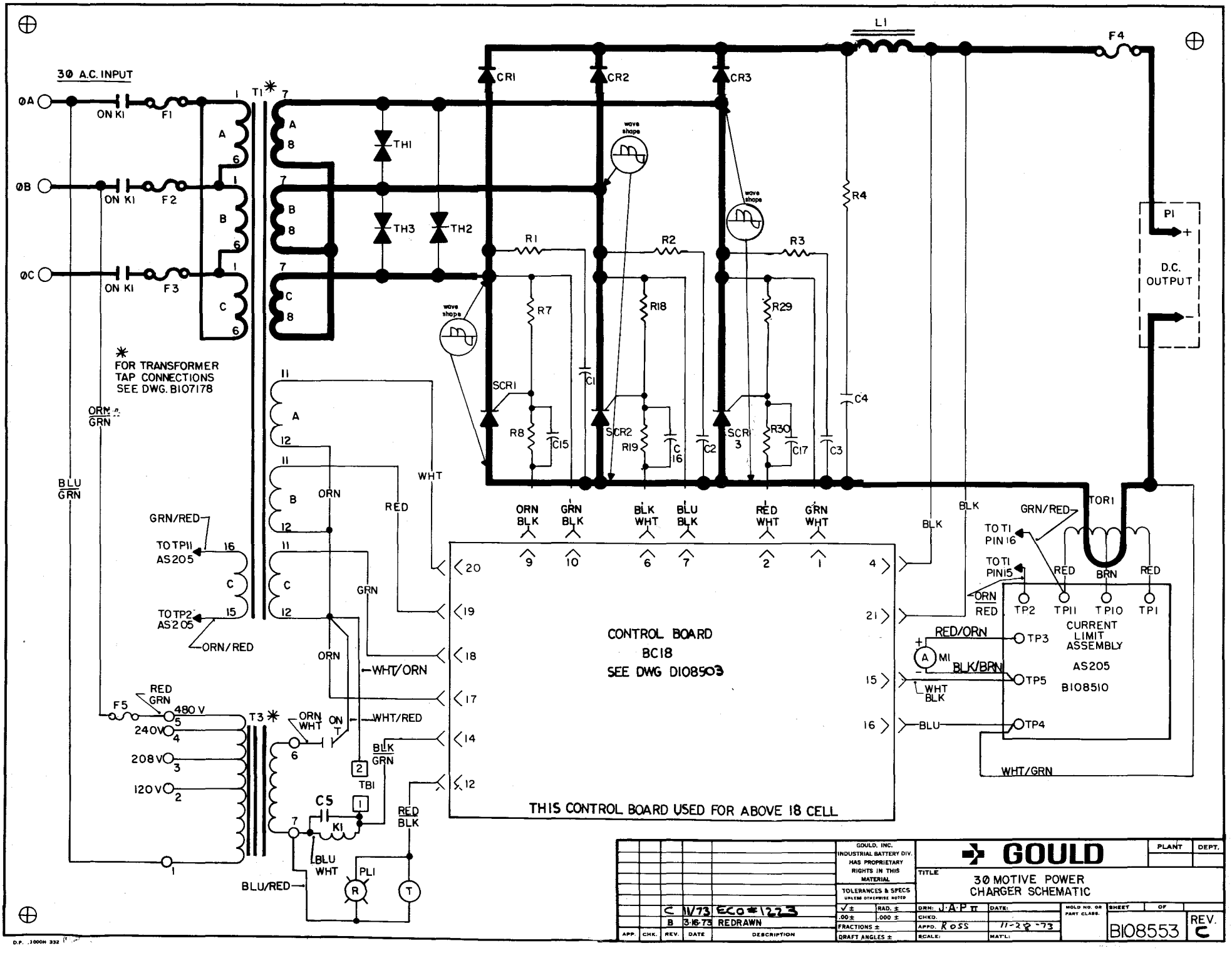
D.P. 3000H 282


GOULD
TITLE 3Ø MOTIVE POWER CHARGER SCHEMATIC
B108554
REV C
DRN. J.A.P.
APPD. ROSS
DATE 11-28-73
GOULD, INC. INDUSTRIAL BATTERY DIV. HAS PROPRIETARY RIGHTS IN THIS MATERIAL
TOLERANCES & SPECS UNLESS OTHERWISE NOTED
C 11/15 ECO #1223
B 3-16-73 REDRAWN
D.C. OUTPUT
P1
F4
L1
R4
C4
C3
C2
C1
R3
R2
R1
CR3
CR2
CR1
SCR3
SCR2
SCR1
TH1
TH2
TH3
CURRENT LIMIT ASSEMBLY AS205 B108510
TOR1
TP1
TP10
TP11
TP2
TP3
TP4
TP5
TO T1 PIN 16
TO T1 PIN 15
CONTROL BOARD BC17 SEE DWG D108514
THIS CONTROL BOARD USED FOR 18 CELLS & BELOW
M1
T
PL1
TB1
K1
C5
T1 *
T3 *
480 V
240 V
208 V
120 V
F5
F1
F2
F3
ON K1
3Ø A.C. INPUT
ØA
ØB
ØC
* FOR TRANSFORMER TAP CONNECTIONS SEE DWG. B107178
TO TP11 AS205
TO TP2 AS205
GRN/RED
ORN/RED
BLU/RED
BLU/GRN
ORN/GRN
WHT/ORN
WHT/RED
WHT/GRN
RED/ORN
BLK/BRN



GOULD

SCHEMATIC BC-17



APP.	CHK.	REV.	DATE	DESCRIPTION
		C	11/73	ECO #1223
		B	3-16-73	REDRAWN

GOULD, INC. INDUSTRIAL BATTERY DIV. HAS PROPRIETARY RIGHTS IN THIS MATERIAL

TOLERANCES & SPECS UNLESS OTHERWISE NOTED
√ ± RAD. ±
.00 ± .000 ±
FRACTIONS ±
DRAFT ANGLES ±

GOULD

PLANT | DEPT.

TITLE: 30 MOTIVE POWER CHARGER SCHEMATIC

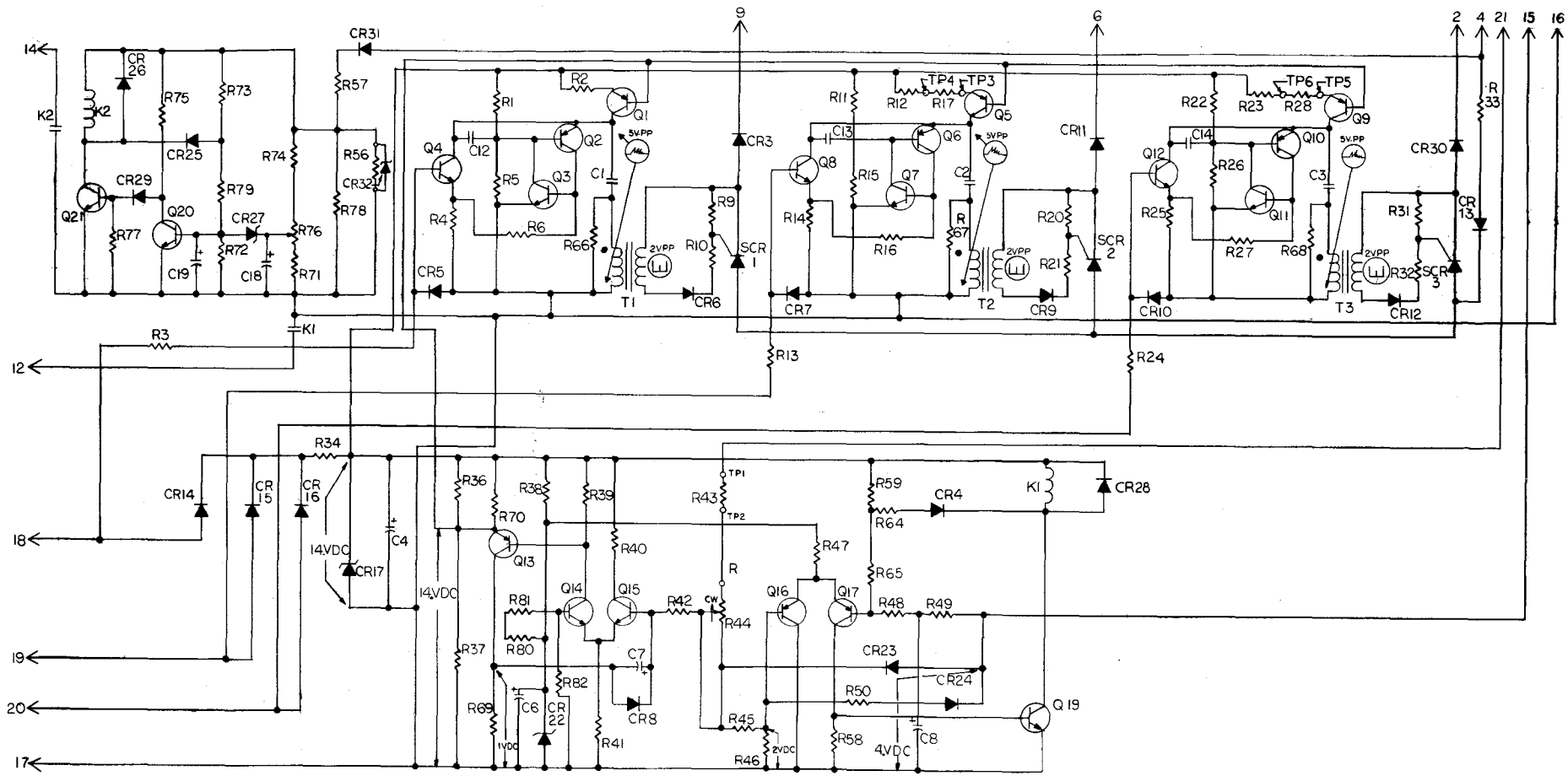
DRN: J.A.P II DATE:
CHKD.
APPD. ROSS 11-28-73
SCALE: MATL:

MOLD NO. OR PART CLASS.

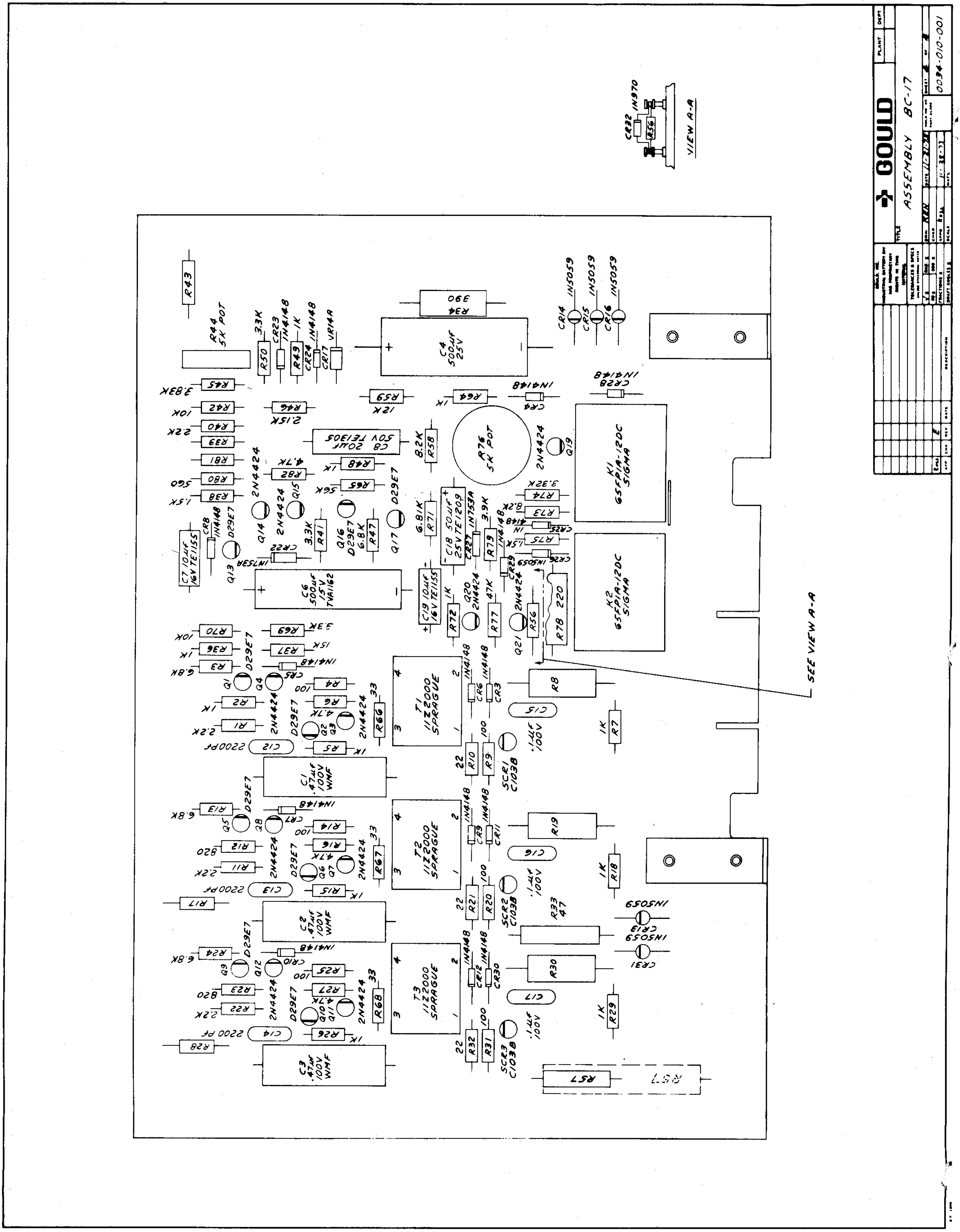
SHEET OF

B108553

REV. C



						GOULD	PLANT / DEPT.
						TITLE: SCHEMATIC BC-18	
		B	5258	ECO#1102			
		A	10-2272	INITIAL REL			D108503 B


GOULD
ASSEMBLY BC-17
0034-010-001
VIEW A-A
SEE VIEW A-A
K1 GSFPIA-12DC SIGMA
K2 GSFPIA-12DC SIGMA
T1 11Z2000 SPRAGUE
T2 11Z2000 SPRAGUE
T3 11Z2000 SPRAGUE
C4 500uf 25V
C6 500uf 15V TVA1162
R76 5K POT
R44 5K POT