

LORAIN

Products Corporation

LORAIN NA INTERRUPTER

Spec. No. 5873-115

Serial No. 2827

instructions

INSTALLATION

OPERATION

MAINTENANCE

DESIGNERS AND MANUFACTURERS OF

power equipment without moving parts

SUB-CYCLE[®]
CONVERTERS

AND

FLOTROL[®]
RECTIFIERS

LORAIN NA INTERRUPTER

Spec. No. 5873-115

Serial No. 2827

LORAIN PRODUCTS CORPORATION WARRANTY

Lorain Products Corporation warrants that all equipment manufactured by it shall be free from defects in material and workmanship. The corporation will, at its option, replace or repair free of charge and pay surface carrier charges on any adequately packed equipment covered by its warranty which shall be returned to the factory within 90 days from date of turn-on and found to be defective. All circuit components are warranted for two years from the original shipping date from the factory and which upon examination prove to be defective in material or workmanship. The corporation recommends that all shipments of equipment be inspected by the customer for hidden damage upon receipt from the carrier to insure that a timely claim be filed, if necessary, by the customer. Lorain Products Corporation will not pay claims for shipping damages.

Systems and Equipment Not Economically Returnable To The Factory

In the event that the product involved is a system or equipment which, in the judgment of Lorain Products Corporation, is not economically returnable to the factory or if Lorain Products Corporation has performed the installation, supervised the installation, or performed testing and turn-on, circuit components and Lorain repair labor are covered by this warranty for the first 90 days from date of turn-on and circuit components are warranted for two years from the date of shipment. Upon request, Lorain will send a service technician to the site to determine if the unit is defective in circuit components or workmanship, and will repair the equipment. If the failure is Lorain's fault, no invoice for circuit components or repair labor will be issued if the complaint has been issued within the first 90 days from date of turn-on. If the complaint is issued more than 90 days from the date of turn-on but within two years from the date of shipment, the customer will be billed at the prevailing Customer Service rates but will not be billed for circuit components. If the problem occurs after two years from the date of shipment, circuit components and repair labor are billable.

If the problem has been created by misuse or abuse of the equipment or by malfunction of associated equipment or by environmental conditions, at any time after shipment, the customer will be billed for circuit components and labor.

General Provisions

Lorain Products Corporation shall not be obligated to pay any costs or charges incurred by the customer or by any other party. In no event will Lorain Products Corporation be liable for consequential damages. No waiver, alteration or modification of any of the provisions herein shall be binding on Lorain Products Corporation unless in writing and signed by an authorized official of Lorain Products Corporation. If, during any warranty period, the subject equipment has, in the opinion of Lorain Products Corporation, been modified or misrepaired, the warranty will be void unless the modifications or repairs have been made after consultation with the corporation and upon the recommendation of the corporation.

1. SPECIFICATION

1.1 GENERAL

1.1.1 This Model NA Interrupter furnishes ground pulse gates and interrupts user furnished tone for Five Frequency, 1-Ring TPS service in GTE-Automatic Electric CXP-5 offices. This interrupter may be used in any ringing plant for which the interruption pattern and ratings would apply.

1.2 OUTPUT

1.2.1 Interrupter Timing Chart

DESIGNATION	TIME												OUTPUT	
	0	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	TYPE
RP1	[Pulse pattern]												GP	0.5 AMP
RP2	[Pulse pattern]													
RP3	[Pulse pattern]													
RP4	[Pulse pattern]													
RP5	[Pulse pattern]													
CODE 2	[Pulse pattern]													
TIME 1 & CODE 1	[Pulse pattern]													
60 IPM	[Pulse pattern]													2.0 AMP
120 IPM	[Pulse pattern]													2.0 AMP
L BSY (ODD & EVEN)	[Pulse pattern]												MR	1.0 AMP
T BSY (ODD & EVEN)	[Pulse pattern]												MR	1.0 AMP
TIME 2	[Pulse pattern]												GP	0.5 AMP
	[Pulse pattern]													
	[Pulse pattern]													

GP - GROUND PULSE GATE
MR - MERCURY RELAY GATE

1.2.2 Interrupted Busy Tone: There are four interrupted busy tone outputs as shown in Para 1.2.1 L BSY and T BSY which may carry a maximum of 1.0 amperes each.

1.2.3 Interrupted Ground Pulse Outputs:

- (A) There are nine interrupted ground pulse outputs shown in Para 1.2.1 which may carry a maximum of 0.5 amperes each: RP1, RP2, RP3, RP4, RP5, Code 1, Code 2, Time 1 and Time 2.
- (B) There are two interrupted ground pulse outputs shown in Para 1.2.1 which may carry a maximum of 2.0 amperes each: 60 IPM and 120 IPM

1.3 INPUT

1.3.1 Power

- (A) Voltage: Nominal 48 volts with a positive grounded battery. The interrupter will operate within the range of 44 to 56 volts.
- (B) Current: 650 milliamperes at 56 volts input

1.3.2 Tone: Any 400 milliwatt LORAIN Tone Generator

LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS (CANADA) LTD., ST. THOMAS, ONTARIO			
POWER DATA MODEL NA INTERRUPTER SPEC NO. 5873-115			
DR. BY <i>S. Ledy</i>	DATE <i>3-23-73</i>	ENGR. BY <i>P. Williams</i>	DATE <i>3-16-73</i>
CH. BY <i>A. Miller</i>	DATE <i>3-13-73</i>	APP. BY <i>OT Cavell</i>	DATE <i>3-12-73</i>
<i>E. Blakowich</i>	DATE <i>3-14-73</i>	ECN APP	
PD5873-115			ISS <i>1</i> ECN PAGE 1 OF 5

1. SPECIFICATION

1.4 STANDARD FEATURES

- 1.4.1 Input Protection: One 1-1/3 ampere Type 70A fuse in negative input lead.
- 1.4.2 Ground Pulse Outputs: May be connected to operate interruption relays or to light lamps.
- 1.4.3 Busy Tone Interruptions: Accomplished with Mercury Relays with contacts rated one ampere at 50 volts.
- 1.4.4 Alarm: Operation of D-C input fuse (F1) causes -48 volt battery to be furnished through an internal 500 ohm resistor.
- 1.4.5 Timing Accuracy: The Clock-Divider will remain within $\pm 2\%$ of the adjusted frequency.

1.5 ENVIRONMENTAL RATINGS

- 1.5.1 Operating Ambient Temperature Range: 0°C ($+32^{\circ}\text{F}$) to $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$)
- 1.5.2 Storage Temperature Range: -40°C (-40°F) to $+85^{\circ}\text{C}$ ($+185^{\circ}\text{F}$)
- 1.5.3 Ventilation Requirements: In mounted position, the unit should be located so that ventilating openings are not blocked and air entering the cabinet does not exceed $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$). It may be necessary to allow 1-3/4 inches spacing between this interrupter and other heat producing equipment.

1.6 ACCESSORIES AVAILABLE BUT NOT INCLUDED WITH THIS INTERRUPTER - None

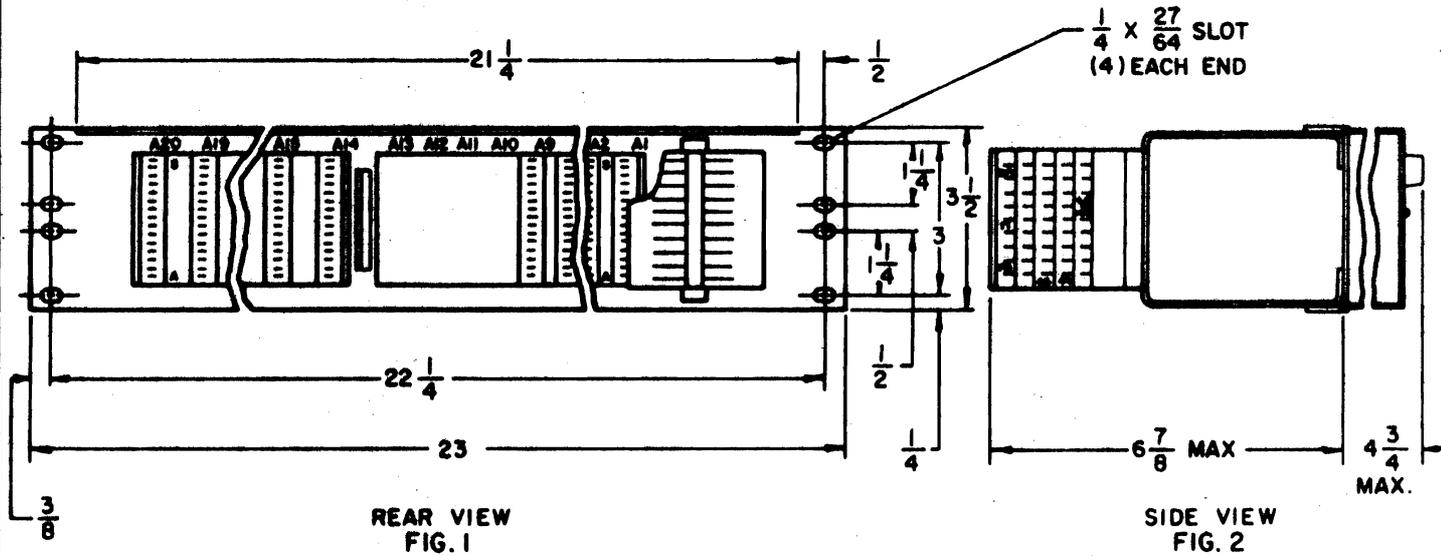
1.7 MISCELLANEOUS

- 1.7.1 Schematic Diagram: SD5873-115
- 1.7.2 Wiring Diagram: T5873-115
- 1.7.3 Assembly Drawing: J5873-115
- 1.7.4 Instructions: Form 2865

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2. DIMENSIONS



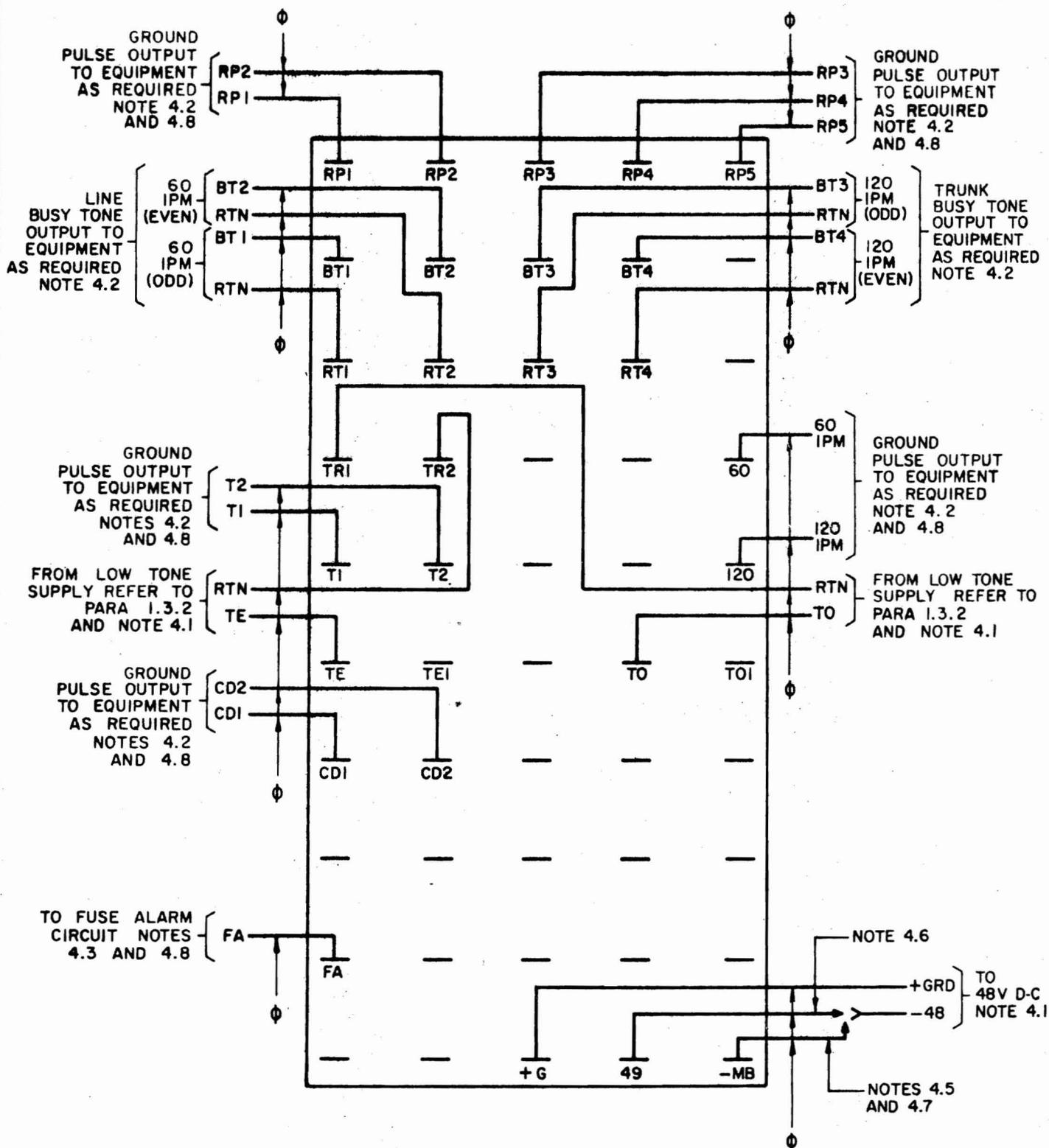
NOTES

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. FINISH: EQUIPMENT LIGHT GRAY
3. WEIGHT
 - (A) SHIPPING: 15 LBS
 - (B) NET: 12 LBS

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3. INSTALLER'S CONNECTIONS



PD5873-115

4. INSTALLER'S INFORMATION NOTES

4.1

D-C POWER INPUT		TONE INPUT	
Term. Cap.	Recm Wire Size	Term. Cap.	Recm Wire Size
Note 4.4	18 Ga.	Note 4.4	20 Ga. Min.

4.2

ALL OUTPUTS	
Term. Cap.	Recm Wire Size
Note 4.4	20 Ga. Min.

4.3

ALARM	
Term. Cap.	Recm Wire Size
Note 4.4	20 Ga. Min.

4.4 "Telephone-Type" terminal blocks are rated for 5 amperes maximum.

4.5 Negative resistance battery is furnished at terminal FA should the fuse operate and local fusing has been provided. Refer to Para 4.7.

4.6 For remote fusing and fuse alarm, negative battery should be supplied at terminal 49 and fused at 2 amperes.

4.7 For local fusing and fuse alarm, negative battery should be supplied at terminal -MB. Refer to Para 4.5.

4.8 Central office battery serves as the return path for these circuits.

4.9 ϕ indicates leads run by the installer.

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CAUTION !

Do not use a test receiver or "earphone" to check interrupter outputs unless it is a high impedance test receiver. Most test receivers used in telephone offices are of low enough resistance to draw excessive current through the interrupter output transistors or mercury relay contacts. If in doubt about impedance of test receiver, connect a 500 ohm resistor in series with the test receiver. If this precaution is not followed, the output transistors or mercury relay contacts may be instantly destroyed without any visible sign of damage.

March 21, 1968

Form 2309

INSTRUCTIONS
LORAIN TYPE NA INTERRUPTER, SPEC 5873-115
SD-5873-115

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INSTRUCTIONS
LORAIN TYPE NA INTERRUPTER, SPEC 5873-115
SD-5873-115

1. DESCRIPTION, RATINGS

a. General

LORAIN Type NA Interrupter, Spec 5873-115, operates from nominal 48 volt d-c to furnish ground pulse signals, and interrupt user furnished tone. Refer to the timing chart on Schematic Diagram SD-5873-115 for the interrupter timing pattern.

2. INSTALLATION

a. Location

This Interrupter operates best in a well ventilated area which has an ambient temperature range between 0°C (32°F) and 55°C (131°F).

b. Mounting

This LORAIN Type NA Interrupter can be mounted in a twenty-three inch relay rack. It requires 3-1/2 inches of panel space, extends 4-3/4 inches to the front of the rack, and has an overall depth of 11-5/8 inches.

CAUTION: In mounted position, ventilation openings at top and bottom of cabinet must be unobstructed. The temperature of the air entering the bottom of the cabinet should not exceed 55°C. If this unit is mounted in a relay rack with other equipment, it is recommended that 1-3/4 inches of ventilation space be provided above and below the cabinet; this is essential to proper cooling during operation.

c. Electrical Connections

Installer connections are made at a fifty-point solder-type terminal block at right side as viewed from rear of Interrupter. These connections are indicated on Wiring Diagram T-5873-115; they are summarized and described below. Timing of output signals is shown in the timing chart on Schematic Diagram SD-5873-115.

- (1) This Interrupter supplies the following ground pulse signals at the respective terminals:

2. c. (1) (continued)

<u>Signal</u>	<u>Terminal Block Designation</u>
RP1	RP1
RP2	RP2
RP3	RP3
RP4	RP4
RP5	RP5
60 IPM*	60
TIME 1	T1
TIME 2	T2
120 IPM*	120
CODE 1	CD1
CODE 2	CD2

CAUTION: The ground pulse signals marked (*) are rated at 2.0 ampere. Hence, the ground pulse load connected to these terminals must have a resistance of no less than 25 ohms. All other ground pulse output circuits are rated to supply 0.5 ampere. Ground pulse load connected to these terminals must have resistance of not less than 100 ohms.

- (2) Connect the external user furnished Low Tone Supply as follows:

<u>Designation</u>	<u>Terminal Block Designation</u>
LT (EVEN)	TE
LTR (EVEN)	TR2
LT (ODD)	TO
LTR (ODD)	TR1

- (3) The Interrupter will supply interrupted Low Tone signals at the following terminals:

<u>Signal</u>	<u>Terminal Block Designation</u>
60 IPM BSY (ODD)	BT1
60 IPM BSY RTN (ODD)	RT1
60 IPM BSY (EVEN)	BT2
60 IPM BSY RTN (EVEN)	RT2
120 IPM BSY (ODD)	BT3
120 IPM BSY RTN (ODD)	RT3
120 IPM BSY (EVEN)	BT4
120 IPM BSY RTN (EVEN)	RT4

- 2. c. (4) Terminal FA can be connected to operate an external fuse alarm. In the event fuse F1 should open, resistance battery is furnished on terminal FA.
- (5) Supply -48 volt d-c at terminal -MB and connect terminal +G to office ground.

NOTE: When this unit is furnished as part of a LORAIN Ringing Power Plant, supply -48 volt d-c (fused at 2 amp) to terminal 49 instead of terminal -MB.

3. INPUT FUSE

An input fuse, located at the left front of the Interrupter, protects d-c input to the Interrupter. This fuse can be connected to give an external fuse alarm if it should open. If necessary to replace fuse F1, replace only with a Type 70A indicator-alarm, 1-1/3 ampere, or equivalent.

4. CIRCUIT CARDS AND POWER SUPPLY

Sixteen separate, independently-removable, circuit cards and a plug-in type power supply make up the Interrupter circuit. It is recommended that one spare circuit card be kept for each type of circuit card in the Interrupter. It is also recommended that one spare power supply be kept for the Interrupter. Due to a similarity of function in four types of circuit cards, only six types of standby circuit cards are required:

<u>Position</u>	<u>Description</u>
A1	4872-013 Clock-Divider
A2-A7, A9	4872-206 Pulse Divider
A8	4866-049 Logic Gate
A14, A16, A17	4866-041 Dual Ground Pulse Gate
A15, A18	4866-040 Dual Ground Pulse Gate
A19, A20	4866-079 Mercury Relay Gate
E1	4864-012 Power Supply

To gain access to circuit cards and power supply, pull front cover of Interrupter forward and remove from base plate. If failure should occur in any circuit card, it can quickly and easily be withdrawn forward from its connector, and a replacement circuit card of similar type can be installed immediately to maintain service. Each connector has a polarizing key which assures that no circuit card can be installed at a position in which it would be damaged. The power supply may be withdrawn by first removing the two screws which secure the power supply to the interrupter panel and then withdrawing the power supply from its connector socket.

5. MANUFACTURER ADJUSTMENT

Potentiometer R1 of 4872-013 Clock-Divider A1 is adjusted at the factory to set its pulse repetition rate at 20 Hz. This setting determines the timing of all Interrupter outputs; it is recommended that no change be made in this adjustment setting.

6. CIRCUIT DESCRIPTION

a. General

Schematic Diagram SD-5873-115 shows the electrical circuitry and timing pattern of the Interrupter.

b. Timing Circuit

The timing circuit consists of a pulse generator or "clock" driving a series of pulse dividers which establish the basic timing pattern of the Interrupter. The pulse generator and a pulse divider are on circuit card A1, while subsequent dividers are on circuit cards A2 through A7, and card A9.

Pulses from the "clock" are fed to Pulse Divider Circuit Cards A1 and A9, which causes these pulse dividers to divide the pulse repetition rate of the "clock". One of the outputs of each of the first dividers, A1 and A9, are connected to the inputs of the divider that follows. The following divider, in each case, changes state when its input voltage goes from -22 volts to ground, thereby producing one complete cycle at one-half the rate of the previous divider output. In the same manner, subsequent dividers act to divide the timing rate.

Pulse dividers A, B, C, H, L and M have an input applied to their "SET" input terminal. When a ground signal is applied to the "SET" input terminal of a pulse divider, it causes the "1" output of that divider to hold at -22 volts and the "0" output of that divider to hold at ground potential. When ground is removed from the "SET" terminal, the input signal at the "TRIGGER" terminal will cause the divider to change state each time this "TRIGGER" potential changes from -22 volts to ground.

Dual logic gate A8 is also part of the timing circuit. When the input of the logic gate is at ground potential, two output signals are produced; one output is at -22 volt potential, while the other is at ground potential. When -22 volts is applied at a logic gate input, the output signals are now reversed. The output which was formerly at -22 volt potential is now at ground potential, while the output which was at ground potential is now at -22 volt potential.

6. b. (continued)

Diodes A-N and R, in conjunction with capacitor DS, ensure that the pulse divider outputs will always begin at time 0 when the Interrupter is first started. This prevents "garbling" the various outputs of the Interrupter.

The logic timing chart on Schematic Diagram SD-5873-115 shows the voltage produced on leads A through P and lead R with the high portions of each line representing a voltage on the corresponding lead of -22 volts, and low portions representing approximately ground potential.

c. Ground Pulse Gate Circuits

Each gate switches "on", or conducts between its output terminal and ground, when its input is at approximately ground potential. When approximately -22 volts is applied to its input, the gate switches "off", or stops output current flow. Gate inputs are connected to divider outputs of the timing circuit so that a gate is "on" only during the time that the associated divider output is at approximately ground potential.

d. Mercury Relay Gate Circuits

- (1) Mercury relay gate A19 interrupts low tone (from external tone supply) at a 60 IPM rate. When the input to A19 is at -22 volts potential, the relays operate to allow low tone current to flow on the 60 IPM BSY (ODD) and 60 IPM BSY (EVEN) output leads. When the input to A19 is at ground potential, the relay releases to stop tone current flow on the 60 IPM BSY (ODD) and 60 IPM BSY (EVEN) leads.
- (2) Mercury relay gate A20 interrupts low tone (from external tone supply) at a 120 IPM rate. When the input to A20 is at -22 volts potential, the relays operate to allow low tone current to flow on the 120 IPM BSY (ODD) and 120 IPM BSY (EVEN) output leads. When the input to A20 is at ground potential, the relay releases to stop tone current flow on the 120 IPM BSY (ODD) and 120 IPM BSY (EVEN) output leads.

e. Power Supply (See SD-4864-012)

The power supply circuit furnishes three voltages through multiple straps common to circuit cards in the Interrupter. The following voltages are supplied: -0.6 volts, -22 volts, -48 volts. Voltage limiting is provided to protect transistors in ground pulse gate circuits. This voltage limiting lead is designated CP.

6. e. (continued)

Resistors A, B and R4, capacitor C2, zener diode CR3 and transistor Q1 make up a series voltage regulator circuit which supplies -22 volts to Interrupter circuits. Forward voltage drop across diode CRA provides -0.6 volts to Interrupter circuit cards requiring this voltage.

The CP voltage limiting circuit is composed of zener diode CR1, diode CR2, resistor R1 and capacitor C1. During normal operation, capacitor C1 is charged to 48 volts through CR2. When a voltage surge appears on the CP lead, the voltage rises across zener diode CR1 until its breakdown voltage is reached, about 12 volts. At this point, the voltage on the CP lead equals battery voltage plus the zener diode voltage, or about 60 volts, and any increases in voltage causes a current to flow which charges capacitor C1, thus limiting the surge voltage. When the surge has passed, capacitor C1 discharges through resistor R3 until its voltage is again 48 volts. Resistor R1 limits the initial charging current of capacitor C1 when the Interrupter is started.

7. TROUBLESHOOTING

Different types of failure in the Interrupter will cause different trouble symptoms. The following steps should be taken in localizing and correcting the trouble:

- (a) Locate the signal designations in the trouble chart, that follows, which correspond to the signals which are absent, continuous, or irregular.
- (b) To the right of the signal designation column in the trouble chart, the plug-in interrupter circuit card positions A1-9, A14-20 and power supply E1 are listed. An "X" under a card position indicates which output signals will be absent, continuous or irregular, if that particular card has failed. Replace the circuit card in heading under which the "X's" correspond to the signals which are absent, continuous or irregular.

NOTE: Several circuit cards have dual functions and can cause two separate groups of trouble symptoms.

The following voltage chart shows the voltages at the Interrupter power supply socket J1. All voltages are read with a 20,000 ohms per volt d-c multimeter, with nominal 50 volts d-c applied to the input of the power supply.

7. (continued)

<u>Voltage</u>	<u>Between J1 Pins</u>
0.5 to 1.0 d-c	6 and 7
19.8 to 24.2 d-c	5 and 7
50 d-c	1 and 7
48 to 50 d-c	2 and 7

Voltages at the outputs of pulse dividers in the Interrupter may be tested with a d-c voltmeter to check whether a divider is dividing properly, however, the following conditions must be considered:

First: When a test probe is touched to a pulse divider output terminal, it causes an instantaneous disturbance in the Interrupter timing sequence. If the probe is held steadily on the terminal, no further disturbance occurs. Therefore, it is important to keep a good solid connection with the test probe if a meaningful reading is to be obtained.

Second: On a faster divider output, 60 IPM, for example, the meter will not follow the voltage exactly, never quite resting near either a zero or 22 volt reading. However, the meter is still useful for indicating the divider output rate.

When replacing clock-divider card A1 in the Interrupter, the rate of the new divider should be checked. The timing rate of clock-divider A1 should be 20 Hz.

To check the timing rate of clock-divider A1, connect a 48C or 2Y switchboard lamp from the 60 IPM ground pulse output to -48V battery. With the Interrupter in operation, observe the test lamp while observing the second hand of a watch or clock. The lamp should light ten times in ten seconds. If necessary, adjust the potentiometer on the clock-divider to produce the correct timing rate.

TROUBLE CHART

SIGNAL DESIGNATION ABSENT, CONTINUOUS OR IRREGULAR	INTERRUPTER PLUG-IN CIRCUIT CARDS AND POWER SUPPLY																	
	A20	A19	A18	A17	A16	A15	A14	A9	A8	A7	A6	A5	A4	A3	A2	A1	E1	
120 IPM BSY (EVEN)	X													X	X	X	X	X
120 IPM BSY (ODD)		X												X	X	X	X	X
60 IPM BSY (EVEN)			X											X	X	X	X	X
60 IPM BSY (ODD)				X										X	X	X	X	X
120 IPM					X									X	X	X	X	X
60 IPM						X								X	X	X	X	X
TIME 2							X		X	X	X	X	X				X	X
CODE 1, TIME 1								X	X	X	X	X	X				X	X
CODE 2						X			X	X	X	X	X				X	X
RP4							X	X	X	X	X	X	X				X	X
RP5								X	X	X	X	X	X				X	X
RP3									X	X	X	X	X				X	X
RP2								X	X	X	X	X	X				X	X
RP1									X	X	X	X	X				X	X

ELECTRICAL PARTS LIST
LORAIN MODEL NA INTERRUPTER
SPEC. NO. 5873-115

This Electrical Parts List is arranged alphabetically by part name. Spare parts are not usually required if adequate standby equipment is available and if the LORAIN EQUIPMENT is installed at an accessible location so that parts can readily be obtained from Lorain Products stock. When ordering parts, please furnish equipment Model No., Spec. No., and Serial No. as given on the equipment nameplate. The quantity of spare parts listed should be sufficient for ten or less assemblies or models for at least 18 months. If a single asterisk (*) appears in the Quantity Recm. Spares column, it indicates the part, assembly, or model is listed more than once, in which case, use the quantity where the item first appears. If two asterisks (**) appear, refer to the sub-list for that assembly or model. If a dash (-) appears, this indicates that spares are not recommended for this part or assembly.

<u>Ref.</u> <u>Desig.</u>	<u>LPC</u> <u>Part No.</u>	<u>Description</u>	<u>Quantity</u> <u>Recm. Spares</u>
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ASSEMBLIES

E1	4864-012	Power Supply	**
	4866-040	Dual 2.0A G. P. Gate	1
	4866-041	Dual 0.5A G. P. Gate	1
	4866-049	Dual Logic Gate	1
	4866-079	1.0A M. R. Gate	1
	4872-013	Clock Divider	1
	4872-206	Pulse Divider	1

CAPACITORS

DS	2715-123	1.5UF 100 Volt	1
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DIODES

CRA	2813-134	1N1200RA	2
	2811-204	0.060 Amp 75 Volt	2

FUSES

	2486-208	1.33 Amp, Alarm	2
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RESISTORS

A	2656-542	39 Ohm 25 Watt	1
B	2656-542	39 Ohm 25 Watt	*

LORAIN PRODUCTS CORPORATION
Lorain, Ohio, U. S. A.

LORAIN PRODUCTS (CANADA) LTD.
St. Thomas, Ontario, Canada

ELECTRICAL PARTS LIST
 LORAIN 4864-012 PLUG-IN POWER SUPPLY ASSEMBLY

This Electrical Parts List is arranged alphabetically by part name. Spare parts are not usually required if adequate standby equipment is available and if the LORAIN EQUIPMENT is installed at an accessible location so that parts can readily be obtained from Lorain Products stock. When ordering parts, please furnish equipment Model No., Spec. No., and Serial No. as given on the equipment nameplate. The quantity of spare parts listed should be sufficient for ten or less assemblies or models for at least 18 months. If a single asterisk (*) appears in the Quantity Recm. Spares column, it indicates the part, assembly, or model is listed more than once, in which case, use the quantity where the item first appears. If two asterisks (**) appear, refer to the sub-list for that assembly or model. If a dash (-) appears, this indicates that spares are not recommended for this part or assembly.

<u>Ref.</u> <u>Desig.</u>	<u>LPC</u> <u>Part No.</u>	<u>Description</u>	<u>Quantity</u> <u>Recm. Spares</u>
<u>CAPACITORS</u>			
C1	2731-110	20UF 100 Volt, Electrolytic	-
C2	2731-108	20UF 50 Volt, Electrolytic	-
<u>DIODES</u>			
CR1	2836-212	1N4742, Zener	2
CR2	2812-310	1N4818, Silicon	2
CR3	2836-401	1N3028A, Zener	2
<u>FUSES</u>			
	2486-208	1.33 Amp, Alarm	3
<u>RESISTORS</u>			
R1	2662-815	10 Ohm 2 Watt, Fixed	1
R2	2656-449	500 Ohm 10 Watt, Fixed	1
R3	2656-449	500 Ohm 10 Watt, Fixed	*
R4	2651-189	100 Ohm 3 Watt, Wirewound	1
<u>TRANSISTORS</u>			
Q1	2844-096	2N3792	1

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March 22, 1974
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ELECTRICAL PARTS LIST
LORAIN 4864-012 PLUG-IN POWER SUPPLY ASSEMBLY

<u>Ref.</u> <u>Desig.</u>	<u>LPC</u> <u>Part No.</u>	<u>Description</u>	<u>Quantity</u> <u>Recm. Spares</u>
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MISCELLANEOUS

	2488-130	Fuseholder, Comp.	1
	2486-322	Designation Pin, White	1

LORAIN PRODUCTS CORPORATION
Lorain, Ohio, U. S. A.

LORAIN PRODUCTS (CANADA) LTD.
St. Thomas, Ontario, Canada

Printed in U. S. A.

dmb

STOCKLIST						
AB	AC	AD	AE	AF	AG	COL
LIST	QTY PER LIST	PART NO	DWG OR CODE NO	DESCRIPTION	NOTE	LINE
	1	3532-170		MOUNTING PLATE		1
	1	3763-106		COVER		
	1	2465-521		TERMINAL BLOCK		
	4	2565-573		COVER GUIDE		
	1	3662-107		TERM BLOCK MTG BRKT		5
	16	2475-747		CKT BOARD RECEPT		
	16	2478-522		POLARIZING KEY		
	1	3186-866		NAMEPLATE		
	1	2475-152		SOCKET		10
	1	3173-518		TERMINAL BLOCK MARKER		
	2	4866-079		MERCURY RELAY GATE		15
	1	4866-049		DUAL LOGIC GATE		
	1	4866-040		DUAL 2 AMP GROUND PULSE GATE		
	4	4866-041		DUAL 0.5 AMP GROUND PULSE GATE		20
	1	4872-013		GLOCK-DIVIDER		
	7	4872-206		PULSE DIVIDER		
	2	2486-208		SPARE FUSES		25
	1	3621-517		HEAT SINK		30
	1	4864-012		POWER SUPPLY SUB-ASSEMBLY		
	1	4936-875		CABLE FORM		35
	1	2715-123		1.5 MFD 100V CAPACITOR		40
	2	2656-542		39 Ω 25W RESISTOR		
	14	2811-204	TI2G	DIODE		
	1	2813-134		1N1200RA DIODE		45
	2	2216-333		10-32 X 2-3/4		
	2	2216-312		10-32 X 3/8		
	4	2251-257		8-32 X 1/2 -P.H.M.S.		50
	8	2251-203		6-32 X 1/4		
	32	2251-207		6-32 X 1/2		
	2	2244-154		6-32 X 5/16 FHMS		
	2	2151-109		.337 X .194 X .047		55
	2	2151-108		.296 X .164 X .040 - LOCK WASHER		
	32	2151-107		.253 X .141 X .031		
	1	2184-426		8-32 X 1/4 TAPPING SCR		
	1	2156-406		GRD WASH		
	30	2142-023		± 6 FW		60
	2	2233-226		10-32 X 3/8		
	2	2285-421		8-32 X 1 1/32 -HEX NUT		
	2	2285-370		6-32 X 1/4		65
	2	2141-071		.375 X .1718 X .031 FLAT WASHER		
	4	2458-021		FBR WASHER		
	4	2458-234	6011	MICA WASHER		
	4	2668-407	6000	CENTERING WASHER		70
	2	2458-167		.437 X .171 X .062 BAKELITE WASH		
	2	2458-012		SHOULDER WASH		
	1	2453-097		TERMINAL LUG		75
						80

TABLE A								
COL	A	B	C	D	E	F	G	H
EQUIPMENT		RATING	LIST	NO	CIRCUITS & FIGURES EQUIPPED			
					CIRCUIT	FIG	WRG	APP
EQUIPMENT, ASSEMBLY & WIRING FOR ONE SOLID STATE INTERRUPTER ARRANGED FOR FIVE FREQUENCY 1-RING TPS CXP-5 SYSTEM.					T-5873-115	1		

SHOP	INST	MANUFACTURING NOTES
		1. STAMP COMPONENT DESIGNATIONS FRONT & REAR IN 1/8" CHARACTERS AS SHOWN. 2. RESERVED 3. RESERVED 4. STAMP SPECIFICATION, PATENT & SERIAL NO. ON REAR AS SHOWN 5. PIGTAIL COMPONENTS TO BE CONNECTED IN ACCORDANCE WITH INTERRUPTER WIRING DIAGRAM.
		ENGINEERING NOTES 51. EQUIPMENT SHALL BE ORDERED IN ACCORDANCE WITH TABLE A. 52. DRAWING NO. AND PART NO. ARE IDENTICAL WHERE 7 DIGIT (0000-000) PART NUMBERS ARE SHOWN.
		ISSUE 1
J5873-115		DRAWN BY: G. BRENNAN DATE: 3-10-72 CHECKED BY: DATE: 4-6-72 APPROVED BY: DATE: 4-6-72 RATING: STANDARD J5873-115 5873-115 LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS (CANADA) LTD., ST. THOMAS, ONTARIO DWS SIZE: D 2 SHEETS SHEET: 1

30 X

SHEET INDEX

SHEET NO	CONTENTS
1.	SHEET INDEX CIRCUIT NOTES SUPPORTING INFORMATION OPTION INDEX INFORMATION NOTES
2	FIG 1 POWER SUPPLY FIG 2 TIMING CKT FIG 3 TIMING CKT FIG 4 LOGIC GATE FIG 5 GROUND PULSE GATES
3	FIG 6 GROUND PULSE GATES FIG 7 MERCURY RELAY GATES CAD 1

OPTION INDEX

APP OR WRG	LOCATION

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT ARRANGEMENT	J5873-115

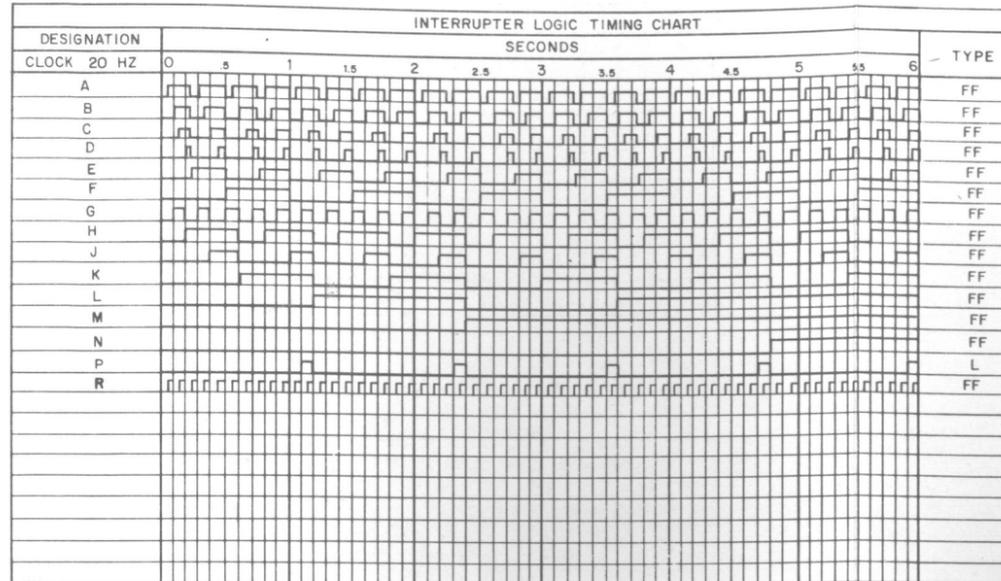
CIRCUIT NOTES

DESIG	FUSE AMP	POTENTIAL	ONE PER
A	2	-48V SIG	INT
A		GRD	INT
BATTERY SYMBOL		VOLTAGE RANGE	
-48V		44-56V	

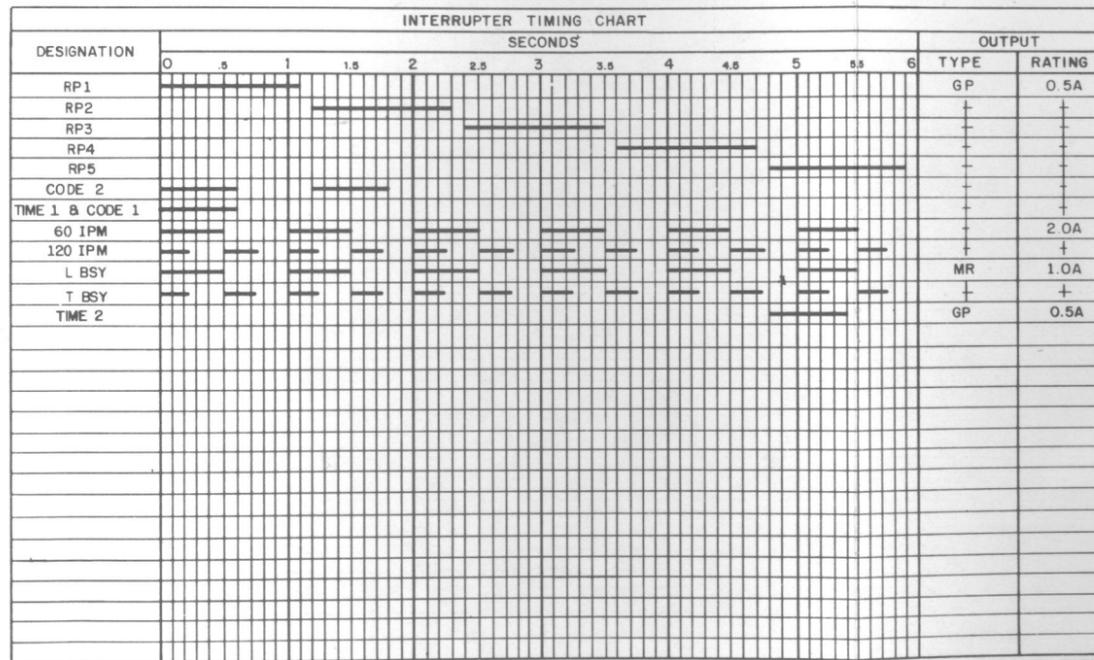
FEATURE OR OPTION	PROVIDE		
	FIG	APP OR WRG	QUANTITY
SOLID STATE INTERRUPTER FOR FIVE FREQUENCY 1-RING TPS CXP-5 SYSTEM			1 PER INT

NETWORK VALUES		
NETWORK NO	RESISTANCE IN OHMS	CAPACITANCE IN UF

RECORD OF FIGURES, WIRING AND APPARATUS CHANGES						
CHANGED ON ISS	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT		
				STD	A B M	MD SPL



FF = FLIP FLOP (PULSE DIVIDER)
L = LOGIC GATE



GP = GROUND PULSE GATE
MR = MERCURY RELAY GATE

CIRCUIT NOTES (CON'T)

- 105 UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS.
- 106 RESERVED
- 107 GROUND AND FUSED BATTERY IN NOTE 101 TO BE PROVIDED BY TEL CO.
- 108 WHEN INT IS FUSED ON RING P.BD, CONNECT -48V(A) LEAD TO TS PCHG 49 OTHERWISE, PROVIDE LEAD FROM -48V BAT (FUSED AT 2 AMP) & CONNECT TO TS PCHG -MB.

SD-5873-115	DRAWN BY G.L. DRENNAN	DATE 3-10-72
	CHECKED BY S.D. [Signature]	DATE 4-6-72
	APPROVED BY G.L. [Signature]	DATE 4-6-72
RATING STANDARD		
SD-5873-115		
5873-115		
LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS (CANADA) LTD., ST. THOMAS, ONTARIO		
WG SIZE D	3 SHEETS	SHEET 1
PRINTED IN U.S.A.		

ISSUE
1

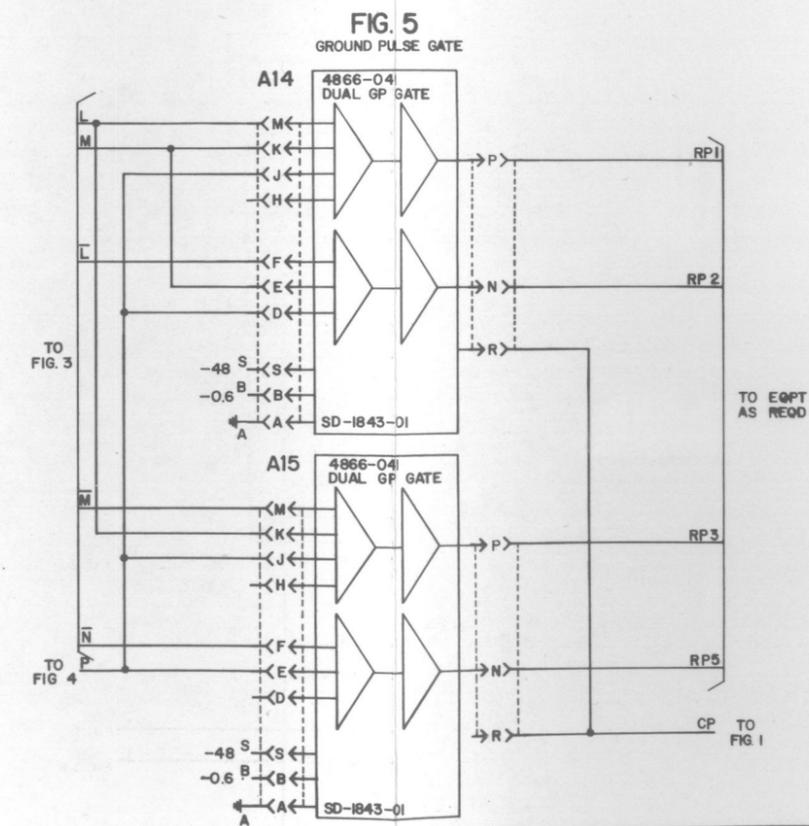
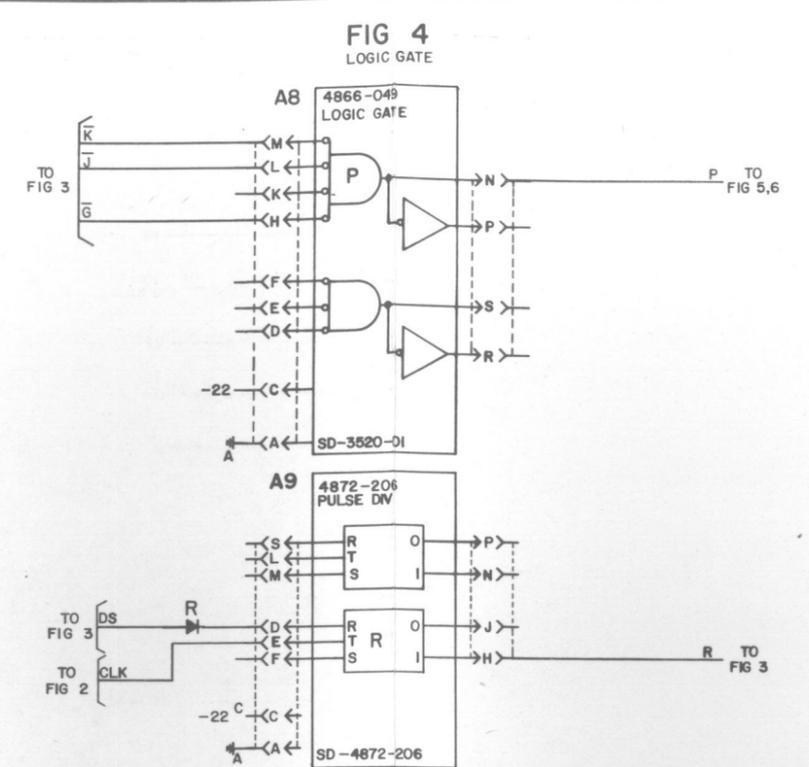
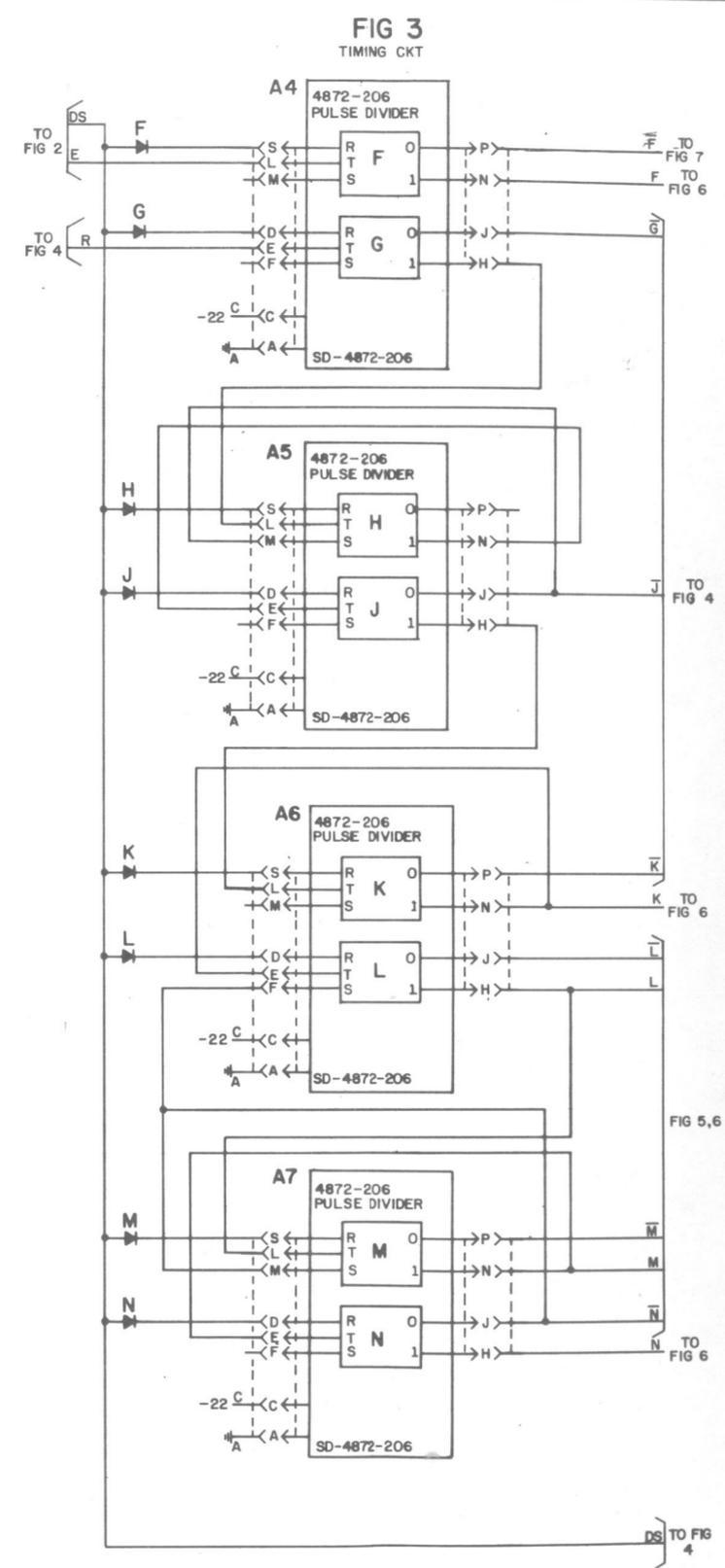
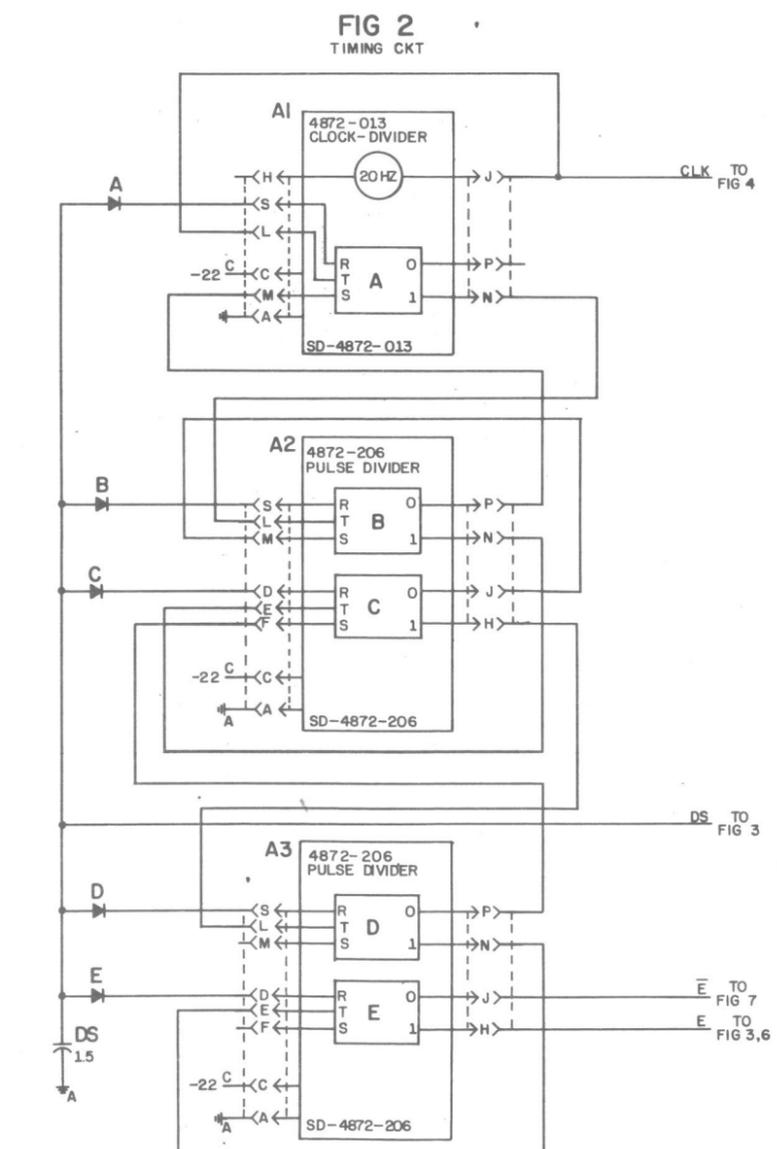
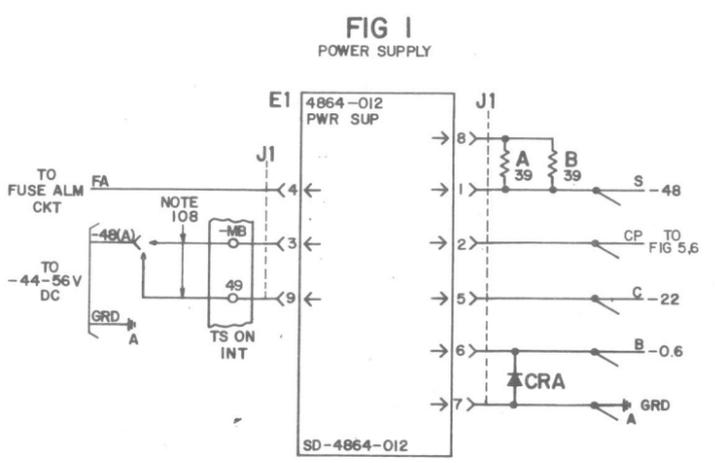


FIG 6
GROUND PULSE GATES

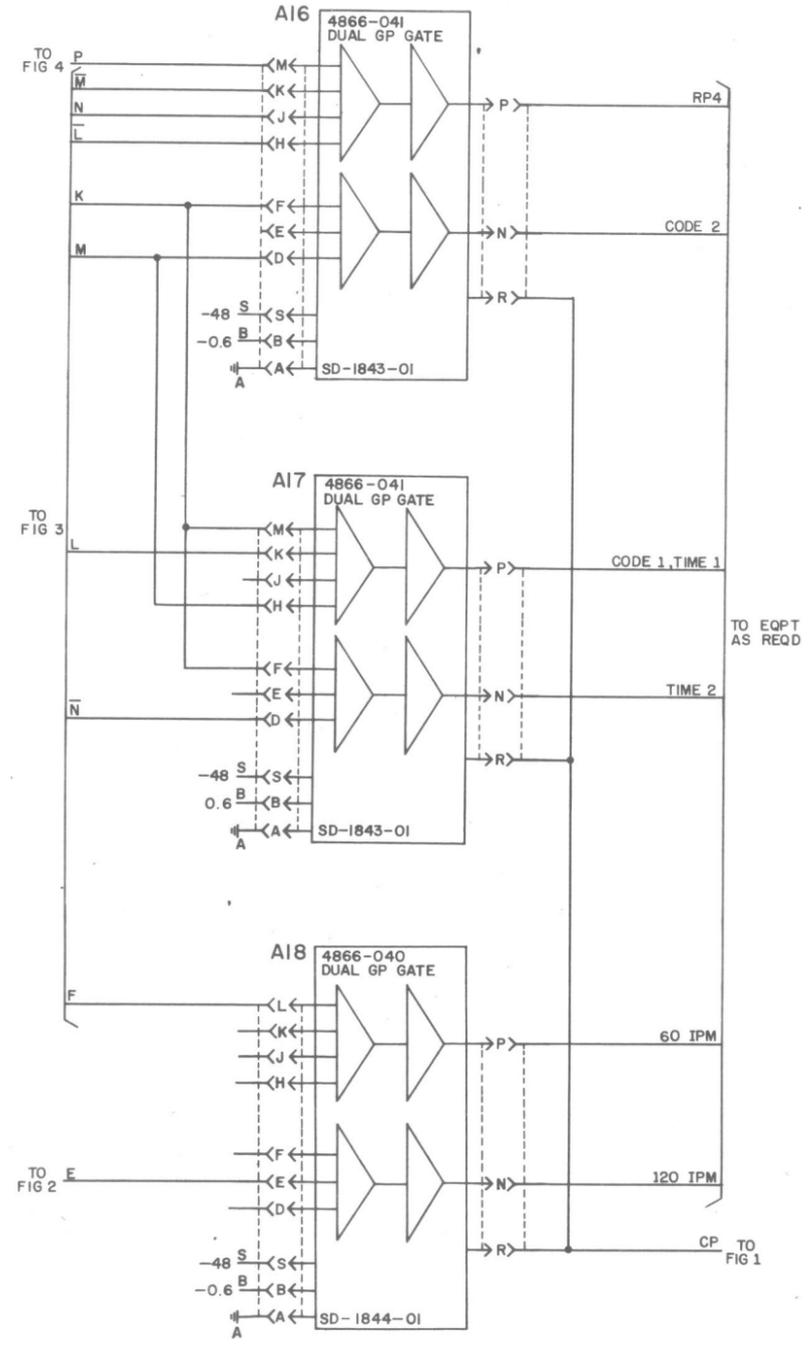
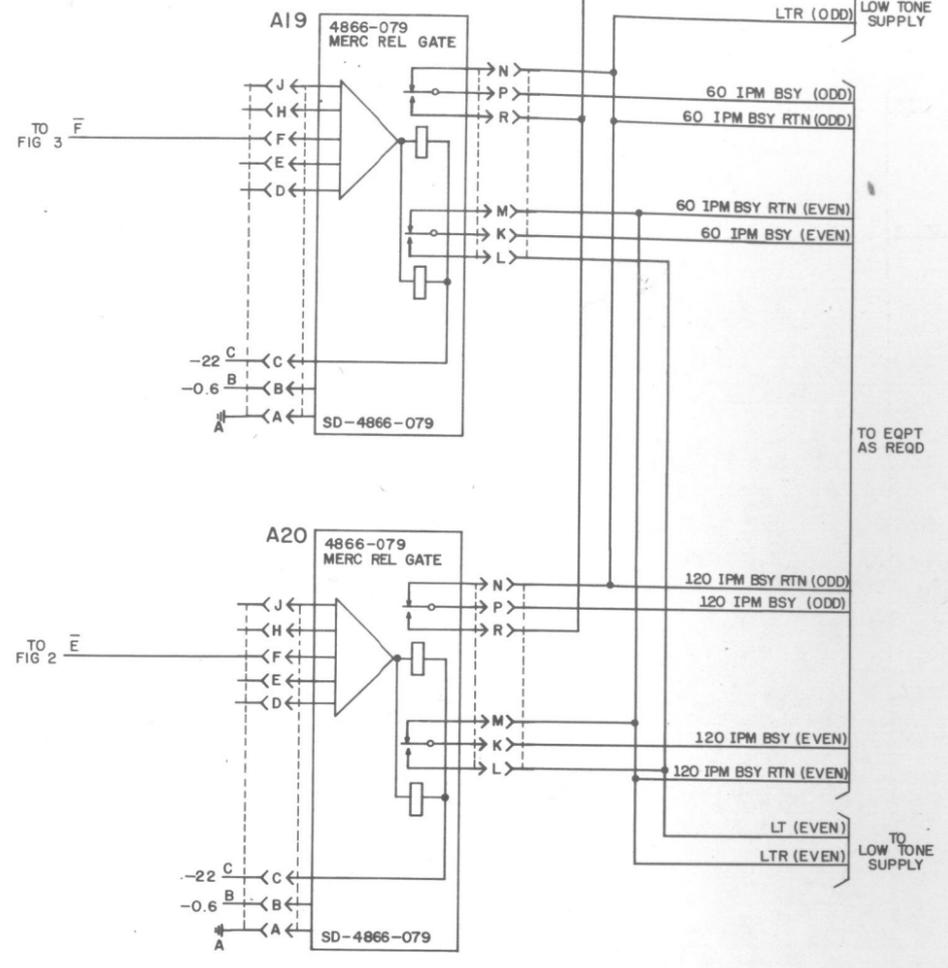


FIG 7
MERCURY RELAY GATES



CAD 1
FOR FIGS 1,5,6,7

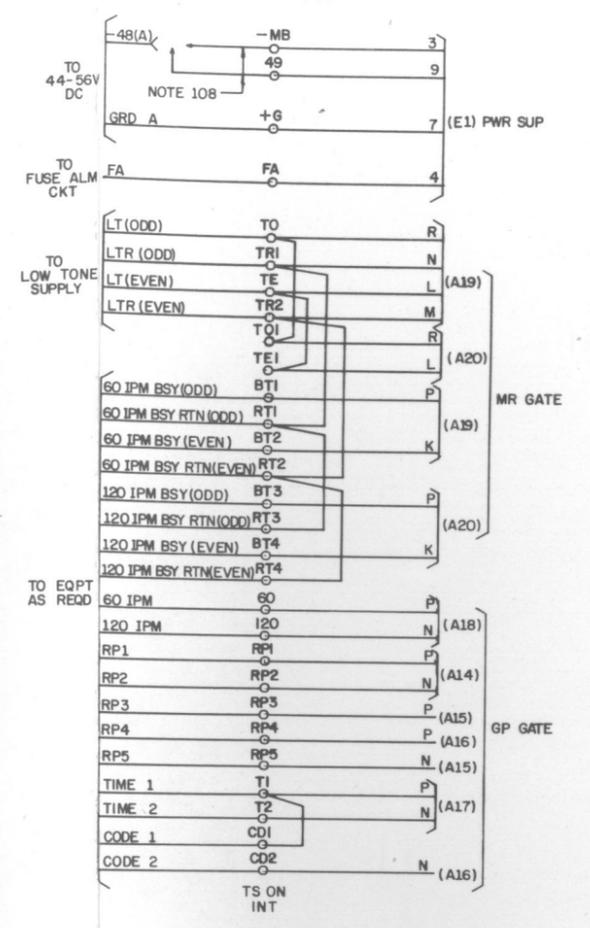


TABLE A						
SD-T DWG CROSS REFERENCE & FIGURE LOCATION TABLE						
ITEMS IN PARENTHESES ARE FOR INFORMATION ONLY AND ARE NOT TO BE RECORDED ON JOB WIRING LIST DRAWING						
LINE	SD-5873-115			T-5873-115		
	SHEET	FIG	OPT	FIG	WRG	APP SHEET
1	2	1		1		3
	2	2		1		3
	2	3		1		3
	2	4		1		3
5	2	5		1		2
	3	6		1		2
	3	7		1		2
	3	CAD1		81		3
10						
15						

TABLE B							
RECORD OF FIGURES, APPARATUS AND WIRING CHANGES							
CHANGED ON ISSUE	IF OFFICE RECORDS		THIS OPTION WAS FURNISHED	SEE ENG NOTE	RATING		
	SPECIFY	DO NOT SPECIFY			STD	A&M	MD

ENGINEERING NOTES										
51.	THIS DRAWING AGREES WITH	ISSUE	I							
	SD-5873-115	ISSUE	I							

52. EQUIPMENT ARRANGEMENT PER J5873-115
 53. WHEN INT IS FUSED ON RING P BD, INSTRUCT INSTALLER TO CONNECT -48 LEAD TO TS PCHG 49 OTHERWISE, PROVIDE LEAD FROM -48 BAT (FUSED AT 2 AMP) & CONNECT TO TS PCHG-MB.

MANUFACTURING NOTES	
X	1. COLOR CODED LEADS TO BE 24 GA EXCEPT AS NOTED. LEADS NOT COLOR CODED TO BE BARE 20 GA SOLID.
X	2. BI-TERMINAL NEAREST PANEL.
X	3. α - LEADS INSULATED WITH VARNISHED CAMBRIC SLEEVING.
X	4. RESERVED.
X	5. LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENTS.
X	6. D-WIRING NOT INCLUDED IN LOCAL CABLE FORM BUT RUN AS SEPARATE LEADS.
X	7. PTα - PIGTAIL LEADS INSULATED WITH VARNISHED CAMBRIC SLEEVING.
X	8. ALL LEADS IN FIG 81 TO BE RUN BY THE INSTALLER.

TABLE C						
FEATURE TABLE						
ITEM	FEATURE	SPECIFY T-5873-115			AUTOMATIC	REMARKS
		FIG	QUAN	WRG		
	SOLID STATE INTERRUPTER FOR FIVE FREQUENCY 1-RING TPS CXP-5 SYSTEM	1	1			1 PER INT

TABLE E			
FUSE REQUIREMENTS			
ITEM NO	FIG	FUSE	REMARKS
1	81	2 AMP NEG 48V SIG	1 PER INT
1	81	GRD ON 48V FUSE PNL	1 PER INT

TABLE F				
PIGTAIL COMPONENT INFORMATION				
DESIG	PT NO.	VALUE OR CODE NO	RATING	NEAREST LOC NO
CAPACITORS				
DS	2715-123	1.5	100V	310
DIODES				
A,B,C	2811-204	1N96		310, 309
D,E,F,G	2811-204	1N96		308, 307
H,J,K,L	2811-204	1N96		306, 305
M,N	2811-204	1N96		304
R	2811-204	1N96		302
RESISTORS				

INFORMATION NOTES

101. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS.

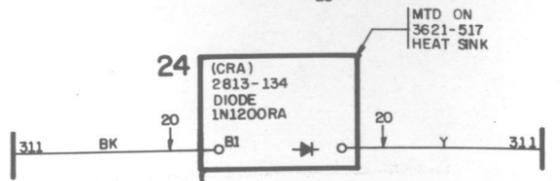
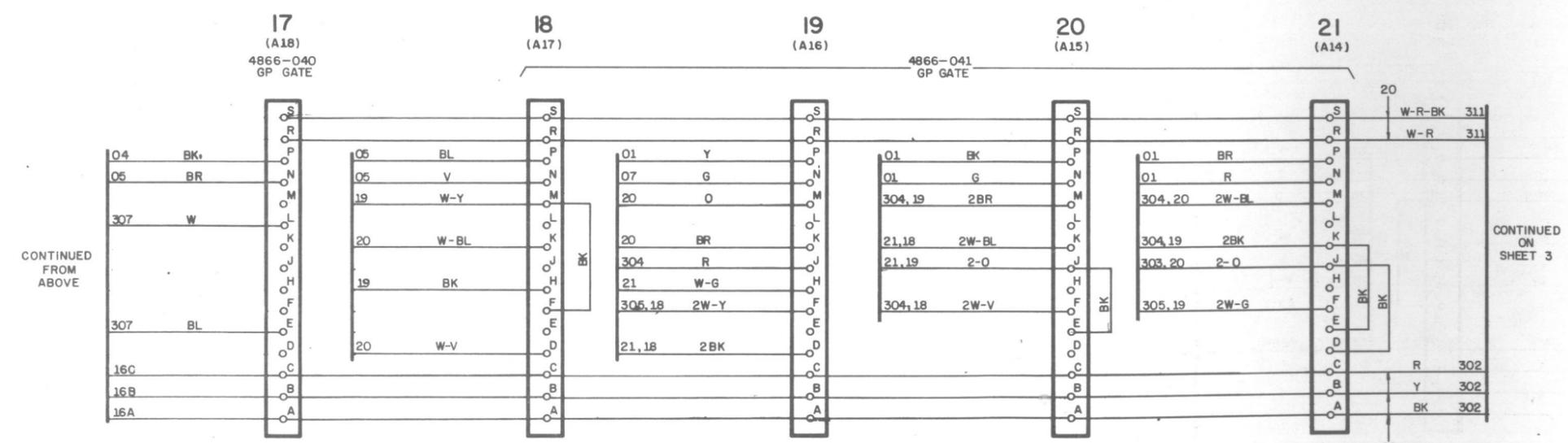
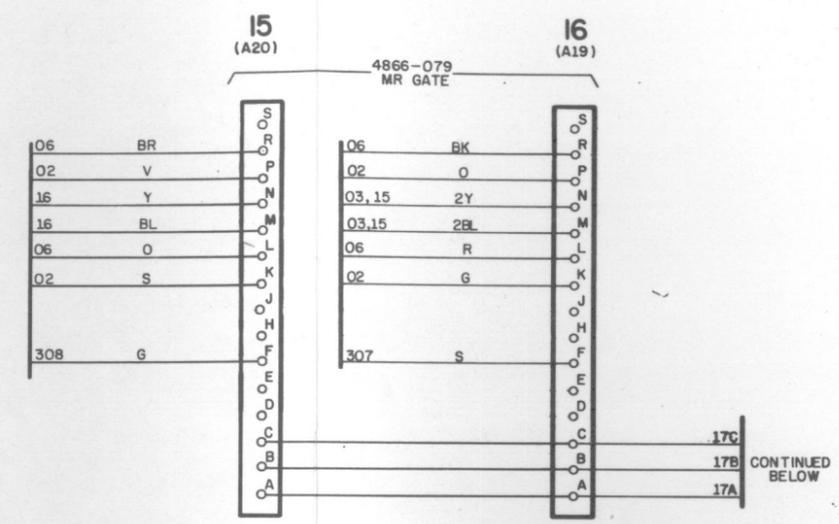
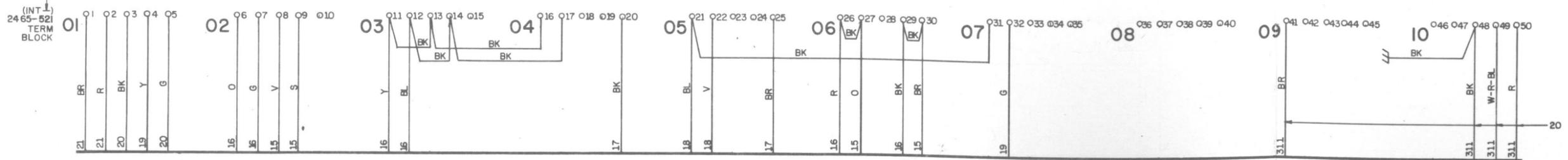
102. LEAD AND EQUIPMENT DESIGNATIONS FOLLOWED BY A DASH (-) INDICATE CKT AND EQUIPMENT NUMBERING: 1 FOR 1ST (FIGURE, CKT OR EQPT), 2 FOR 2ND, ETC.

103. GROUND AND FUSED BATTERY LEADS IN TABLE E TO BE PROVIDED BY TEL. CO.

T-5873-115		POWER SYSTEMS		DATE 3-10-72	
SOLID STATE INTERRUPTER CIRCUIT		DRAWN BY G.L. DRENNAN		DATE 4-6-72	
FOR FIVE FREQUENCY 1-RING TPS CXP-5 SYSTEM		APPROVED BY D.J. Law		DATE 4-6-72	
5873-115		STANDARD		T-5873-115	
LORAIN PRODUCTS CORPORATION LORAIN, OHIO		D		3 SHEETS	
LORAIN PRODUCTS (CANADA) LTD., ST. THOMAS, ONTARIO		1		1	

FIG 1
INTERRUPTER CKT

1 FOR 1ST
2 FOR 2ND
FIG 1



CONTINUED
FROM
ABOVE

CONTINUED
ON
SHEET 3

CONTINUED
BELOW

INTERRUPTER CIRCUIT		T-5873-115	
5873-115		3 SHEETS	
LORAIN PRODUCTS CORPORATION	DWG SIZE D	PRINTED IN USA	SHEET 2

ISSUE
1

FIG 1 (CON'T)

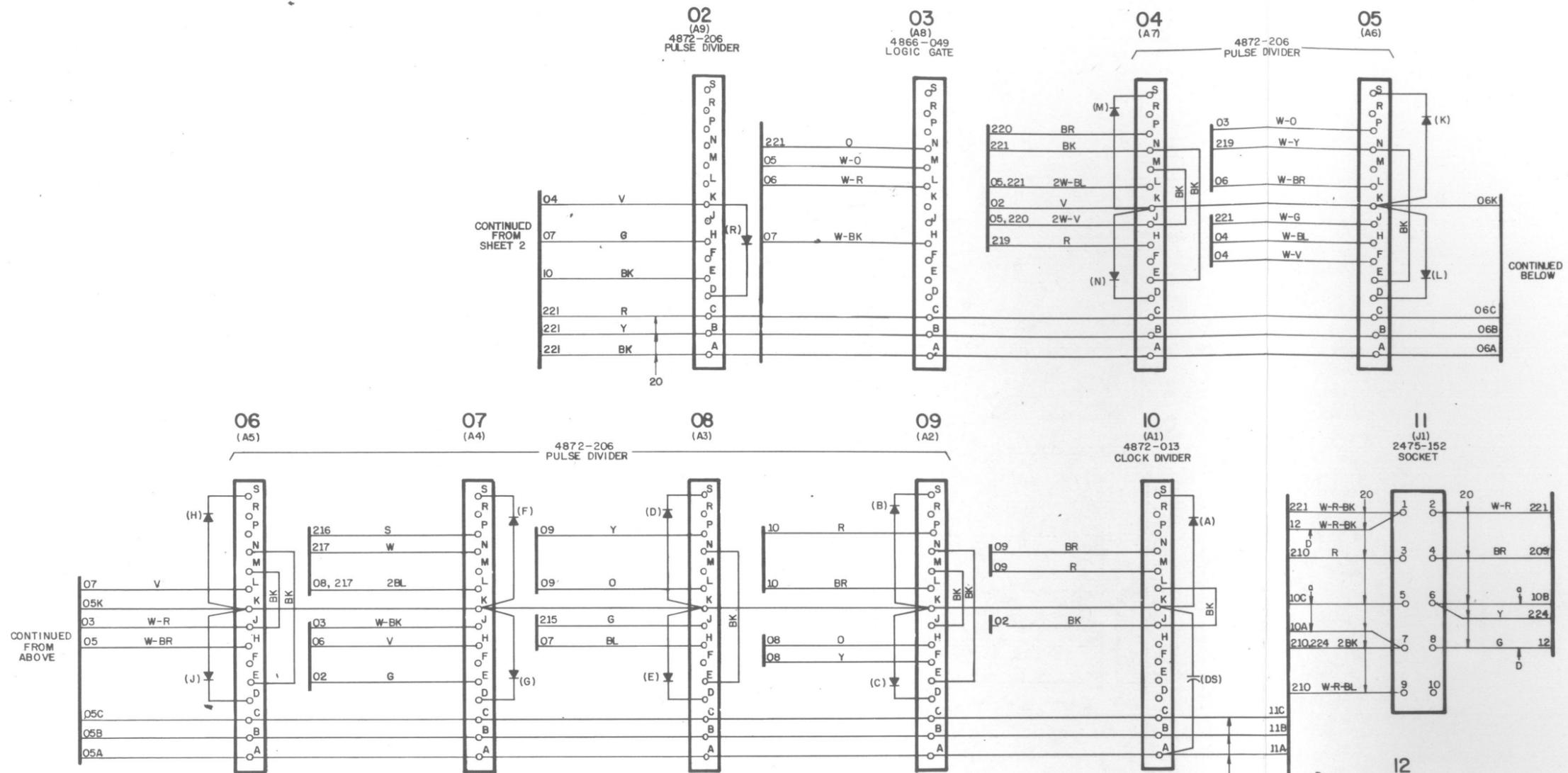


FIG 81 INSTALLERS WIRING

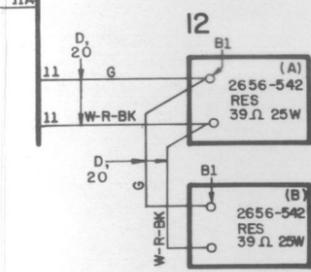
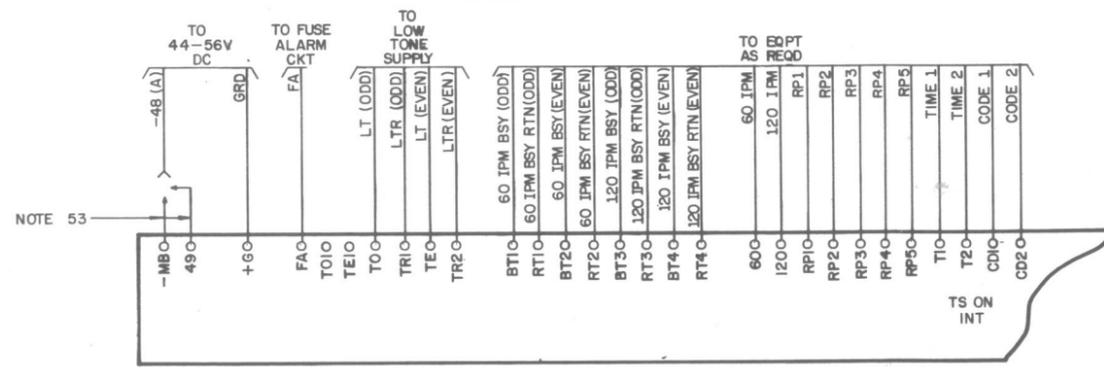
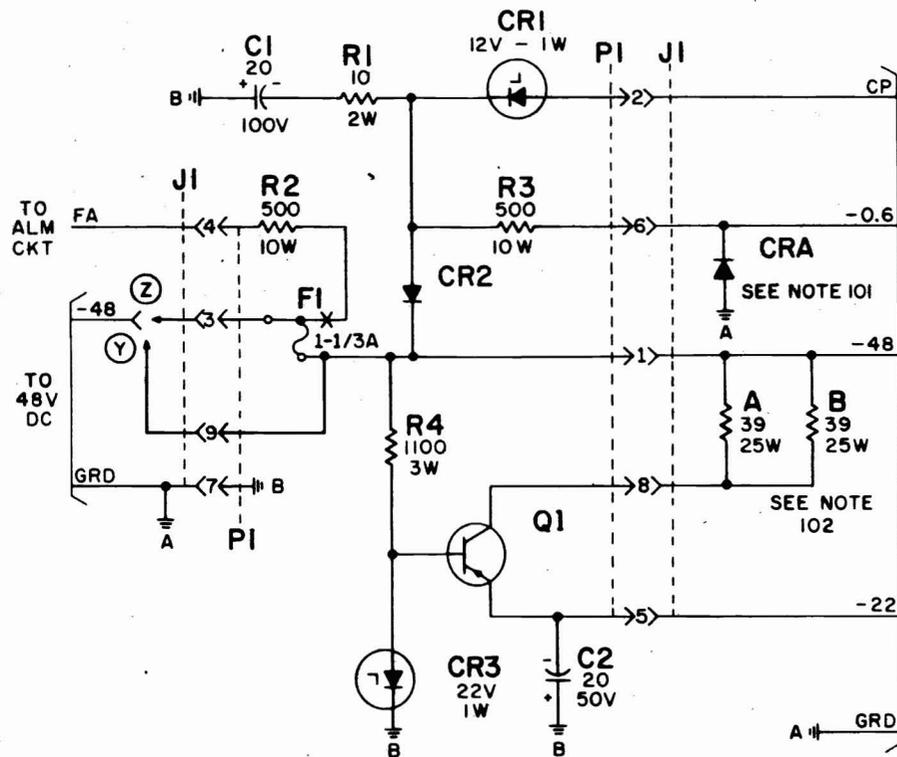


FIG 1
POWER SUPPLY



CIRCUIT NOTES

101. DIODE (CRA) IS NOT FURNISHED AS PART OF THIS ASSEMBLY AND SHALL BE MOUNTED EXTERNALLY ON 3621-517 (OR EQUAL) HEAT SINK.
102. RESISTORS (A) & (B) ARE NOT FURNISHED AS PART OF THIS ASSEMBLY AND SHALL BE MOUNTED EXTERNALLY.
103. (CP) LEAD PROVIDES "CONTACT PROTECTION" TO ABSORB INDUCTIVE TRANSIENTS FROM RELAYS CONNECTED TO GROUND PULSE GATES.

104. PROVIDE "Y" OPTION WHEN INTERRUPTER IS FURNISHED AS PART OF A LORAIN RINGING PLANT, OTHERWISE, PROVIDE "Z" OPTION.
105. CONNECTOR (J1) IS NOT FURNISHED AS PART OF THIS ASSEMBLY AND IS SHOWN FOR REFERENCE ONLY.

NOTICE
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1. THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED.
2. THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSES FOR WHICH IT WAS DESIGNED.

TO INTERRUPTER CKTS

DWG. NO.	REV.	DATE	DRAWN BY	APP. BY
1				
R2 WAS 500 Ω 5W.				
CN 1833733 M/29/74				
2	B.R.Z.	2-13-74	G.P. Powell	2-13-74
DRAWN BY: <i>H. Dorman</i> DATE: 11-9-66				
CHECKED BY: <i>D. J. Law</i> DATE: 2-9-67				
APPROVED BY: <i>R. Powell</i> DATE: 3-8-67				
APPROVED BY: <i>B. Williams</i> DATE: 3-8-67				
TYPE NA INTERRUPTER POWER SUPPLY				
4864-012				
LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS CANADA, LTD ST THOMAS, ONTARIO				
DWG. SIZE		B		
PRINTED IN USA		SD-4864-012		

