1C DISCRETE CALLING GENERATOR

CIRCUIT DESCRIPTION, SCHEMATIC WIRING DIAGRAMS,

AND CIRCUIT CARDS

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1. GENERAL

1.01 This section provides the schematic wiring diagrams, circuit card diagrams, and circuit description for the discrete calling generator. It has been reissued to include the latest engineering changes, and to remove the preliminary designation. Since this is a general revision, arrows normally used to indicate changes and additions have been omitted. See the appropriate section for the actual wiring diagrams.

1.02 The schematic wiring diagrams (SWD's) contain the various circuits which make up the unit. Symbols are used to denote coils, contacts, electronic logic elements, connectors, etc. The special circuit variations, applying to specific applications and conditions, are denoted by encircled letters; the symbols are defined in the associated circuit notes.

1.03 The electronic logic elements are illustrated in symbol form, schematic form, and actual form in the associated circuit card (CC) diagrams. The electrical components are fully described in each drawing.

1.04 The circuit description includes a detailed analysis of the logic circuits which function before, during, and after operation of the discrete calling generator. Both serial and parallel data set applications are covered.

1.05 A complete listing of the attached wiring diagrams is presented in the diagram index. The diagrams are listed in numerical order with the current issue number indicated in the appropriate column.

2. CIRCUIT DESCRIPTION

2.01 The discrete calling generator contains the logic circuits for operation with either a serial or parallel type data set. The signal generator may be started automatically or remotely through either an available data set circuit (for serial type data set application only) or an auxiliary control circuit.

Note: The logic elements and logic circuits of the discrete calling generator are included in the following discussion. As the circuits are described, reference is made to the coordinate location in the basic schematic wiring diagram, 7293WD.

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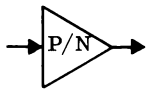
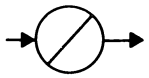
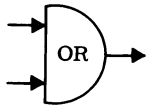
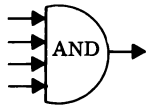
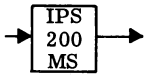
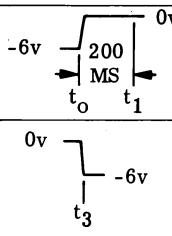
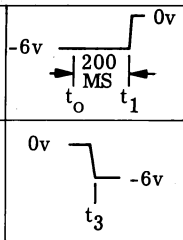
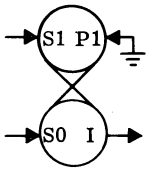
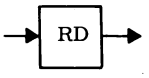
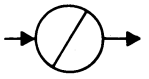
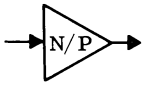
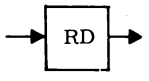
TABLE 1 - LOGIC ELEMENTS AND CHARACTERISTICS

LOGIC		SYMBOL	VOLTAGE		FUNCTION	CIRCUIT CARD REFERENCE
NAME	ELEMENT (*)		INPUT(S)	OUTPUT		
Polar to Neutral Converter	Z3002A(C5) Z3002B(C5) Z3002C(D5) Z3003C(D5)		+3 volts to +25 volts	-6 volts	Convert polar voltage from line to neutral signal for logic function.	306080 & 306082
			-3 volts to -25 volts	0 volt		
Inverter	Z3002D(C5) Z3003D(D5)		-6 volts	0 volt	Invert neutral signal for AND gate input.	306080 & 306082
			0 volt	-6 volts		
OR Gate	Z3002E(D5)		-6 volts -6 volts	-6 volts	Present a 0 volt output when one or both inputs are 0 volt.	306082
			0 volt -6 volts	0 volt		
			0 volt 0 volt	0 volt		
AND Gate	Z3002F(D6)		0 volt 0 volt 0 volt 0 volt	0 volt	Compare four input conditions to establish one operate condition for integrator pulse shaper.	306082
			Any one or more -6 volt input will produce a -6 volt output.			
Integrator Pulse Shaper	Z3002G(D7)				Provide a -6 to 0 volt output approximately 200 MS after a -6 to 0 volt input is received. (The 0 volt level must be maintained for 200 MS.)	306082
Flip-Flop (Primed)	Z3003A(D7)		-6 to 0 volt on S1	I = -6 volts	Provide a -6 volt output for relay driver when positive transition (-6 to 0 volt) is received from integrator pulse shaper.	306080
			-12 to +6 volts on S0	I = 0 volt		
Relay Driver	Z3003B(D8)		-6 volts	-12 volts	Provide -12 volts when I (Inverted) output of flip-flop is -6 volts.	306080
			0 volt	0 volt		
Inverter	Z3003E(D3)		ON (-12 volts)	0 volt	Invert input from signal generator.	306080
			OFF	-6 volts		
Neutral to Polar Converter	Z3003F(D4)		0 volt	-6 volts	Convert neutral signal to polar voltage for serial data set application.	306080
			-6 volts	+6 volts		
Relay Driver	Z3003G(D4)		0 volt	Does not conduct	Provide intermittent ground to signal line for parallel data set application.	306080
			-6 volts	Conducts to ground.		

* Each logic element is used in 7293WD. The coordinate location of the element is indicated in the parenthesis following the element designation, eg, Z3002A(C5) means element Z3002A on 7293WD, coordinate location C-5.

LOGIC ELEMENTS

2.02 The logic elements appearing on the discrete calling generator schematic wiring diagram, are electronic elements whose input-output characteristics are listed in Table 1. The logic elements include converters, inverters, an OR gate, an AND gate, an integrator pulse shaper, a flip-flop, and relay drivers. The relays, whose operational characteristics are evident, have been omitted from the table. Each logic element schematic is given in the referenced circuit card diagram.

SERIAL DATA SET APPLICATION

2.03 For serial data set applications, the logic circuits of the discrete calling generator are divided into the following categories: serial interface logic, clutch control logic, code sending logic, and reset logic. After the conditions for operation are applied to the interface, the clutch engages the code disc with the motor drive, and the 14-bit code is distributed on the Send Data (pin 2) interface circuit.

2.04 The serial interface connectors, J3002 and P3002, of the discrete calling generator are shown in areas B3 and B5 of 7293WD. The disposition of the circuits for a serial type data set are given in Table 2. The data set circuits which bypass the discrete calling generator, ie, pins 9, 10, and 13 through 25, are wired directly from the input connector, J3002, to the output connector, P3002. All other circuits, tapped and intercepted, are available to the discrete calling generator. The tapped circuits are monitored by the serial interface logic. The intercepted circuits are transferred to the discrete calling generator only when relay K3001 of the clutch control logic is energized.

A. Serial Interface Logic

2.05 The serial interface logic consists of four polar to neutral converters, an OR gate, two inverters, and an AND gate. As the interface circuit conditions are presented, the various inputs to the AND gate will be either -6 volts or 0 volt. When conditions for operation are presented, the logic elements will cause all inputs of the AND gate to reach 0 volt, causing the output to become 0 volt. The rise from -6 volts to 0 volt provides a positive transition input to the integrator pulse shaper, Z3002G, in the clutch control logic.

Interface Circuit Conditions

2.06 The operate voltages on the interface circuits are +3 volts on lead 6 (Data Set Ready - ON), -3 volts on lead 4 (Request to Send - OFF), +3 volts on a remote control circuit (if used) through either the data set or the auxiliary control connector, and -3 volts on lead 8 (Data Carrier Detect - OFF). For automatic operation, the remote control input to the AND gate is strapped directly to ground (0 volt). The operate conditions are summarized in Table 3.

Note: The voltage levels of the interface circuits can vary from +3 volts (minimum) to +25 volts (maximum) for an ON condition and from -3 volts (minimum) to -25 volts (maximum) for an OFF condition.

2.07 The ON - OFF conditions of interface circuits prior to the operate condition depend upon the data handling status of data processing terminal.

2.08 If the data processing terminal is to receive data only (or receive first and then transmit), the Data Set Ready, Request to Send, and Data Carrier Detect circuits are OFF when a call is initiated. They remain OFF while the disabling and recognition tone is being transmitted by the remote data set. When the automatic calling unit detects the end of the disabling tone, it transfers the call to the data set at the data processing terminal. The local data set turns Data Set Ready ON and presents the interface conditions for operating the discrete calling generator. An additional input of +3 volts (minimum) to +25 volts (maximum) for 200 ms is necessary if a remote control option has been selected.

2.09 If data has already been transmitted before data is to be received, the Data Set Ready, Request to Send, and Data Carrier Detect circuits will be ON. The data processing terminal will then switch the Request to Send circuit OFF. Approximately 30 ms later, the local data set will switch the Data Carrier Detect circuit OFF, presenting the interface conditions for operating the discrete calling generator. If a remote control option is used, an additional input of +3 volts (minimum) to +25 volts (maximum) for a duration of 200 ms is necessary to trip the signal generator.

TABLE 2 - DISPOSITION OF SERIAL TYPE SET CIRCUITS THROUGH DISCRETE CALLING GENERATOR

INTERFACE		SIGNALS BYPASSED	SIGNALS USED	SIGNALS CONTROLLED
PIN	CIRCUIT			
1	Frame Ground	X	X	
2	Send Data			X
3	Receive Data			X
4	Request to Send		X	X
5	Clear to Send			X
6	Data Set Ready	X	X	
7	Signal Ground	X	X	
8	Data Carrier Detect		X	X
9	+17.5 Volts	X		
10	-17.5 Volts	X		
11*	Reverse Channel Send	X	X	
12*	Reverse Channel Receive	X	X	
13	Not Used	X		
14	New Sync.	X		
15	Transmit Clock	X		
16	Dibit Transmit Clock	X		
17	Not Used	X		
18	Dibit Receive Clock	X		
19	Not Used	X		
20	Data Terminal Ready	X		
21	Not Used	X		
22	Ring Indicator	X		
23	Not Used	X		
24	External Clock	X		
25	Remote Test	X		

*RD Option - Remote control through data set.

TABLE 3 - SERIAL DATA SET CIRCUIT CONDITIONS FOR OPERATION OF DISCRETE CALLING GENERATOR

OPTION	DATA SET READY (LEAD 6)	REQUEST TO SEND (LEAD 4)	DATA CARRIER DETECT (LEAD 8)	AUXILIARY CONTROL	DATA SET INTERFACE
A (Automatic)	ON (+3 volts)	OFF (-3 volts)	OFF (-3 volts)	Not Used	Not Used
R (Remote Control)	ON (+3 volts)	OFF (-3 volts)	OFF (-3 volts)	+3 volts	Not Used
RD (Remote Control through Data Set Connector)	ON (+3 volts)	OFF (-3 volts)	OFF (-3 volts)	Not Used	+3 volts

Note: Voltages shown for serial operation are minimum voltages; maximum voltages are +25 volts for ON and -25 volts for OFF. Option R uses the auxiliary control connector; option RD uses the data set connector in place of the auxiliary connector.

AND Gate Input Circuits

2.10 Four logic circuits provide inputs to AND gate Z3002F. The inputs are discussed in the order in which they appear on 7293WD-D6.

(a) The first input originates from a tap on the Data Set Ready circuit (pin 6). For the operate condition, the Data Set Ready circuit is ON. The +3 volts (+25 volts maximum) is converted to -6 volts by P/N converter Z3002A, inverted to 0 volt by inverter Z3002D, and applied to AND gate Z3002F as 0 volt. For an OFF condition, the -3 volts (-25 volts maximum) is converted to 0 volt, inverted to -6 volts, and applied to AND gate Z3002F as -6 volts.

(b) The second input originates from a tap on the Request to Send circuit (pin 4). For the operate condition, the Request to Send circuit is OFF. The -3 volts (-25 volts maximum) is converted to 0 volt by P/N converter Z3002B and applied to AND gate Z3002F as 0 volt. An ON condition (-3 volts minimum, -25 volts maximum) is converted and applied to the AND gate as -6 volts.

(c) The third input to AND gate Z3002F originates from one of three points, depending upon the choice of operation. If automatic operation is selected, the input is wired directly to ground through terminals 6 and 7 of TB3002, maintaining a 0-volt input to the AND gate. If remote operation is desired, the input to the AND gate will pass through P/N converter Z3003C and inverter Z3003D. The input to the P/N converter may originate from either the auxiliary control connector (7293WD-F8), pin 1, or the data set connector (7293WD-A4), pin 11, Reverse Channel Send. In either case, an additional polar voltage input (+3 volts to +25 volts - ON; -3 volts to -25 volts - OFF) is required from the data processing terminal for application to the P/N converter. A positive voltage, eg, +3 volts, is converted to -6 volts by P/N converter Z3003C, inverted to 0 volt by inverter Z3003D, and applied to AND gate Z3002F as 0 volt. A negative voltage, eg, -3 volts, is converted to 0 volt, inverted to -6 volts, and applied to the AND gate as -6 volts.

(d) The fourth input to AND gate Z3002F originates from OR gate Z3002E. If either or both inputs to the OR gate is 0 volt, the output is 0 volt. Only when both inputs are -6 volts is the output -6 volts. One input to the OR gate originates from a tap on Data Carrier Detect circuit, pin 8. For an operate condition, Data Carrier Detect is OFF, applying a negative polar voltage (eg, -3 volts) to P/N converter Z3002C. The output of the converter is 0 volt. The OR gate passes the 0 volt to the AND gate. When the integrator pulse shaper, Z3002G, has an output of 0 volt, the feedback loop maintains an alternate 0 volt input to OR

gate Z3002E. After the discrete calling generator begins sending a 14-bit code onto the line, the Data Carrier Detect circuit goes ON. Upon completion of the 14-bit code, the Data Carrier Detect circuit goes OFF. The feedback loop is required to prevent repeated operation of the AND gate (and consequently the signal generator) by maintaining a 0-volt output from the OR gate despite a changing condition on the Data Carrier Detect circuit (pin 8).

B. Clutch Control Logic

2.11 The clutch control logic consists of an integrator pulse shaper, flip-flop, relay driver, relay, and clutch solenoid. When a 0-volt level is presented to the integrator pulse shaper (7293WD-D7), it is passed and activates the flip-flop and relay driver. The relay then operates, causing the clutch solenoid (7293WD-E3) to energize. The clutch, in turn, engages the code disc with the motor drive.

K3001 Relay Operation

2.12 A positive transition of -6 to 0 volt from the interface logic will initiate the clutch control logic. The 0-volt level must then be maintained for 200 milliseconds (by the input from the interface logic) to permit the integrator pulse shaper, Z3002G, to deliver a similar -6 to 0 volt transition to the S1 input of flip-flop Z3003A. (A noise pulse of less than 200 ms duration would not be passed by the integrator pulse shaper.)

2.13 Before receipt of the positive transition on S1, flip-flop Z3003A is in state 0, having an inverted (I) output of 0 volt. With the prime input, P1, at 0 volt (ground), the -6 to 0 volt input on S1 will set the flip-flop to state 1. In state 1 the I output delivers a -6 volt input to relay driver Z3003B. A -6 volt input causes the relay driver to deliver a -12 volt input to the coil of relay K3001. The -12 volts combine with the +36 volts to cause the coil to energize and the relay to operate.

2.14 When relay K3001 operates, the operated relay contacts change the circuit conditions for the clutch solenoid, data set interface, and remote control interface.

Clutch Solenoid

2.15 K3001 relay contact 12M (7293WD-E3) is closed to complete the circuit for energizing the clutch solenoid. The clutch engages the motor drive with the code disc, and the disc starts rotating. The disc rotates for only a short distance before reaching the end of the homing position, at which point a brush comes into contact with the common signal area (-12 volts) of the disc. Generator homing contact, 11-12 (7293WD-E7), connects relay K3001 across a potential of 48 volts (from -12 volts to +36 volts). Relay K3001 is therefore latched for the duration of one revolution of the code disc.

Interface Circuits

2.16 The operation of relay K3001 causes transfer contacts 4, 5, 6, and 7 (7293WD-B3) to intercept the Receive Data (pin 3), Request to Send (pin 4), Clear to Send (pin 5), and Data Carrier Detect (pin 8) circuits. Thus, the discrete calling generator provides -6 volts on the Receive Data (pin 3), Clear to Send (pin 5), and Data Carrier Detect (pin 8) circuits for the data processing terminal, and provides +6 volts on the Request to Send (pin 4) circuit for the data set.

Remote Control Circuits

2.17 For remote control operation through either the auxiliary control connector or through the data set connector, the data processing terminal is notified that the signal generator is operating. When relay K3001 operates, contact 9 (7293WD-F7) transfers from -6 volts to +6 volts, sending a +6 volt signal to the data processing terminal. For remote control operation (option R), this appears on the Acknowledge Signal lead (pin 2) of the auxiliary control connector; and for remote control through the data set (option RD), this appears on the Reverse Channel Receive lead (pin 12) of the data set connector.

C. Code Sending Logic

2.18 The code sending logic includes the signal generator, an inverter, N/P converter, and contacts in relay K3001.

Signal Generator

2.19 The signal generator consists of a 20 rpm synchronous motor, solenoid operated clutch, code disc, and three active

brushes. When operated, the signal generator will (1) generate a 14-bit code and (2) maintain energizing current to relay K3001 for the duration of one disc revolution.

2.20 The three active brushes include the common brush, signal brush, and generator homing brush. The code disc (Figure 1) consists of a solid inner ring with cutout, a segmented outer ring, and spokes connecting the solid inner ring with each segment of the outer ring. The common brush wipes the solid portion of the inner ring to provide the -12 volt potential for the other brush paths.

2.21 The signal brush, generator homing brush, and their respective code disc paths form two sets of normally open contacts. The signal brush and associated segmented ring form the normally open contacts, 8-12 (7293WD-D3). The generator homing brush and associated brush path form the normally open contacts, 11-12 (7293WD-E7). When the code disc is resting in the stop position (generator homing), both the signal and generator homing brushes are resting in open areas (0 volt) of the code disc.

2.22 After relay K3001 is energized by a pulse from the clutch control logic, the code disc starts rotating. When the disc is displaced from the homing position, the generator homing brush will maintain -12 volts to relay K3001 for the duration of one revolution. Meanwhile, the signal brush will generate a spacing bit, marking bit, and 14 bits of spacing and/or marking signals to the Send Data (pin 2) circuit. The marks or spaces of the 14-bit signal are dependent upon the condition of the spokes between the segmented ring and the solid inner ring. An unbroken spoke will produce a marking condition (-12 volts), and a broken spoke will provide a spacing condition (0 volt).

Signal Line Code

2.23 When relay K3001 energizes, transfer contact 3 operates in the Send Data (pin 2) circuit. A spacing bit (0 volt) then originates as an open condition of contact 12-8 of code disc Z3001. Inverter Z3003E changes the 0-volt input to a -6 volt output. The -6 volt input is converted to a +6 volt output by N/P converter Z3003F, and the +6 volt output appears on the Send Data lead as a space. As the disc rotates, the signal brush wipes the first segment with an unbroken spoke. The inverter changes the -12 volts to 0 volt, and the N/P converter changes this to -6 volts. The -6 volt output appears on the Send Data lead as a mark. The next 14 segments will be

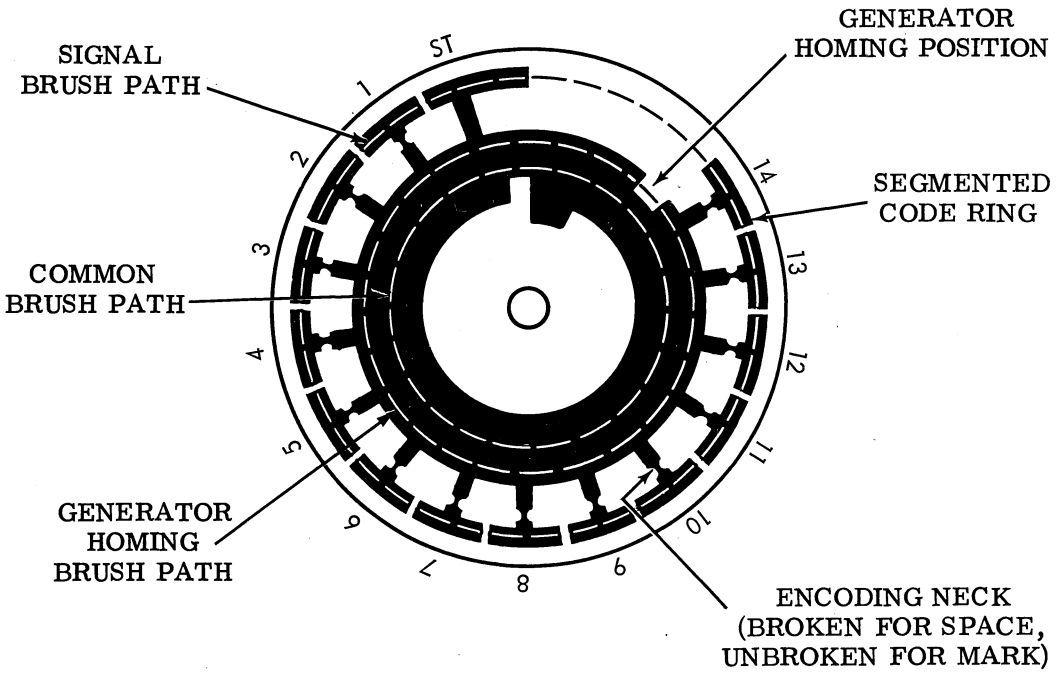


Figure 1 - Generator Code Disc and Brush Paths

either spacing or marking through broken or unbroken spokes between the segments and the -12 volt source.

D. Reset Logic

2.24 Resistor R23 (7293WD-D7) is at +6 volts before flip-flop Z3003A changes from state 0 to state 1. When relay K3001 is energized (flip-flop in state 1), code disc Z3001 begins rotating and leaves the homing position. Generator homing contact 11-12 closes, causing the potential of R23 to fall to -12 volts. (Current will flow from the +6 volt source through diode CR10 to the -12 volt source. Since the voltage drop across CR10 is negligible, the 18 volt drop will occur across R23 establishing a -12 volt condition at the output of the resistor.) The negative transition from +6 volts to -12 volts at the output of the resistor, will have no affect on the flip-flop.

2.25 When the disc returns to the homing position, contact 11-12 opens, causing the output voltage of R23 to rise from -12 volts to +6 volts. The positive transition on input S0 will reset the flip-flop to state 0 and turn off the relay driver. Since relay K3001 is also unlatched when the generator homing contact is opened, the relay de-energizes, the relay contacts return to their unoperated position, the clutch disengages, and the code disc stops in the correct position. All affected circuits (with K3001 relay contacts) at the interface and auxiliary control, are restored to their normal state.

PARALLEL DATA SET APPLICATION

2.26 For parallel data set applications, the logic circuits are divided into the parallel interface logic, clutch control logic, code sending logic, and reset logic. When the conditions for operation are applied to the interface, the clutch engages the code disc with the motor drive, and the 14-bit code is distributed on the Answer-back A (pin 18) circuit.

2.27 The parallel interface connectors, J3001 and P3001, of the discrete calling generator are shown in areas B6 and B8 of 7293WD. The disposition of the incoming circuits for a parallel data set are given in Table 4. The data set circuits which bypass the discrete calling generator, ie, pins 2 through 12, 14 through 16, 22, 23, and 25, are wired directly from the input connector, J3001, to the output connector, P3001. All other circuits are available to the discrete calling generator.

A. Parallel Interface Logic

2.28 The parallel interface logic consists of four relay contacts and auxiliary circuit path (optional). The associated relays are energized directly from the interface circuits. When the conditions for operation are presented, the relay contacts are operated to provide ground (0 volt) to the integrator pulse shaper, Z3002G, of the clutch control logic.

Interface Circuit Conditions

2.29 The discrete calling generator will operate when an open circuit condition is on lead 21 (Data Carrier Detect - OFF), and a closed circuit condition is on lead 17 (T-R Control - ON), lead 20 (Data Mode - ON), and lead 13 (Interlock - OFF). The operate conditions are summarized in Table 5.

2.30 The circuit conditions prior to the operate condition depend upon the data handling status of the data processing terminal.

2.31 If the data processing terminal is to receive data only (or receive first and then transmit), the Data Carrier Detect circuit will be OFF (open) while the disabling and recognition tone is being transmitted by the remote data set. Data Mode will always be ON (closed) if no answer-back signals are to be transmitted by the remote data processing terminal. The data processing terminal will turn T-R Control ON (closed) before the disabling and recognition tone ends. Interlock will then come ON (closed) automatically at the end of the tone, thus providing the operate condition for the discrete calling generator. (If answer-backs are to be sent, T-R control must be ON, then Data Mode will be turned ON by the data processing terminal after it is through sending the answer-backs.)

2.32 If data has already been transmitted before data is to be received, the following circuit conditions develop. Carrier Detect, T-R Control, and Interlock will be OFF (open) and Data Mode will be ON (closed) while data is being transmitted. When the data processing terminal is through transmitting, it will turn T-R Control ON (closed), energizing relay K3002U. After K3002U relay contact 12M

TABLE 4 - DISPOSITION OF PARALLEL TYPE DATA SET CIRCUITS THROUGH DISCRETE CALLING GENERATOR

INTERFACE		SIGNALS BYPASSED	SIGNALS USED	SIGNALS CONTROLLED
PIN	CIRCUIT			
1	Frame Ground	X	X	
2	Data 1	X		
3	Data 2	X		
4	Data 3	X		
5	Data 4	X		
6	Timing	X		
7	Data 5	X		
8	Data 6	X		
9	Data 7	X		
10	Data 8	X		
11	Data Common	X	X	
12	Timing Common	X		
13	Interlock		X	
14	Release	X		
15	Operate	X		
16	Reverse Channel Send	X		
17	T-R Control		X	
18	Answer-Back A			X
19	Answer-Back B			X
20	Data Mode		X	X
21	Data Carrier Detect		X	
22	Ring Indicator	X		
23	Out of Service	X		
24	Control Common	X	X	
25	Not Used	X		

TABLE 5 - PARALLEL DATA SET CIRCUIT CONDITIONS FOR OPERATION OF DISCRETE CALLING GENERATOR

OPTION	DATA CARRIER DETECT (LEAD 21)	T-R CONTROL (LEAD 17)	DATA MODE (LEAD 20)	INTERLOCK (LEAD 13)	AUXILIARY CONTROL (PIN 4)
A (Automatic)	OFF (Open)	ON (Closed)	ON (Closed)	ON (Closed)	Not Used
R (Remote Control)	OFF (Open)	ON (Closed)	ON (Closed)	ON (Closed)	ON (Closed)

Note: Remote control through data set interface cannot be used with parallel type data sets.

closes, the sending data set switches to the receiving data set, turning Interlock ON (closed) and providing the operate conditions.

Interface Relay Contacts

2.33 When the discrete calling generator is operated, relay coils K3002U (7293WD-B7), K3002L (7293WD-B8), and K3003L (7293WD-C7) are energized and relay coil K3003U (7293WD-C8) is de-energized. (If data is transmitted by the data processing terminal before data is to be received, a time delay will occur as the sending data set switches to the receiving data set. This will result in a delay before relay coil K3002L is energized.) The associated relay contacts, K3002L relay contact SM, K3002U relay contact 8M, and K3003L relay contact 5M will make in the interface logic circuit. For automatic operation, terminals 5 and 6 of TB3002 are strapped to ground (0 volt). For remote control operation, terminals 4 and 5 are strapped to provide a remote ground (0 volt for a minimum duration of 200 milliseconds) by the data processing terminal through pin 4 of the auxiliary control connector. In either automatic or remote control operation, a voltage rise from -6 volts (from the inactive AND gate) to 0 volt is presented to the integrator pulse shaper. The 0-volt level must be maintained for a minimum duration of 200 ms in order to provide a -6 to 0 volt output from the integrator pulse shaper.

2.34 In addition, the operate condition causes K3002L relay contact 1M, K3002U relay contact 12M, and K3003L relay contact 1M to close and provide ground to their interface circuits. Circuit Interlock (pin 13) is grounded on the data processing terminal side, and circuits T-R Control (pin 17) and Data Mode (pin 20) are grounded on the data set side. Since Data Carrier Detect (pin 21) is open for the operate condition, K3003U relay contact 12M is open on the data processing terminal side.

B. Clutch Control Logic

2.35 The clutch control logic described in Paragraphs 2.11 through 2.15 for serial data sets, is applicable to the parallel data sets.

Interface Circuits

2.36 When K3003L relay contact 1M had closed, the Data Mode (pin 20) circuit was grounded to the data set. But when K3001 relay contact 8B opens (as a result of the clutch control logic operating), the Data Mode circuit is reopened, placing the data set in the answer-back mode so that the code can be transmitted. (A receiving data set cannot transmit answer-backs when it is in the data receive mode.) K3001 relay contact 8B remains open until the associated relay coil is de-energized at the end of code transmission. The data set is then restored to the data receive mode.

2.37 The operation of relay K3001 causes transfer contact 1 (7293WD-B8) to open the Answer-back A circuit on the data processing terminal side while closing the circuit from the data set side to the code sending contacts of the signal generator. K3001 relay contact 2B opens the Answer-back B circuit.

Remote Control

2.38 For remote control operation, the data processing terminal is notified that the signal generator is operating when K3001 relay contact 8M is closed. Closure of this contact

provides ground to the Acknowledge Signal circuit (pin 5) of the auxiliary control connector.

C. Code Sending Logic

2.39 The code sending logic includes the signal generator, an inverter, relay driver, and contacts in relay K3001.

Signal Generator

2.40 Refer to Paragraphs 2.19 through 2.22.

Signal Line Code

2.41 When relay K3001 energizes, transfer contact 1 operates in the Answer-back A (pin 18) circuit to place the code sending contacts of the discrete calling generator on the line. A spacing bit (0 volt) then originates as the open condition of contact 12-8 (7293WD-D3) of code disc Z3001. Inverter Z3003E changes the 0-volt input to a -6 volt output. The -6 volt input to relay driver Z3003G causes the relay driver to conduct and provide ground to pin 18 of the Answer-back A circuit. As the disc rotates, the signal brush wipes the first segment with an unbroken spoke (marking bit). The inverter changes the -12 volts to 0 volt which, in turn, causes the relay driver to stop conducting. The next 14 segments will provide either spacing or marking bits through broken or unbroken spokes between the segments and the -12 volt source.

D. Reset Logic

2.42 Refer to Paragraphs 2.24 and 2.25.

POWER SUPPLY

2.43 The 115 volt ac power cord is connected to terminals 1 and 2 of terminal board TB3001. Parallel leads, supplying 115 volts ac, are connected to the signal generator motor and the power supply, PS3001. A 1.5 ampere fuse is provided in the dc output circuit of the power supply (5991WD).

2.44 The 48-volt power supply, PS3001, is a standard rectifier assembly plus three zener diodes and four dropping resistors. Diodes CR10, CR12, and CR16 deliver constant voltages of 6.2 volts, and the dropping resistors protect the diodes. The 48-volt potential is thus divided into three 6-volt increments and one 30-volt increment, resulting in dc potentials of -12 volts, -6 volts, +6 volts, and +36 volts. The potential at point 21 is at ground (0 volt).

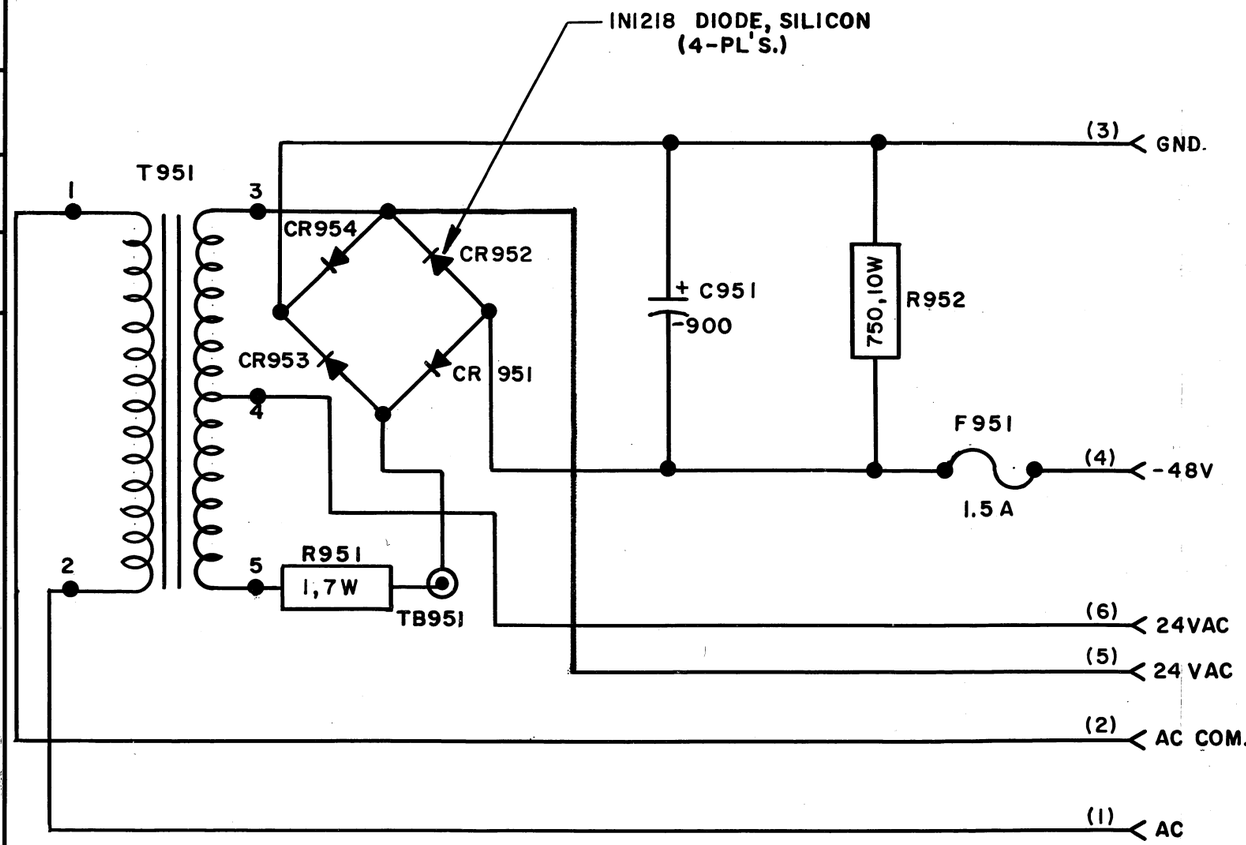
3. WIRING DIAGRAM INDEX

SUBJECT	DRAWING NUMBER	TYPE*	SECTION ISSUE				
			1	2	3	4	5
48-Volt Power Supply	5991WD	SWD	2	2			
Signal Generator Assembly	7029WD	SWD	1	3			
Discrete Calling Generator	7293WD	SWD	1	2			
Card (Sheet 1 of 2 Sheets)	306080	CC	3	3			
Card (Sheet 2 of 2 Sheets)	306080	CC	1	1			
Card (Sheet 1 of 2 Sheets)	306082	CC	3	3			
Card (Sheet 2 of 2 Sheets)	306082	CC	1	1			

* SWD - Schematic Wiring Diagram
CC - Circuit Card

NO.	NOTES
1.	REFER TO 5992WD FOR ACTUAL WIRING DIAGRAM.
2.	ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED.
3.	RESISTANCE VALUES OF WINDINGS ON TRANSFORMER T951
4.	PARENTHESES INDICATE TERMINAL DESIGNATIONS FOR REFERENCE ONLY.
5.	ALL RESISTORS 1/2 WATT AND RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.
6.	ALL CAPACITANCE VALUES IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.

BETWEEN TAPS	RESISTANCE
1 & 2	4Ω
3 & 4	0.526Ω
4 & 5	0.6Ω



5991 W.D.		
ISSUE	DATE	AUTH. NO.
2	7-6-64	82102

SCHEMATIC
WIRING DIAGRAM
FOR
48 VOLT
POWER SUPPLY

ASSEM. NO. 148280

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 5991 WD

DATE: 4-18-64

P.D. FILE NO. 1-33.69AA

DRAWN. N.A.R. CHKD. MCV

ENGD. E.J.T. APPD. ROKE

TELETYPE CORPORATION

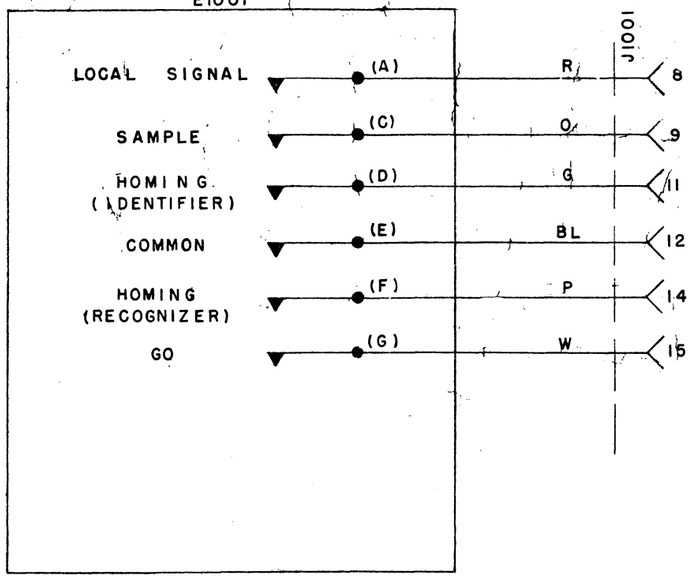
5991 WD

ET108147
TC255(6-54)

NO.	NOTES
1.	REFER TO 7030WD FOR ACTUAL WIRING DIAGRAM.
2.	TERMINAL DESIGNATIONS ENCLOSED IN PARENTHESES ARE NOT MARKED ON THE COMPONENT.
3.	>— INDICATES TERMINAL ON RECEPTACLE J1001.
4.	COLOR CODE W — WHITE BK — BLACK P — PURPLE R — RED O — ORANGE G — GREEN BL — BLUE
5.	J1001 TERMINAL VOLTAGES MAY VARY WITH APPLICATION AS FOLLOWS: A — 117 VAC F — 6VDC I — NOT USED B — AC COMMON F — —12VDC C — 16VDC G — —28VDC D — GRD H — —48VDC

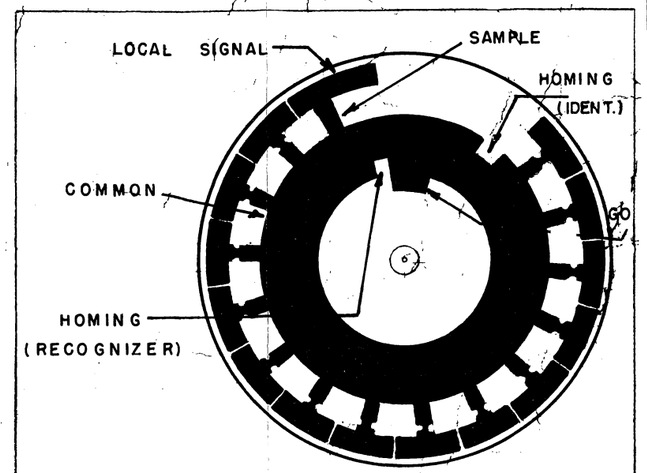
ASSEMBLY USED ON	TERMINAL 1	2	6	8	9	11	12	13	14	15
199552	I	A	B	G	I	G	G	A	I	I
199555	I	A	B	G	I	G	A	G	G	

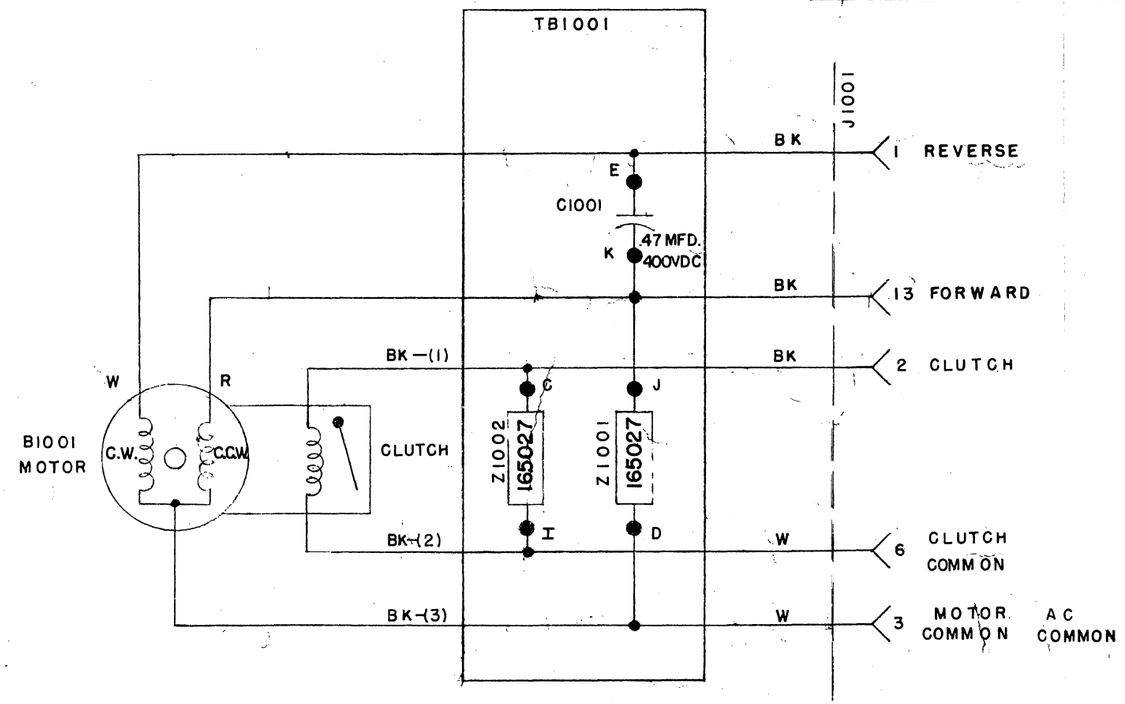
SIGNAL GENERATOR BRUSHES E1001



REFERENCE ONLY

CODING DISC 199580





REVISIONS		
ISSUE	DATE	AUTH. NO.
2	8-18-65	87498-1
3	9-10-65	87498-2

7029 WJ

SCHEMATIC DIAGRAM FOR SIGNAL GENERATOR ASSEM. ASSEM. NO. 199570

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 7029WD

DATE: 11-16-63

P.D. FILE NO. I-A148/134AA

DRAWN. G.J.M. CHKD.

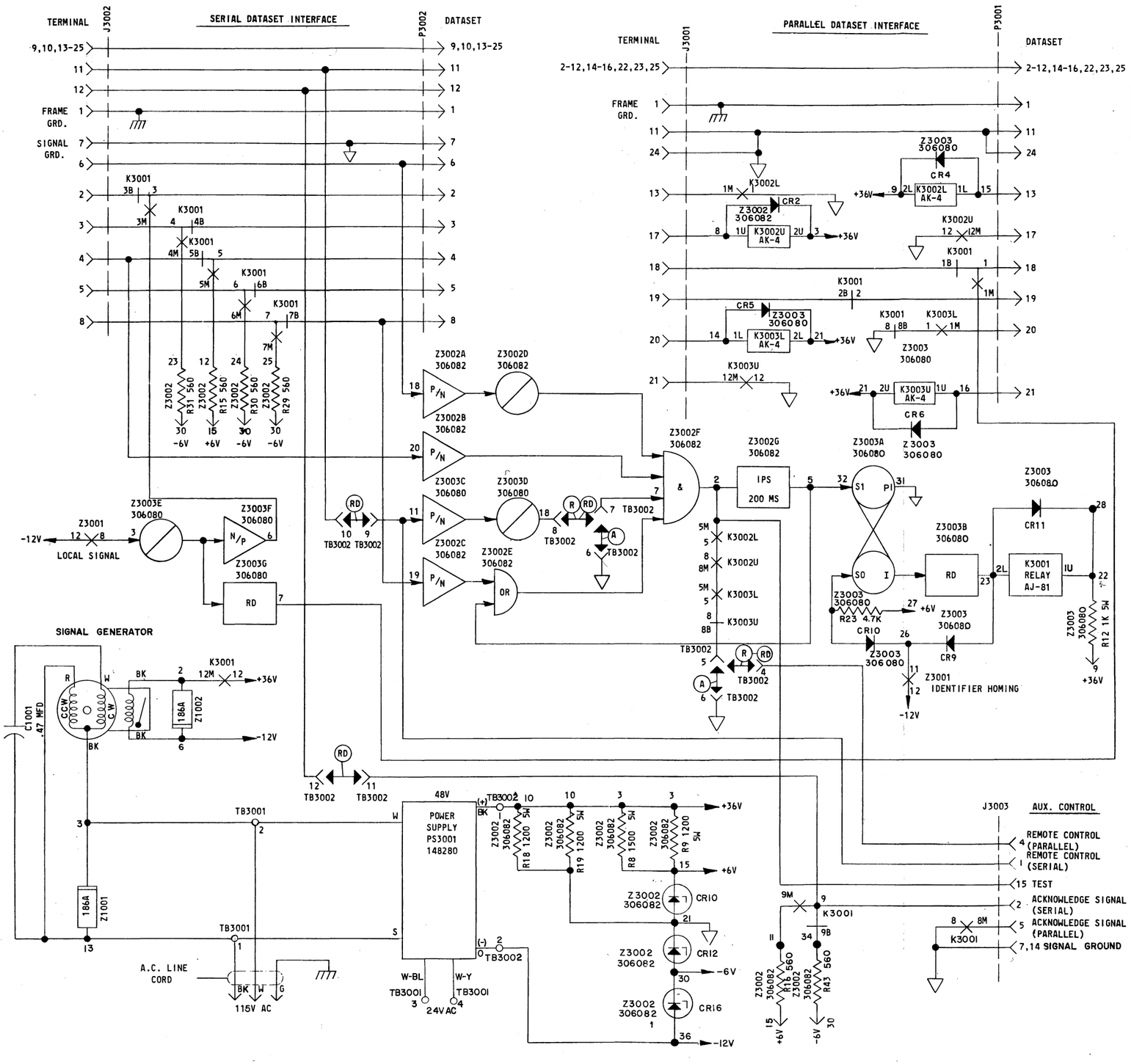
ENGD. W.R.F. APPD.

TELETYPE CORPORATION

7029 WD

7108147
C25516-541

NO.	NOTES
1.	REFER TO 7294WD FOR ACTUAL WIRING DIAGRAM.
2.	ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED.
3.	ALL RESISTORS 1/2 WATT AND RESISTANCE VALUES IN OHMS.
4.	ALL CAPACITANCE VALUES IN MICROFARADS.
5.	⟵ INDICATES MALE TERMINALS ON PLUGS P3001, & P3002.
6.	⟩ INDICATES FEMALE TERMINALS ON RECEPTACLES J3001, J3002, & J3003
7.	(A), (R), (RD) INDICATE SERVICE OPTIONS.
8.	USE FOUR 306087 TERMINAL BOARD STRAPS FOR FACTORY FURNISHED OPTIONS.
9.	(RD) IS A FACTORY FURNISHED OPTION.
10.	FOR TTY PERSONNEL REFERENCE. SPEC.NO.60922S
11.	B1001, C1001, Z1001, & Z1002 ARE ASSOCIATED WITH Z3001, PART NUMBER 199570, 7029WD, AND 7030WD.
12.	Z3001 TERMINAL CONNECTIONS REFER TO TERMINAL CONNECTIONS ON P3003 WHICH CONNECTS TO Z3001.



7293 WD

REVISIONS

ISSUE	DATE	AUTH. NO.
1	2-5-65	15688-R
2	9-21-65	85933

SCHEMATIC
WIRING DIAGRAM
FOR
DCG1
DISCRETE CALLING GENERATOR
(DATASPEED)

APPROVALS

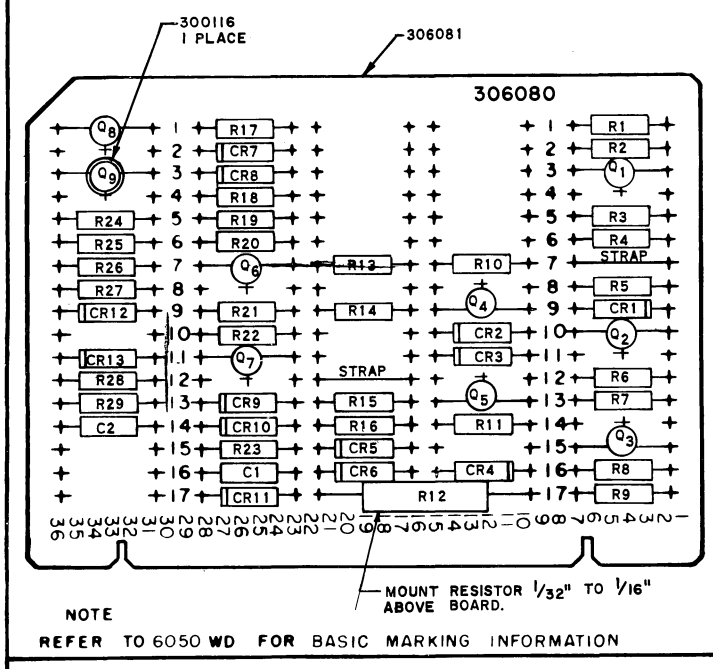
D AND R	E OF M

E-NUMBER	
PROD. NO. 7293WD	
DATE 10-6-64	
P.D. FILE NO. 1-A148/134AA	
DRAWN G.J.M.	CHKD.
ENGD. W.R.F.	APPD.

TELETYPE
CORPORATION

7293 WD

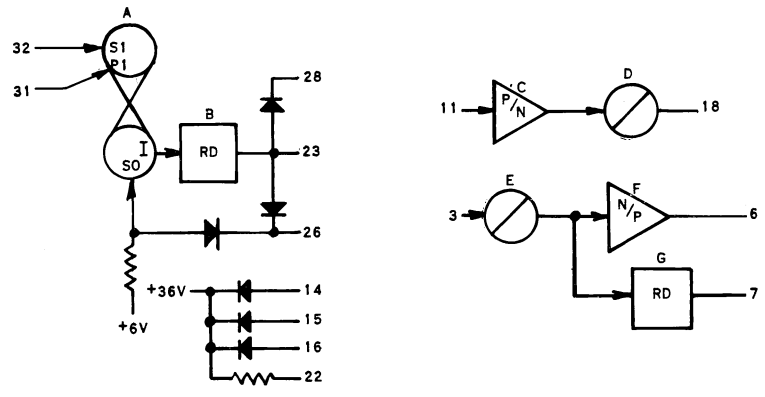
TC 434 (3-63)

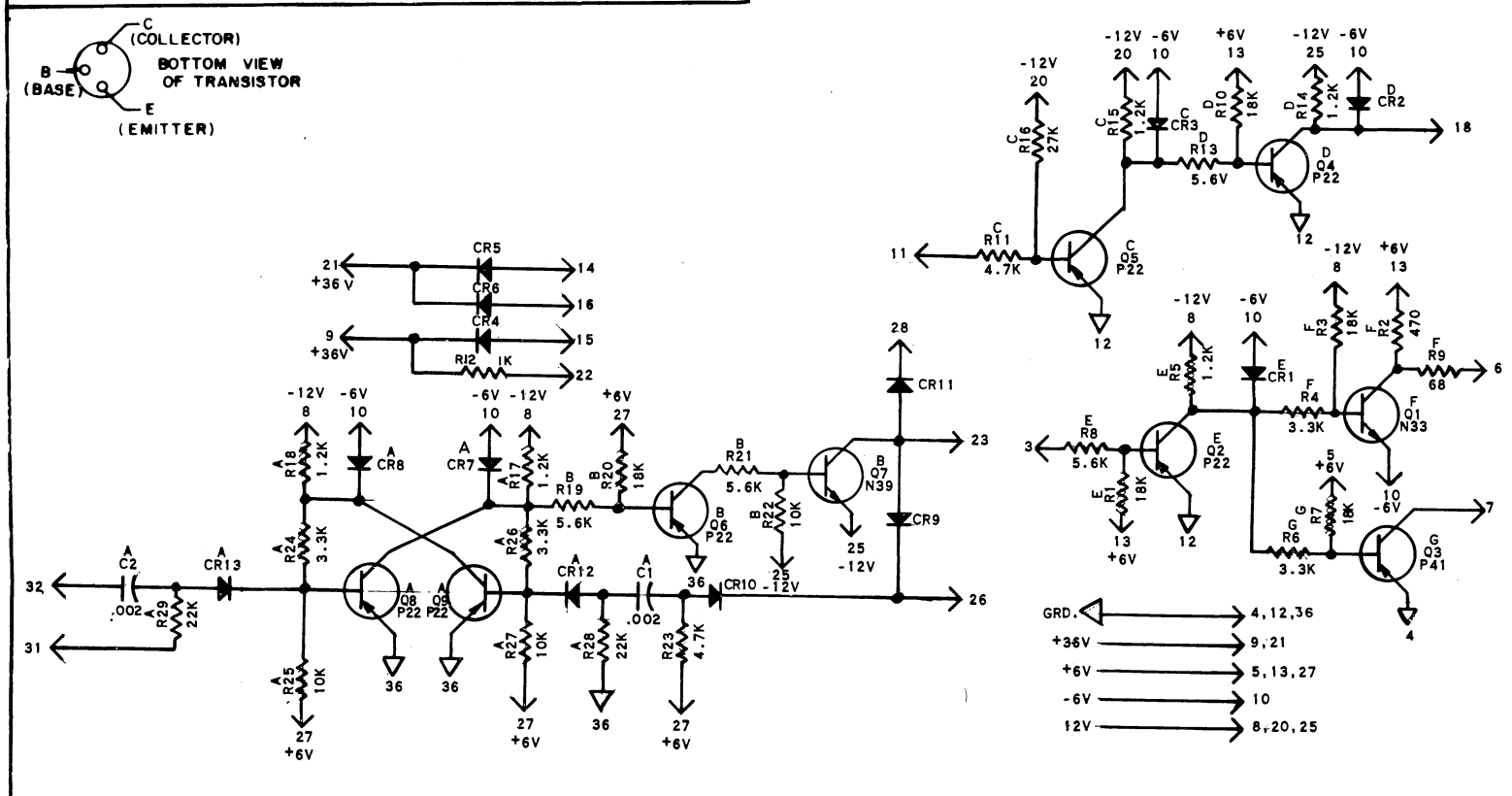


NOTE

REFER TO 6050 WD FOR BASIC MARKING INFORMATION

SPECIAL LOGIC FOR DCG1 DISCRETE CALLING GENERATOR





REVISIONS		
ISSUE NO.	DATE	AUTHOR. NO.
1	12-15-64	15688-R
2	5-24-65	85930
3	6-29-65	85931

CIRCUIT BOARD

306080

SHEET 1 OF 2

APPROVALS	
R AND D	E OF M
E-NUMBER	
PROD.NO. 306080	
DATE: 9-16-64	
R. & D. FILE NO. 1-A148/134AA	
DRAWN G.J.M.	CHKD.
ENGD. W.R.F.	APPD.

TELETYPE CORPORATION

REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
C1	177332	2	CAPACITOR, CERAMIC .002MF	COUPLING
C2			SAME AS C1	COUPLING
CR1	177108	6	DIODE, D-2	CLAMP
CR2			SAME AS CR1	CLAMP
CR3			SAME AS CR1	CLAMP
CR4	177611	7	DIODE, SILICON	RELAY PROTECTION
CR5			SAME AS CR4	RELAY PROTECTION
CR6			SAME AS CR4	RELAY PROTECTION
CR7			SAME AS CR1	CLAMP
CR8			SAME AS CR1	CLAMP
CR9			SAME AS CR4	ISOLATION
CR10			SAME AS CR1	ISOLATION
CR11			SAME AS CR4	RELAY PROTECTION
CR12			SAME AS CR4	INPUT
CR13			SAME AS CR4	INPUT
R1	118151	5	RESISTOR, FIXED 18K OHMS	BIAS
R2	137602	1	RESISTOR, FIXED 470 OHMS	LOAD
R3			SAME AS R1	BIAS
R4	129851	4	RESISTOR, FIXED 3300 OHMS	COUPLING
R5	137441	5	RESISTOR, FIXED 1200 OHMS	LOAD
R6			SAME AS R4	COUPLING
R7			SAME AS R1	BIAS
R8	118186	4	RESISTOR, FIXED 5600 OHMS	INPUT
R9	137601	1	RESISTOR, FIXED 68 OHMS	OUTPUT
R10			SAME AS R1	BIAS
R11	118146	2	RESISTOR, FIXED 4700 OHMS	INPUT
R12	171515	1	RESISTOR, FIXED 1000 OHMS 5W	DROPPING

REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
R13			SAME AS R8	COUPLING
R14			SAME AS R5	LOAD
R15			SAME AS R5	LOAD
R16	118187	1	RESISTOR, FIXED 27K OHMS	BIAS
R17			SAME AS R5	LOAD
R18			SAME AS R5	LOAD
R19			SAME AS R8	COUPLING
R20			SAME AS R1	BIAS
R21			SAME AS R8	COUPLING
R22	118180	3	RESISTOR FIXED 10K OHMS	BIAS
R23			SAME AS R11	BIAS
R24			SAME AS R4	COUPLING
R25			SAME AS R22	BIAS
R26			SAME AS R4	COUPLING
R27			SAME AS R22	BIAS
R28	118177	2	RESISTOR, FIXED 22K OHMS	C1 DISCHARGE
R29			SAME AS R28	C2 DISCHARGE
Q1	177106	1	TRANSISTOR, N33	AMPLIFIER
Q2	177105	6	TRANSISTOR, P22	INVERTER
Q3	177224	1	TRANSISTOR, P41	RELAY DRIVER
Q4			SAME AS Q2	INVERTER
Q5			SAME AS Q2	AMPLIFIER
Q6			SAME AS Q2	RELAY DRIVER
Q7	199807	1	TRANSISTOR, 2N698	RELAY DRIVER
Q8			SAME AS Q2	FLIP-FLOP
Q9			SAME AS Q2	FLIP-FLOP
	144495	9	PAD, TRANSISTOR	
EC	306081	1	CIRCUIT CARD, ETCHED	
		2	STRAP, BARE 24 AWG	
	300116	1	HAT, TRANSISTOR	

SHEET 1 OF 2

APPROVALS

R AND D | E OF M

E-NUMBER

PROD.NO. 306080

DATE: 9-16-64

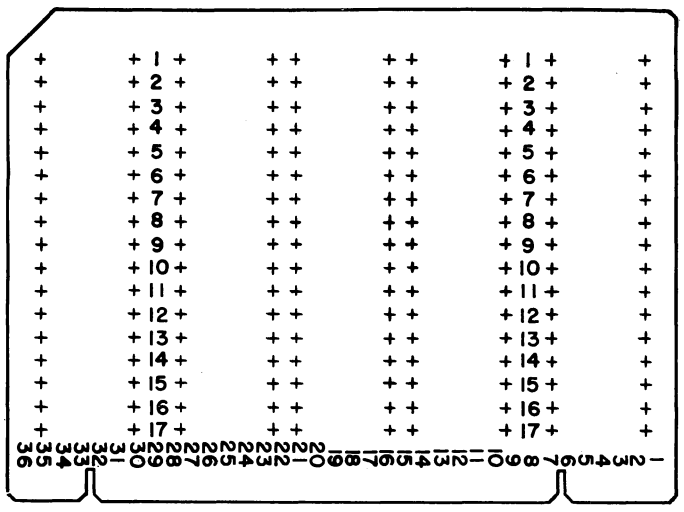
R. & D. FILE NO. 1-A148/134AA

DRAWN G.J.M. | CHKD.

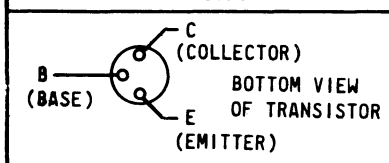
ENGD. W.R.F. | APPD.

TELETYPE CORPORATION

306080



NOTE:
REFER TO 6050WD FOR BASIC MARKING INFORMATION.



SPECIAL LOGIC FOR DCG1
DISCRETE CALLING GENERATOR

CIRCUIT BOARD

306080

REVISIONS

ISSUE NO.	DATE	AUTHOR. NO.
1	12-15-64	15688-R

CIRCUIT BOARD ASSEMBLY 306080 CONTAINS 7 ACTIVE ELEMENTS AND 8 PASSIVE COMPONENTS.

ELEMENT A IS A FLIP-FLOP WHICH IS SET BY -6V TO 0 SIGNALS APPLIED AT C2 AND PRIMED BY R29. THE FLIP-FLOP IS RESET BY A -12V TO +6V SIGNAL AT C1 AND IS PRIMED BY R28. THE INVERTED OUTPUT IS TAKEN FROM THE COLLECTOR OF Q8.

ELEMENT B IS A SPECIAL RELAY DRIVER WHICH OPERATES A 30 MA RELAY COIL. THE INPUT IS CONNECTED TO THE INVERTED OUTPUT OF THE FLIP-FLOP THROUGH R19 TO THE BASE OF Q6. THE RELAY IS CONNECTED TO THE COLLECTOR OF Q7. CR11 PROVIDES PROTECTION FOR THE RELAY AND CR9 PROVIDES ISOLATION FOR ANOTHER CIRCUIT WHICH OPERATES THE SAME RELAY.

ELEMENT C IS A SINGLE STAGE POLAR TO NEUTRAL AMPLIFIER WHICH CONVERTS A +3V AND -3V (MINIMUM OPERATE SIGNAL FOR EIA INTERFACE) POLAR SIGNAL TO -6V AND 0V. SIGNAL RESPECTIVELY.
ELEMENTS D AND E ARE INVERTERS WHICH CHANGE A 0V AND -6V SIGNALS TO A -6V AND 0V SIGNALS.

ELEMENT F IS A NEUTRAL TO POLAR AMPLIFIER WHICH CONVERTS THE -6V AND 0V SIGNALS FROM INVERTER ELEMENT E TO +6V AND -6V POLAR SIGNALS. R9 IS A CURRENT LIMITING RESISTOR TO PROTECT Q1.

ELEMENT G IS A SINGLE STAGE RELAY DRIVER WHICH OPERATES A 20 MA RELAY COIL.

THIS ASSEMBLY ALSO CONTAINS 3 PROTECTION DIODES CR4, CR5, AND CR6 FOR RELAYS. RESISTOR R12 IS A CURRENT LIMITING RESISTOR FOR A RELAY.

SHEET 2 OF 2

APPROVALS

R AND D	E OF M
HJK	

E-NUMBER
PROD.NO. 306080
DATE: 9-20-64
R. & D. FILE NO. 1-A148/134AA
DRAWN — CHKD.
ENGD. W.R.F. APPD.

TELETYPE CORPORATION

REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION	REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION

SHEET 2 OF 2

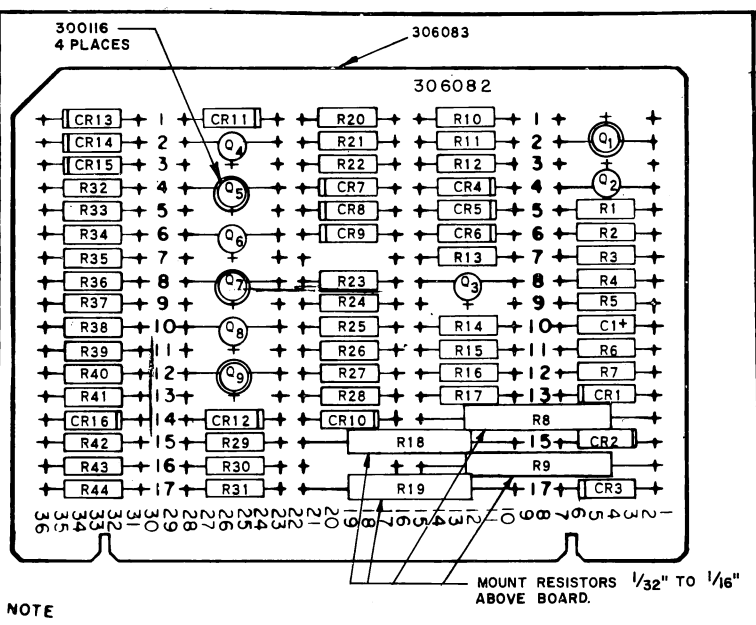
APPROVALS

R AND D	E OF M
HJK	

E-NUMBER
PROD.NO. 306080
DATE: 9-20-64
R. & D. FILE NO. 1-A148/134AA
DRAWN — CHKD.
ENGD. W.R.F. APPD.

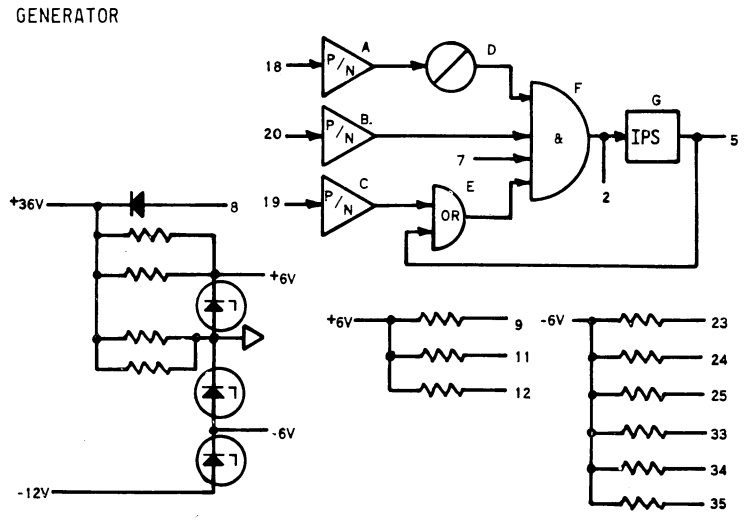
TELETYPE CORPORATION

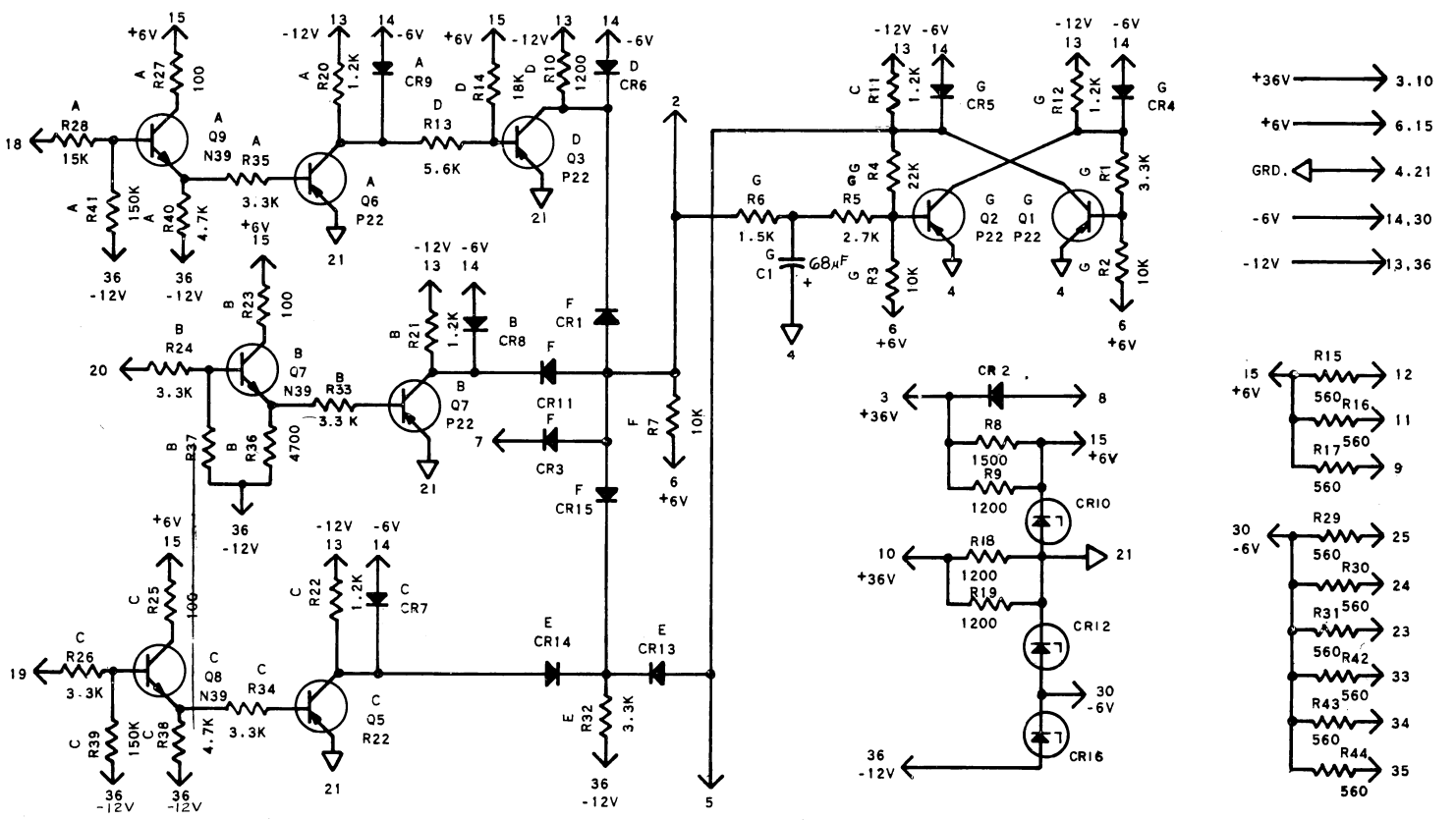
306080



NOTE
REFER TO 6050 WD FOR BASIC MARKING INFORMATION

SPECIAL LOGIC FOR DCG1 DISCRETE CALLING GENERATOR





CIRCUIT BOARD

306082

REVISIONS

ISSUE NO	DATE	AUTHOR NO
1	12-17-64	15689-R
2	5-24-65	85930
3	6-29-65	85931

SHEET 1 OF 2

APPROVALS

R AND D	E OF M
HJK	

E-NUMBER

PROD.NO. 306082

DATE: 9-16-64

R. & D. FILE NO. 1-A148/134AA

DRAWN G.J.M. CHKD. WEMC

ENGD. W.R.F. APPD.

TELETYPE CORPORATION

306082

REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
C1	306088	1	CAPACITOR, TANTALUM 68 MF	INTEGRATION CAPACITOR
CR1	177611	3	DIODE, SILICON	AND GATE
CR2			SAME AS CR1	RELAY PROTECTION
CR3			SAME AS CR1	AND GATE
CR4	177108	10	DIODE, D2	CLAMP
CR5			SAME AS CR4	CLAMP
CR6			SAME AS CR4	CLAMP
CR7			SAME AS CR4	CLAMP
CR8			SAME AS CR4	CLAMP
CR9			SAME AS CR4	CLAMP
CR10	300019	3	DIODE, ZENER 6.2 VOLTS	VOLTAGE DIVIDER
CR11			SAME AS CR4	AND GATE
CR12			SAME AS CR10	VOLTAGE DIVIDER
CR13			SAME AS CR4	OR GATE
CR14			SAME AS CR4	OR GATE
CR15			SAME AS CR4	AND GATE
CR16			SAME AS CR10	VOLTAGE DIVIDER
R1	129851	7	RESISTOR, FIXED 3300 OHMS	BIAS
R2	118180	3	RESISTOR, FIXED 10K OHMS	BIAS
R3			SAME AS R2	BIAS
R4	118177	1	RESISTOR, FIXED 22K OHMS	BIAS
R5	118144	1	RESISTOR, FIXED 2700 OHMS	BIAS
R6	137442	1	RESISTOR, FIXED 1500 OHMS	INTEGRATION
R7			SAME AS R2	AND GATE
R8	171526	1	RESISTOR, FIXED 1500 OHMS 5W	VOLTAGE DIVIDER
R9	171587	3	RESISTOR, FIXED 1200 OHMS 5W	VOLTAGE DIVIDER
R10	137441	6	RESISTOR, FIXED 1200 OHMS	LOAD
R11			SAME AS R10	LOAD
R12			SAME AS R10	LOAD
R13	118136	1	RESISTOR, FIXED 5600 OHMS	COUPLING
R14	118151	1	RESISTOR, FIXED 18K OHMS	BIAS
R15	143659	5	RESISTOR, FIXED 560 OHMS	CURRENT LIMITING
R16			SAME AS R15	CURRENT LIMITING
R17			SAME AS R15	CURRENT LIMITING
R18			SAME AS R9	VOLTAGE DIVIDER
R19			SAME AS R9	VOLTAGE DIVIDER
R20			SAME AS R10	LOAD

REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
R21			SAME AS R10	LOAD.
R22			SAME AS R10	LOAD
R23	137438	3	RESISTOR, FIXED 100 OHMS	BIAS
R24			SAME AS R1	INPUT
R25			SAME AS R23	BIAS
R26			SAME AS R1	INPUT
R27			SAME AS R23	BIAS
R28	118150	1	RESISTOR, FIXED 15K OHMS	INPUT
R29			SAME AS R15	CURRENT LIMITING
R30			SAME AS R15	CURRENT LIMITING
R31			SAME AS R15	CURRENT LIMITING
R32			SAME AS R1	OR GATE
R33			SAME AS R1	COUPLING
R34			SAME AS R1	COUPLING
R35			SAME AS R1	COUPLING
R36	118146	3	RESISTOR, FIXED 4700 OHMS	LOAD
R37	118159	3	RESISTOR, FIXED 150KOHMS	BIAS
R38			SAME AS R36	LOAD
R39			SAME AS R37	BIAS
R40			SAME AS R36	LOAD
R41			SAME AS R37	BIAS
R42			SAME AS R15	CURRENT LIMITING
R43			SAME AS R15	CURRENT LIMITING
R44			SAME AS R15	CURRENT LIMITING
Q1	177105	6	TRANSISTOR, P-22	INTEGRATOR
Q2			SAME AS Q1	INTEGRATOR
Q3			SAME AS Q1	INVERTER
Q4			SAME AS Q1	AMPLIFIER
Q5			SAME AS Q1	AMPLIFIER
Q6			SAME AS Q1	AMPLIFIER
Q7	177422	3	TRANSISTOR, N-39	AMPLIFIER
Q8			SAME AS Q7	AMPLIFIER
Q9			SAME AS Q7	AMPLIFIER
	144495	9	PAD, TRANSISTOR	
EC	306083	1	CIRCUIT CARD, ETCHED	
	300116	4	HAT, TRANSISTOR	

SHEET 1 OF 2

APPROVALS

R AND D	E OF M
HJK	

E-NUMBER

PROD.NO. 306082

DATE: 9-16-64

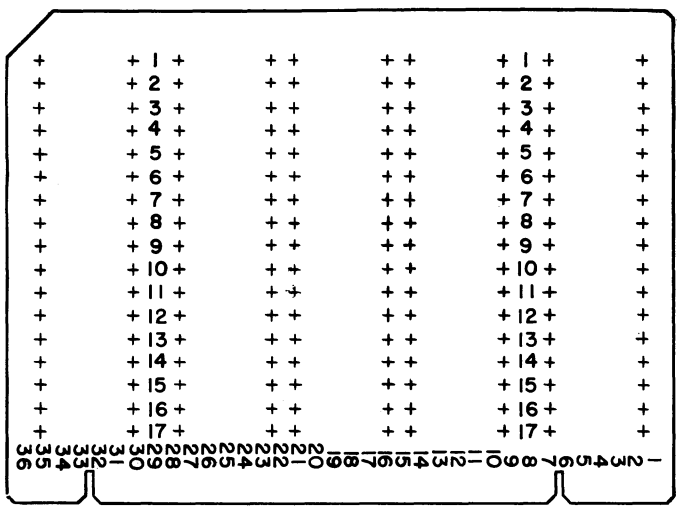
R. & D. FILE NO. 1-A148/134AA

DRAWN G.J.M. CHKD.

ENGD. W.R.F. APPD.

TELETYPE CORPORATION

306082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