

INTERTRON INDUSTRIES, INC.

SINGLE PHASE RESISTANCE WELDER MICROPROCESSOR CONTROLLER MODEL 105 OPERATING MANUAL

REFERENCE MANUAL

REV. D October 15, 1993

www.intertron-ind.com

INTRODUCTION

Intertron Industries Incorporated Resistance Welding Controller Model 105 is a Microprocessor Welding Control . The sophistication of today's electronics is used to simplify the welder's operating procedures and logistic of operations. The computer powers are used to greatly enhance the flexibility of programming and storing welding programs. In the following pages we will attempt to give the user a working knowledge of the control system and its parameters.

CAUTION: Please read the installation instructions carefully prior to installation.

INTERTRON INDUSTRIES INCORPORATED WARRANTY

The Single Phase Resistance Welder Controller Model 105 has a limited warranty of one year parts and labor, FOB, Santa Ana, California, from the date of purchase. During that period, upon prepaid return to the distributor or the factory, equipment proving to be defective will be repaired (or at our option, replaced) without charge for either material or labor. No responsibility will be assumed for damage to equipment through improper installation, or through attempts to operate it above its rated capacity, intentional or otherwise.

The SCR's used in the ignitron firing module or SCR contactors are warranted for 90 days, if correct installation procedures are used.

***WARRANTY EXTENSION, as of May 01, 2001 the limited warranty of one year parts and labor has been extended to THREE years. Any items purchased prior to May 01, 2001 retains the limited warranty of one year parts and labor. In addition, the warranty for the SCR's used in the ignitron firing module or SCR contactors has been extended from 90 days to ONE year, if correct installation procedures are used.**

In addition, the warranty does not cover any customer equipment to which the Model 105 is installed.

FRONT PANEL PROGRAM SETTINGS

| | |
|------------------------|--------------|
| Weld schedule #1-#2-#3 | |
| SQUEEZE DELAY TIME | 00-99 CYCLES |
| SQUEEZE TIME | 00-99 CYCLES |
| IMPULSES | 00-99 |
| COOL TIME | 00-99 CYCLES |
| HEAT TIME | 00-99 CYCLES |
| HEAT% | 00-99 |
| QUENCH TIME | 00-99 CYCLES |
| TEMPER TIME | 00-99 CYCLES |
| TEMPER% | 00-99 |
| HOLD TIME | 01-99 CYCLES |
| OFF TIME | 00-99 CYCLES |
| UPSLOPE STEPS | 00-99 |
| %HEAT PER STEP | 0.0-9.9 |

REPEAT: Repetitive sequence

WELD: Activates contactor during weld sequence

SEAM: Cool-heat sequence

ROLL SPOT: Roll Spot with clutch/brake on/off control

FRONT PANEL PROGRAM SETTINGS

OPTIONAL FEATURES

SIX WELD SCHEDULE (1-2-3/A 1-2-3 B):

The A/B switch when used replaces repeat or Seam/Roll function remote switching of the A/B selection which is available at terminals TB3-11 and TB3-12. When used, set front panel A/B switch to A. To select weld schedule 1-2-3 B, short TB3-11 and TB3-12 to each other by an external switch.

ADJUSTABLE POWER FACTOR:

The SW6-1 switch is to be set to the "off" position when the adjustable power factor is not in use. To enable the end set variable power factor adjustment, turn switch to **on** and turn clockwise potentiometer R27 to increase maximum heat at 99%. This procedure is not necessary on most welding machines.

PC100 MPU RESET:

The SW6-2 switch is to be set to the "on" setting only when the Model 105 Brain Panel is connected to a PC 100 controller. Failure to keep the switch in the "off" position in normal use, will prevent the 105 controller to function.

MODES OF OPERATION

- 1.) SPOT
- 2.) SEAM
- 3.) ROLL SPOT
- 4.) CASCADE
- 5.) BUTTWELD

SWITCHABLE FEATURES

- 1.) BUTTWELD MODE
- 2.) INTERLOCK SCANNER CONTROL
- 3.) WELD SCHEDULE SELECTION BY FOOT SWITCH

PROGRAMMING

- ◆Set the toggle switch to Weld Schedule 1. The Weld Schedule indicating lamp 1 shall be on. The two digit display window shall be dark. The OFF TIME lamp shall be on. This is a typical STAND BY mode condition.
- ◆The position of the toggle switches REPEAT, WELD, and SEAM/ROLL do not matter for the purposes of setting up a Weld Schedule.
- ◆The keyboard has 10 digits (0-9) plus a * key and a RED key.
- ◆The * key returns the program to the STAND BY mode. The RED key steps the sequence from SQUEEZE DELAY TIME through %HEAT PER STEP and back to the STAND BY mode.
- ◆By pushing the RED key the first time, the sequencer will exit to SQUEEZE DELAY TIME. It should be noted that the OFF TIME lamp is now off and the SQUEEZE DELAY TIME lamp is on. Also, the two digit display is now showing a two digit value. If it is not showing a two digit value, one must be entered at this time.
- ◆SQUEEZE DELAY TIME occurs only once in a repeat cycle in the first sequence, it will not repeat again for the duration of the foot switch closure. It is recommended that if REPEAT is not used, set SQUEEZE DELAY TIME to zero.
- ◆SQUEEZE DELAY TIME in BUTTWELD MODE is used to delay the initiation of the UPSET valve upon initiation of the second foot switch, thus causing a delay time between the clamp and the upset valve.

- ◆IMPULSES must be set to minimum of one. It is a multiplier for COOL TIME + HEAT TIME.
- ◆COOL TIME is used when more than one impulse is required, allowing the weld nugget to cool before it is reheated again.
- ◆HEAT TIME is the length of time the heat is being applied. HEAT% is the amount of heat applied.
- ◆Both HEAT TIME and HEAT% can be accessed by directly by pushing the RED and GREEN keys located adjacent to these functions. After editing these functions, push the * key to exit back to STAND BY mode.
- ◆QUENCH TIME allows the weld nugget to cool.
- ◆TEMPER TIME and TEMPER % function in the same way as the HEAT TIME and HEAT%. They are used to anneal the weld so that cracking may be prevented.
- ◆HOLD TIME is programmable from 1-99 cycles.
- ◆The minimum of one cycle per **hold time** is for safety reasons. It takes at least that amount of time to cool a weld nugget under pressure even on very thin materials.
- ◆In REPEAT MODE, **off time** is programmable to a value other than zero. This allows the electrodes to separate. The operator can position the material for the next weld while the foot switch is held closed.
- ◆UPSLOPE STEPS must be set to zero when slope is not being used.
- ◆HEAT % PER STEP is to be set to zero when slope is not used.

UPSLOPE PROGRAMMING AND OPERATION

- ◆ Upslope is defined as a stair step ladder, where HEAT% is incremented from an initial value, in small increments and over a specified period of time. (See figure 1)
- ◆ A unit of time (selected from 1-99), is composed of two alternating cycles of electrical current, one positive and one negative.
- ◆ A program of 01 HEAT TIME at a heat magnitude of 50% will cause the welder controller to pass to the welding transformer one positive and one negative half cycle of electrical current, both with a magnitude of 50%. (See figure 2)
- ◆ The welder controller can be programmed to increase an initial value of HEAT% (value set in the first impulse and in the first cycle of HEAT TIME). The heat will be incremented in one cycle per step for the total amount of steps programmed in UPSLOPE STEPS.
- ◆ The HEAT% per step can be set in fractions of a % from 0.0 to 9.9.
- ◆ The total number of steps shall always be equal to or less than the total number of heat cycles in HEAT TIME.

UPSLOPE PROGRAMMING AND OPERATION

The upslope feature cannot be used with TEMPER TIME. The illustration in Figure 3 shows a weld schedule using of upslope and the relationship between units of HEAT TIME, IMPULSES, STEPS UPSLOPE HEAT INCREASE, and ALTERNATE POSITIVE/NEGATIVE HALF CYCLES of ELECTRICAL CURRENT. Figure 3 will be used to show how the slope is calculated from basic requirements in easy steps:

- 1.) 3 impulse: 3 cycles of heat time per impulse
2 cycles of cool time per impulse
- 2.) Slope shall start at 20% heat, increase in 6 cycles of heat time to 50% and continue at a consistent 50% for the remaining 3 cycles of heat time in the third impulse.
- 3.) Set up: Set IMPULSE counter to 03
Set COOL TIME counter to 02
Set HEAT TIME counter to 03
Set HEAT % counter to 20
- 4.) Calculate and set UPSLOPE STEPS counter $\text{UPSLOPE STEPS} = \text{HEAT TIME}$ in cycles, 6 cycles of UPSLOPE = 6 UPSLOPE STEPS.

UPSLOPE PROGRAMMING AND OPERATION

Set UPSLOPE STEPS counter to 06.

- 5.) Calculate and set HEAT% per step counter.

$$\frac{\text{Ending HEAT\%} - (\text{Starting HEAT\%})}{\text{UPSLOPE}} = \frac{\text{HEAT\% PER STEP}}{1}$$

$$\frac{(50\%) - (20\%)}{6 \text{ steps}} = \frac{5.0\% \text{ PER STEP}}{1}$$

Set HEAT% per step to 5.0

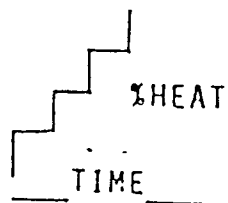


FIG. 1

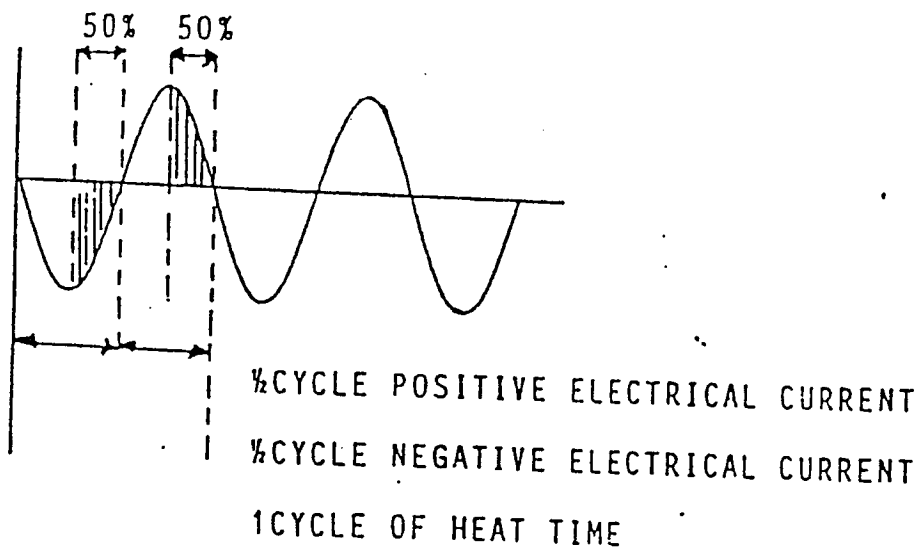


FIG. 2

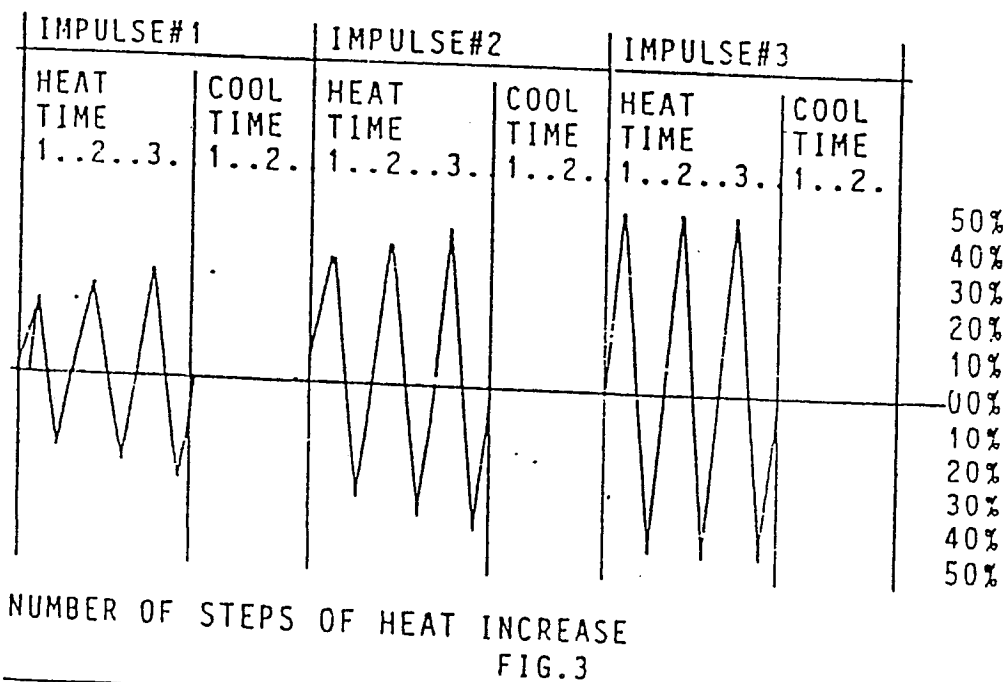


FIG. 3

SEAM/ROLL SPOT

◆In the SEAM mode, the sequencer will step through SQUEEZE to the first impulse and do a COOL TIME/HEAT TIME sequence continuously until the foot switch is released, then step to HOLD TIME and OFF TIME.

◆A motor clutch/brake on/off control output provides 110 VAC to energize the motor with the second stage of the foot switch.

In ROLL SPOT mode, the output will energize the motor during Off TIME when the foot switch is depressed.

CASCADE OPERATION

In the CASCADE mode, the controller will energize the following valves in a sequential manner.

- 1.) ♦ The CLAMP VALVE will be energized up on the first stage foot switch closure FS1 and released when the foot switch is released.
♦ If FS1 is not released and the 2nd stage foot switch is closed momentarily, the clamp valve will latch on and remain energized throughout the full sequence of the weld schedule 1,2 and 3. The clamp will be released at the end of weld schedule 3.
- 2.) At the beginning of the squeeze time of weld schedule 1, an output called SQ1 will energize a valve to operate Gun#1. This valve will remain energized until the end of the HOLD TIME of weld schedule 1. An additional output called FM1 is available to energize a welding transformer only from that weld schedule.
- 3.) ♦ At the end of weld schedule 1, weld schedule 2 will begin. An output called SQ2 will energize a valve to operate Gun#2.
♦ This valve will remain energized until the HOLD TIME of weld schedule 2. An additional output called FM2 is available to energize a second weld

CASCADE OPERATION

- schedule, but only from weld schedule 2.
- 4.) At the end of weld schedule 2, weld schedule 3 will begin. An output called SQ3 will energize a valve to operate Gun#3. This valve will remain energized until the HOLD TIME of weld schedule 3. An additional output called FM3 is available to energize a third welding transformer, but only from weld schedule 3.
- 5.) The Cascade foot switch trigger output is turned on during the OFF TIME of weld schedule 3. It is used to trigger another Model 105 controller in order to obtain a cascade of 6 guns and or 6 transformers. This output must be set to a minimum of 3 cycles of OFF TIME on weld schedule 3. This output (See DWG. 1050-101-34) can also be used in normal Spot or Roll Spot to trigger a weld counter to count the number of parts welded on a job. In Spot or Roll Spot, it will trigger during the OFF TIME of all 3 weld schedules every time the foot switch is being released.

BUTTWELD MODE

This mode is set up by turning on the minidip switch SW5-4. The first stage foot switch turns the clamp output on or off. The second stage foot switch turns on the upset output delayed by the number of cycles of time set in SQUEEZE DELAY TIME. The sequence starts and both the clamp and the upset valve are turned off at the end of **HOLD TIME**.

A retraction relay output is also available to operate a retraction valve for Spot, Seam and Roll Spot.

◆ A TIP DRESS relay output is also available to provide reduced air pressure for tip dressing in Spot and also energized motor in Seam or Roll Spot at the same time. A terminal strip is available to connect switches to energize all valves independently during set up.

◆ All outputs except for SQ1 are factory installed options. It is suggested that the controller brain panel and peripheral board be returned to the factory for upgrading, when that becomes a requirement.

INTERLOCK

The controller will interface directly with the 10 station Interlock Scanner Model 375. When enabled, it will wait at the end of squeeze time for an enable signal from the scanner to let the next controller in line to start welding.

WELD SCHEDULE SELECTION BY FOOT SWITCH

- ◆ Typically, weld schedule selection is done by a 3 position toggle switch located on the bezel of the brain panel. Once the brain panel has been programmed, the switch must be set on WELD SCHEDULE 2 for the proper operation.
- ◆ The Foot switches for WELD SCHEDULE 1, 2 and 3 will now control which weld schedule has been selected.

INSTALLATION INSTRUCTIONS

◆ Use DWG. 155-017-01; 155-018-01; 155-019-01 as a reference. The power transformer T1 has 5 taps on the primary side. A metallic sticker on the transformer shows the tap arrangement and physical location. Taps to set are 200V-220V-440V-480V.

◆ The transformer 110V secondary output has a total capacity of 150V to be used with the designated loads as specified for the Model 105. All valves have typically a 110V/20VA solenoid coil. If the 110V source is to be used to operate an external load switched on/off by a mechanical switch, a 0.1 MF/600VAC capacitor must be used across the switch. If this is not done, electrical noise generated by the switch will interfere with the controller operation.

CHART OF SOLENOID VALVE INTERCONNECT

| | | |
|------------|-------|----------------------|
| 1.) SV com | TB2-8 | Common to all valves |
| 2.) SV1 | TB2-1 | Tip Dress Valve |
| 3.) SV2 | TB2-2 | Retraction Valve |
| 4.) SV3 | TB2-3 | SQ1 |
| 5.) SV4 | TB2-4 | SQ2 |
| 6.) SV5 | TB2-5 | SQ3 |
| 7.) SV6 | TB2-6 | Motor/Clutch Relay |
| 8.) SV7 | TB2-7 | Clamp Valve |

Note: The switches will be switching 5VDC/20MA

| CHART OF SOLENOID VALVE MANUAL TRIGGER SWITCHES | |
|---|--------|
| 1.) SW com. (Gnd.) | TB1-23 |
| 2.) SW Retraction valve | TB1-24 |
| 3.) SW Tip Dress Valve | TB1-25 |
| | |
| 1.) SW com. (Gnd.) | TB3-1 |
| 2.) SW SQ3 Valve | TB3-2 |
| 3.) SW SQ2 Valve | TB3-3 |
| 4.) SW SQ1 Valve | TB3-4 |

To energize one welding transformer, one firing module is connected to TB1-18 and 19. (Observe Polarity) To energize 3 transformers in the CASCADE mode, 3 firing modules are connected TB3-5; 6; 7; 8; 9; and 10.

PRESSURE SWITCH CONNECTION

Terminal strip TB1-10 and TB1-11 are to be connected to the (a) N.O. pressure switch. After the closure of the first stage foot switch FS1, the controller will lock in the squeeze valve until the pressure switch is closed. Then it will allow the sequence to start if FS2 is also closed. If pressure switch closure does not occur, this condition will not occur, this condition will prevail indefinitely, unless the emergency stop switch (TB1-6/TB1-7) is momentarily opened.

A normally closed temperature switch is connected across TB1-11 and TB1-12. This switch is connected in series with the pressure switch described above.

PERIPHERAL DIAGNOSTICS

On the brain panel there is a row of red lamps L.E.D. in a rectangular package called LM1. When either one is lit, it has the following indication:

- 1.) PS/TS Pressure switch and thermal switch are closed.
- 2.) FS1 Foot switch first stage switch is closed.
- 3.) FS2 Foot switch second stage switch is closed.
- 4.) Clamp SOL. Computer is turning on the clamp relay.
- 5.) SQ1 SOL. Computer is turning on the squeeze 1 relay.
- 6.) SQ2 SOL. Computer is turning on the squeeze 2 relay.
- 7.) SQ3 SOL. Computer is turning on the squeeze 3 relay.
- 8.) MOTOR Computer is turning on the motor relay.
- 9.) SCAN OUT Computer is turning on the INTERLOCK output.
- 10.) OFF OUT Computer is turning on the OFF TIME output.
- 11.) LED 17 Computer is receiving signal from Interlock scanner to start welding.
- 12.) LED 18 Computer is generating pulses to energize the firing module.

OPERATING MODE SETTING

On the brain panel is a 4 minidip switch module labeled S5 for setting the operating mode.

| <u>S5-1</u> | | <u>S5-2</u> | | <u>Operating Mode</u> |
|-------------|---|-------------|---|-----------------------|
| OFF | : | OFF | : | SPOT WELD |
| OFF | : | ON | : | SEAM/ROLL SPOT |
| ON | : | OFF | : | CASCADE |

S5-3 ON Enables Interlock

S5-4 ON Enables BUTTWELD MODE

87 DEGREE FIRING LIMIT is active only for the first heat cycle after SQUEEZE TIME.

UNDER VOLTAGE LINE MONITOR

Comparator Q1 will automatically halt the controller, if the line voltage dips below a safe operating limit. Typically there is a 20% line voltage drop margin with no effect on the power line monitor.

POWER UP PROTECTION

The controller's computer monitors the foot switch condition on power up, and if it finds it to be closed, it will inhibit operation. It will also flag the operator by inserting the number 88 in the display window. Simply release the foot switch and proceed welding.

MODEL 105 CONTROLLER
APPLICATION HINTS AND SPECIAL
APPLICATION DRAWINGS

MODEL 105 WELD CONTROL SET UP SHEET

WELD #1, #2, #3 SELECTED BY FOOT SWITCH #1, #2, #3

USE TOGGLE SWITCH FOR SET UP #1, #2, #3 (PROGRAMS PER SWITCH SELECTION)

JOB # _____

DATE: _____

| FUNCTION | SCHEDULE #1 | SCHEDULE #2 | SCHEDULE #3 |
|----------------------------|-------------|-------------|-------------|
| SQUEEZE DELAY | _____ | _____ | _____ |
| SQUEEZE TIME | _____ | _____ | _____ |
| IMPULSE | _____ | _____ | _____ |
| COOL TIME | _____ | _____ | _____ |
| HEAT TIME | _____ | _____ | _____ |
| HEAT % | _____ | _____ | _____ |
| QUENCH TIME | _____ | _____ | _____ |
| TEMPER TIME | _____ | _____ | _____ |
| TEMPER % | _____ | _____ | _____ |
| HOLD TIME | _____ | _____ | _____ |
| OFF TIME | _____ | _____ | _____ |
| UP SLOPE STEPS | _____ | _____ | _____ |
| % HEAT/STEP | _____ | _____ | _____ |
| MATERIAL 1 TYPE | _____ | _____ | _____ |
| THICKNESS | _____ | _____ | _____ |
| MATERIAL 2 TYPE | _____ | _____ | _____ |
| THICKNESS | _____ | _____ | _____ |
| UPPER TIP/WHEEL MAT & SIZE | _____ | | |
| LOWER TIP/WHEEL MAT & SIZE | _____ | | |
| SEAM/ROLL MOTOR SPEED | _____ | | |

- ☐ * BUTTON RESETS CONTROL TO STANDBY (USE AFTER ANY ENTRY)
- RED BUTTON STEPS THROUGH SEQUENCE (L.R. OF KEYPAD)
- GREEN BUTTON EDIT HEAT TIME PUSH * TO RESET (WINDOW DARK, OFF LITE ON)
- RED BUTTON EDIT % HEAT PUSH * TO RESET (L. CENTER)

NOTE: RESET SELECTOR TOGGLE SWITCH TO POSITION #2, FOR 3 FOOT SWITCH SEL.
 (SET TOGGLE SWITCH TO POS. #1 TO LOCK ALL FOOT SWITCHES TO SCHEDULE #1)
 (SET '00' IN ANY FUNCTION NOT REQUIRED)



INTERLOCK INDUSTRIES, INC.
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UPSLOPE CALCULATIONS & SETTINGS FOR MODEL 105 WELDING CONTROL

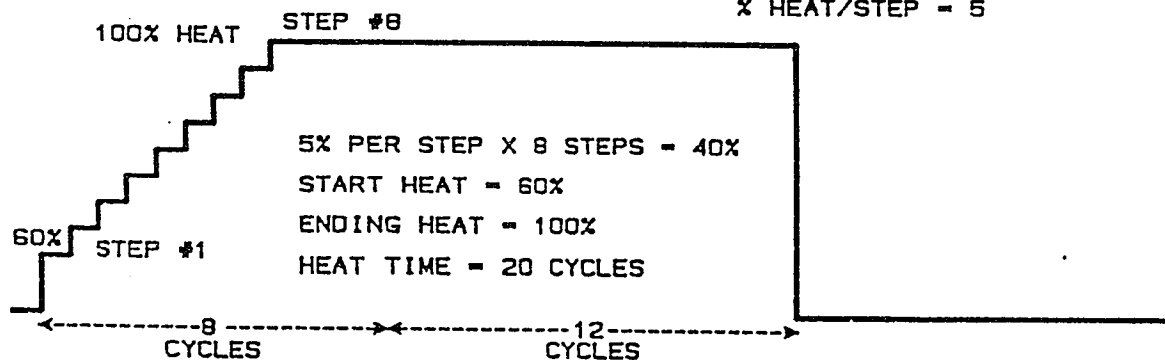
UPSLOPE CONTROLS THE RATE OF HEAT APPLIED TO THE WELDING ELECTRODES. THIS GRADUAL INCREASING CURRENT EXTENDS THE LIFE OF THE ELECTRODES AND REDUCES EXPULSION AND SPLATTER. UPSLOPE IS RECOMMENDED FOR PROJECTION WELDING AND WHEN WELDING COATED MATERIALS.

FORMULA: $\frac{(\text{ENDING HEAT \%} - \text{STARTING HEAT})}{\text{UPSLOPE STEPS}} = \text{HEAT \% PER STEP}$

$$\frac{(100\% - 60\%)}{8 \text{ STEPS}} = 5\% \text{ PER STEP}$$

EXAMPLE NO. 1
SINGLE IMPULSE SETTINGS

IMPULSE = 1
HEAT TIME = 20
HEAT X = 60
UPSLOPE STEPS = 8
X HEAT/STEP = 5



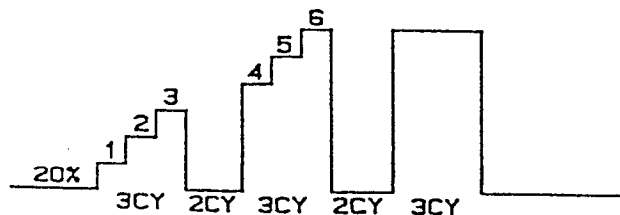
MULTIPLE PULSE SETTINGS (SEE PAGE 9-10 OF OPERATING BOOK)

FORMULA: $\frac{(\text{END HEAT} - \text{START HEAT})}{\text{UPSLOPE STEPS}} = \frac{(50 - 20)}{6 \text{ STEPS}} = 5\% \text{ PER STEP}$

$$\frac{(100\% - 60\%)}{8 \text{ STEPS}} = 5\% \text{ PER STEP}$$

EXAMPLE NO. 2
MULTI-PULSE SETTING

IMPULSE = 3
HEAT TIME = 3
COOL TIME = 2
HEAT X = 20
UPSLOPE = 6 'STEPS'
X HEAT = 5 'PER STEP'



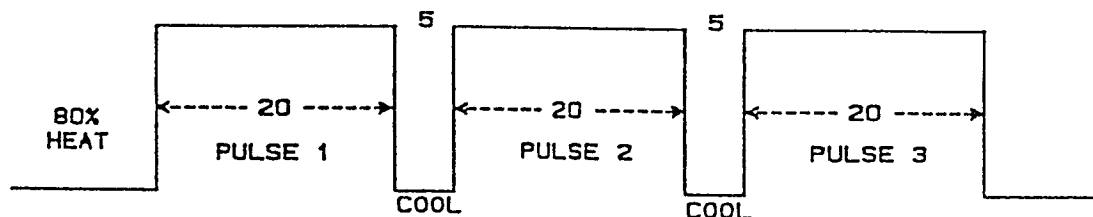
THE TOTAL NUMBER OF UPSLOPE STEPS SHALL ALWAYS BE EQUAL OR LESS THAN THE TOTAL NUMBER OF HEAT CYCLES X IMPULSES.

NOTE: FOR MINOR ADJUSTMENTS IN THE CURRENT CHANGE THE MAIN 'HEAT X' SETTING.

PULSATION & QUENCH - TEMPER OPTIONS FOR: MODEL 105 INTERLOCK SPOT WELD CONTROLS

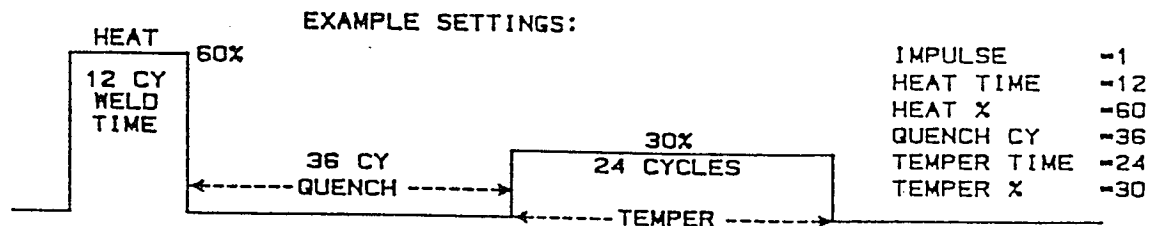
PULSATION FEATURE: PROVIDES MULTIPLE IMPULSES OF WELD TIME WHICH GRADUALLY HEAT UP THICKER MATERIALS. THIS METHOD REDUCES TIP EXPULSION AND INCREASES ELECTRODE (TIP) LIFE. IT IS MANDATORY WHEN WELDING MATERIALS 1/8" OR THICKER TO USE PULSATION. USING THIS METHOD ON THIN MATERIALS RESULTS IN BETTER APPEARANCE WELDS AND REDUCES TIP WEAR.

EXAMPLE SETTINGS: IMPULSE = 3
HEAT TIME = 20
PULSATION WELD HEAT % = 80
COOL TIME = 5

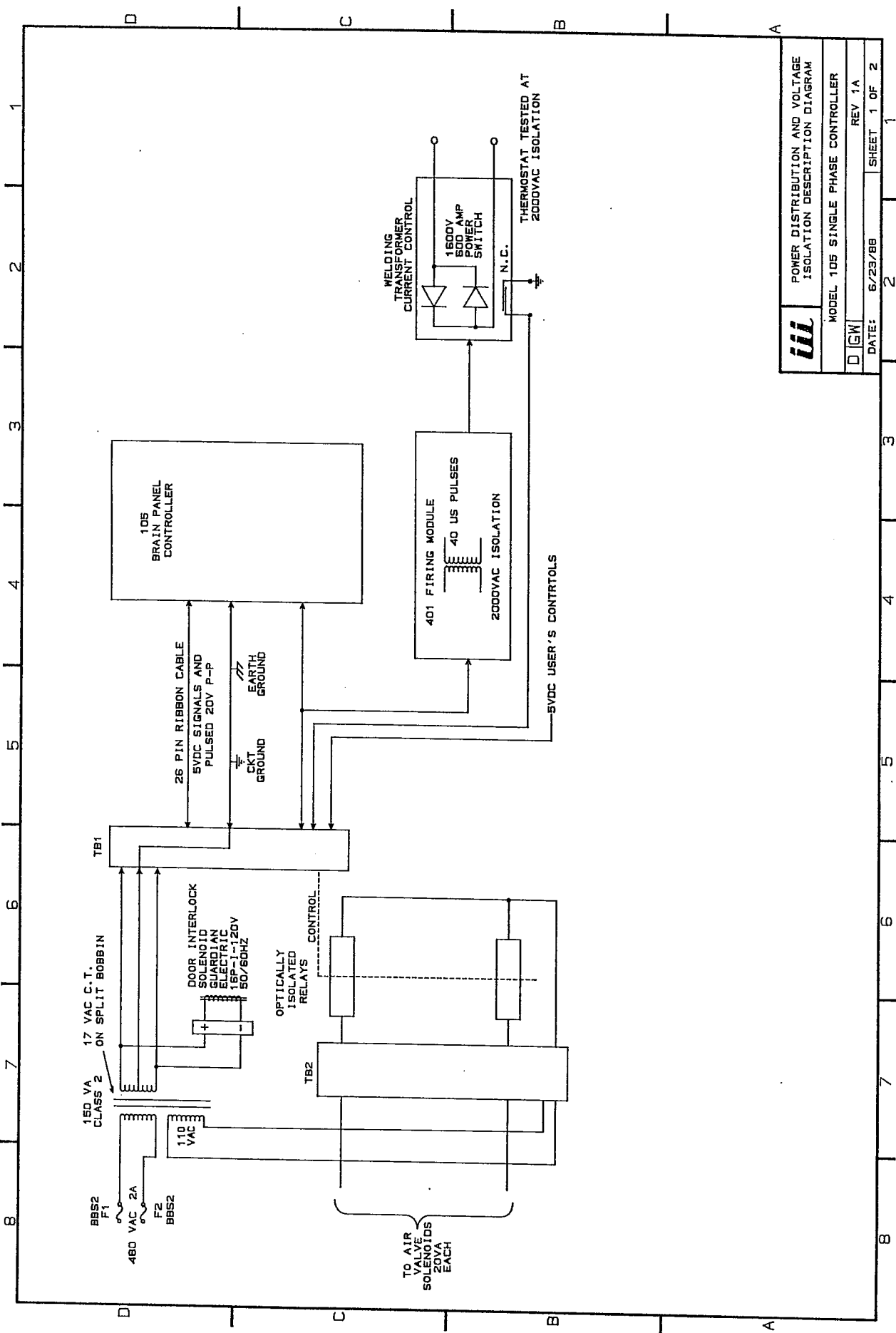


QUENCH & TEMPER CONTROL SETTINGS

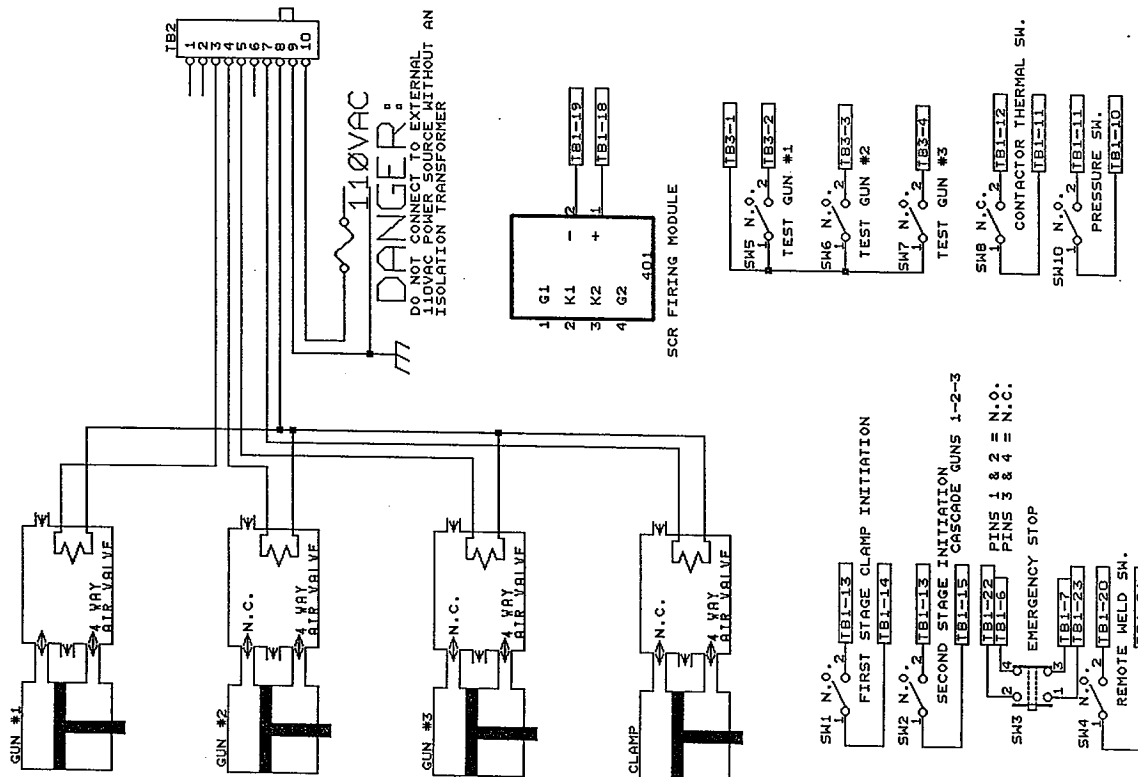
QUENCH & TEMPER: PROVIDES AN ADDITIONAL WELD CYCLE THAT IS OF LESSER MAGNITUDE THAN THE ORIGINAL, BUT APPLIED FOR A LONGER PERIOD OF TIME, WHICH ANNEALS THE WELD AREA. THIS METHOD IS RECOMMENDED WHEN HIGH CARBON STEELS ARE TO BE SPOT WELDED. (1020 CARBON ETC.)



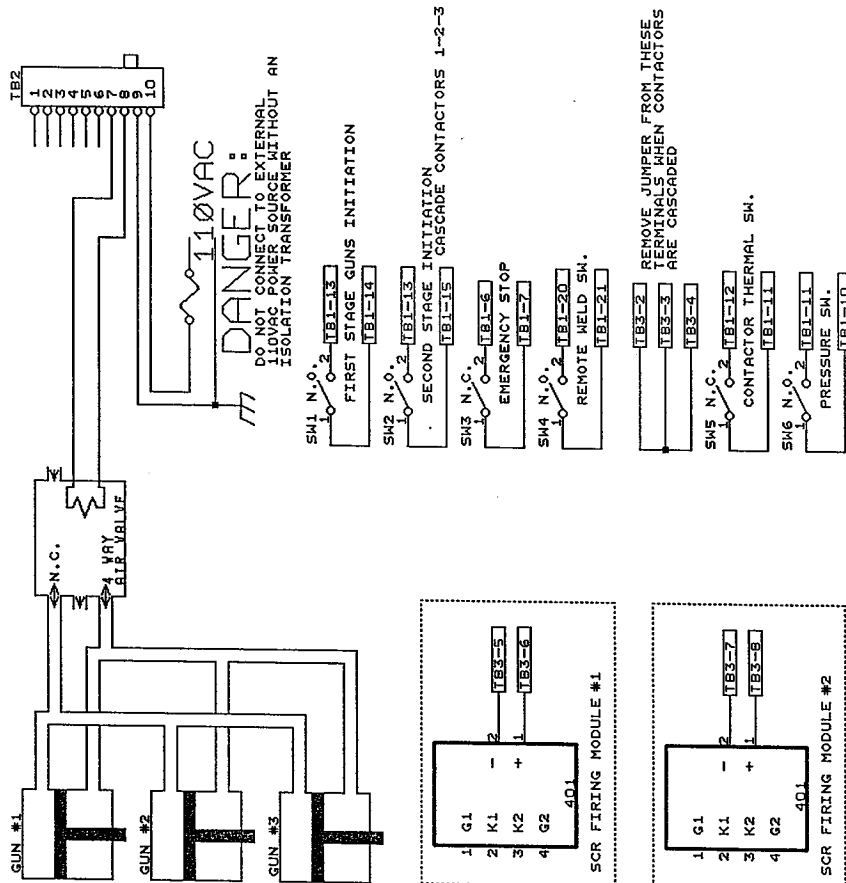
SETTING GUIDE: QUENCH TIME = 3 X HEAT TIME
TEMPER TIME = 2 X HEAT TIME
TEMPER % = 1/2 OF HEAT %



CASCADE 3 GUNS WITH ONE CONTACTOR



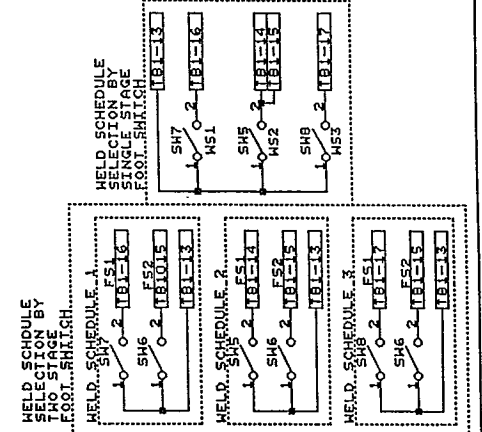
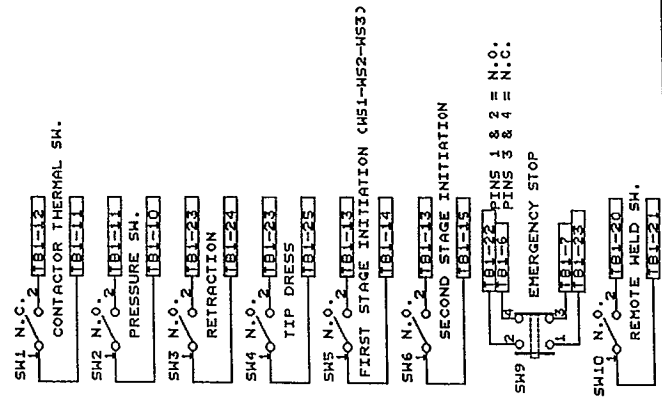
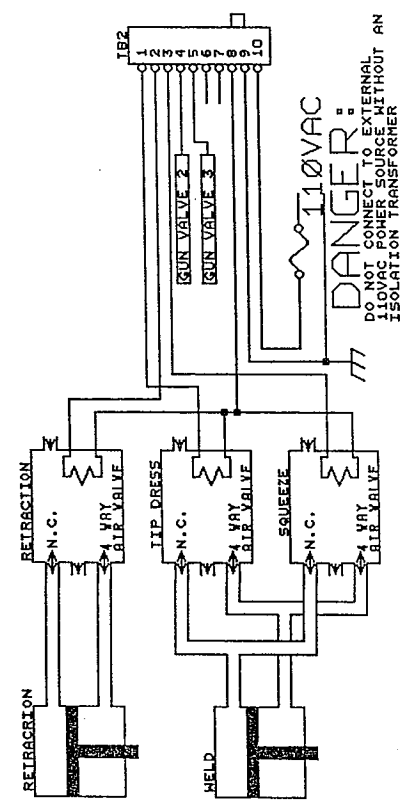
CASCADE 3 CONTACTORS WITH ALL GUNS ENGAGED



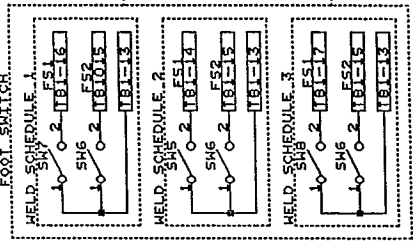
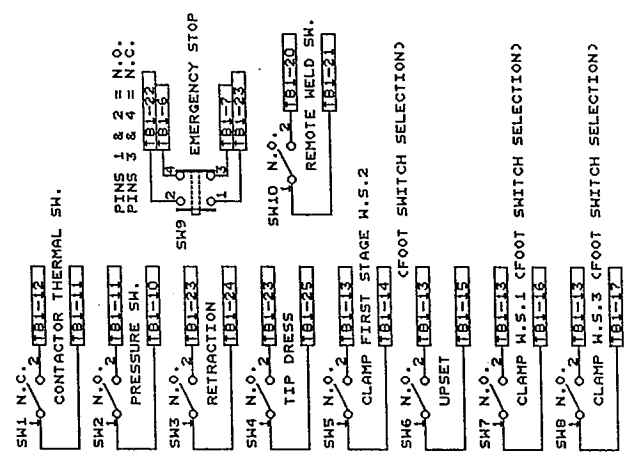
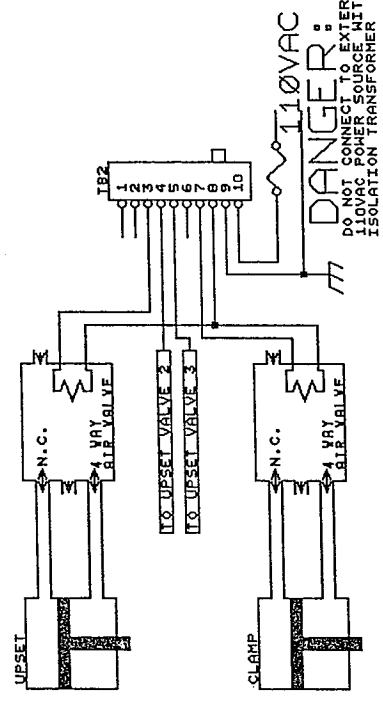
NOTE: SET BRAIN PANEL DIP SWITCH
SW5-1 TO ON POSITION FOR CASCADE OPERATION

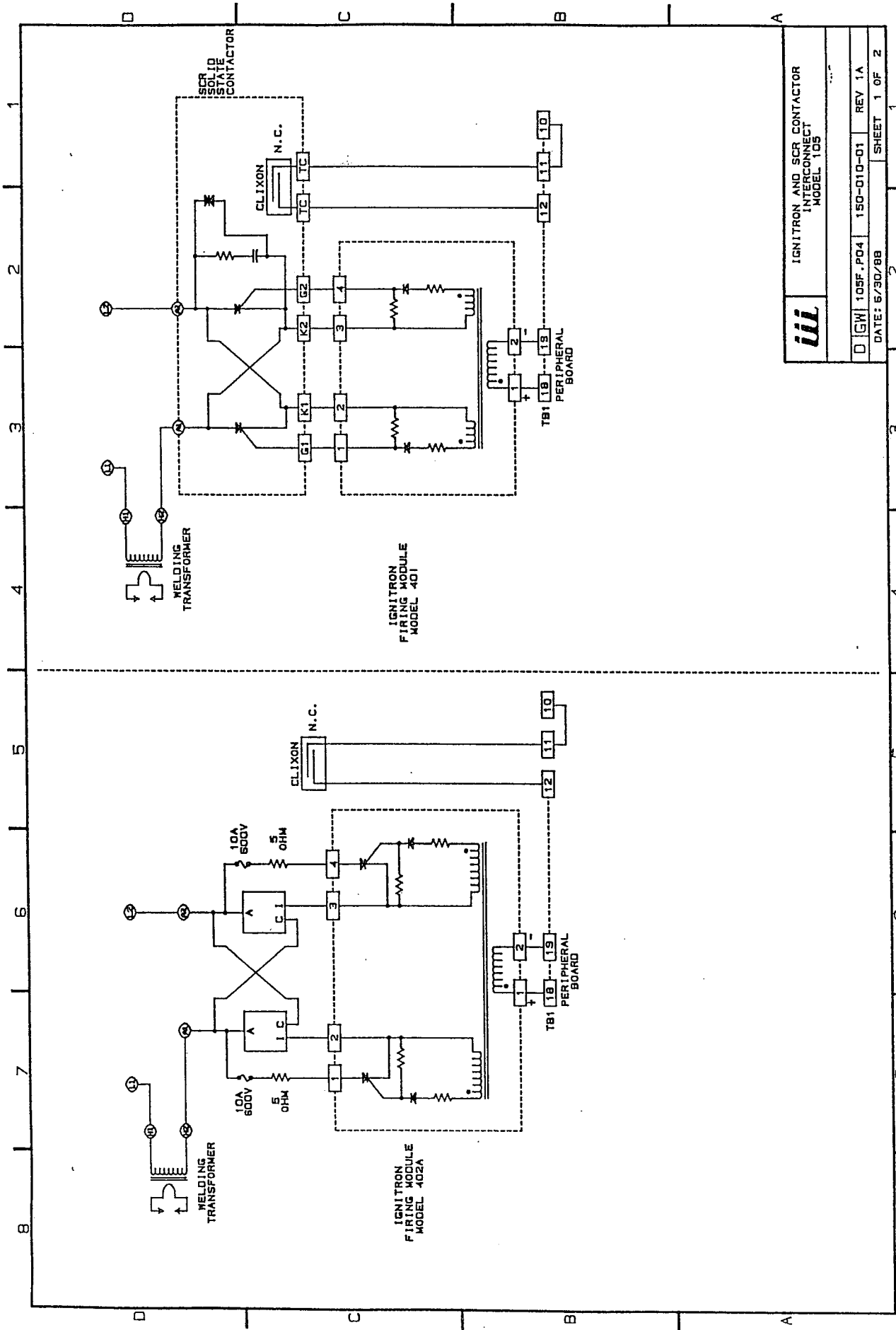
| | |
|----------------------------|--------------------------------|
| INTERLOCK INDUSTRIES, INC. | |
| USER WIRING DIAGRAM | |
| Title | CASCADE 3 GUNS OR 3 CONTACTORS |
| Size | Document Number |
| B | 155-019-01 |
| REV | REV |
| Date: | October 28, 1992 Sheet 1 of 1 |

SINGLE HEAD WELDING MACHINE

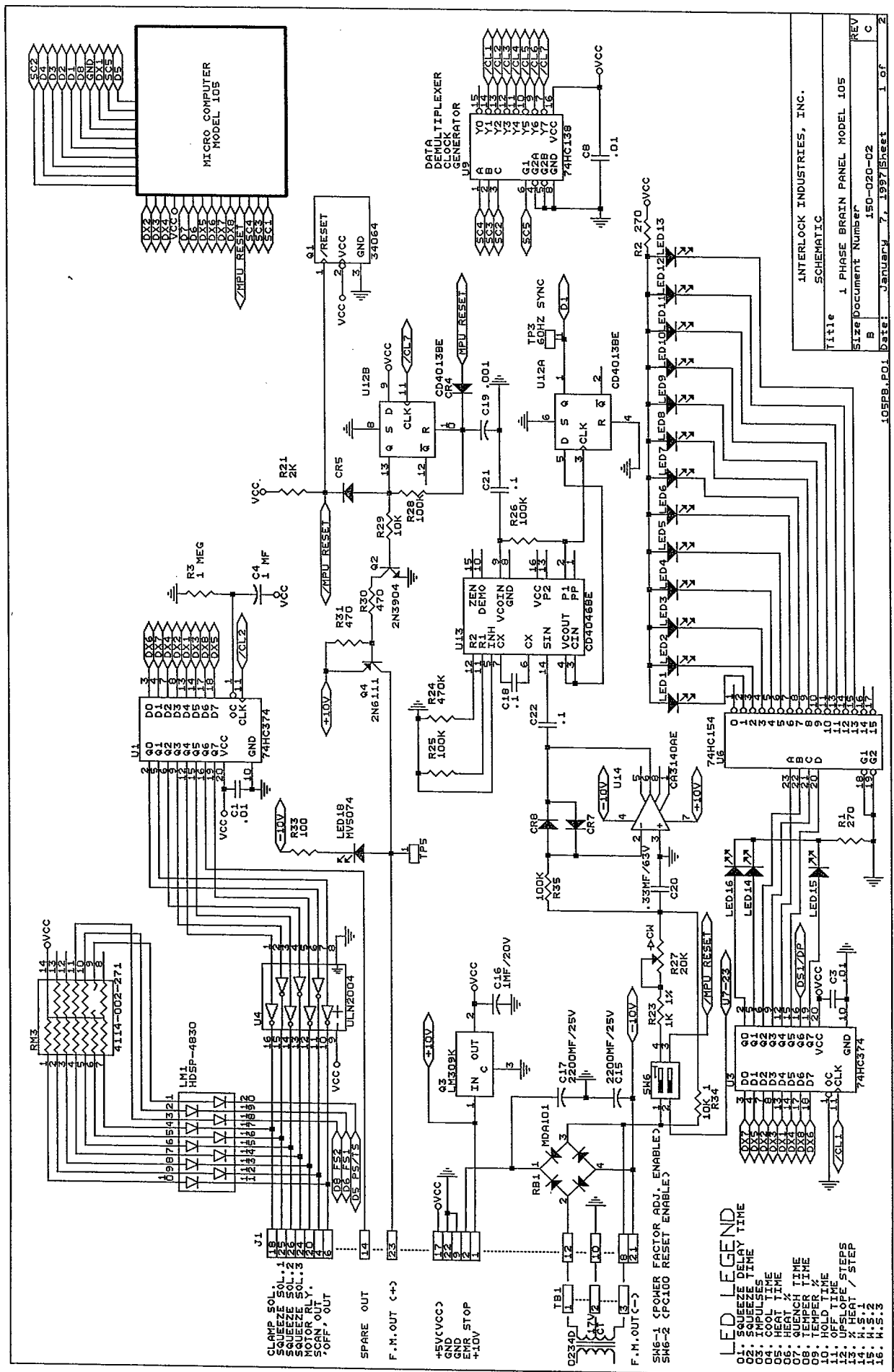


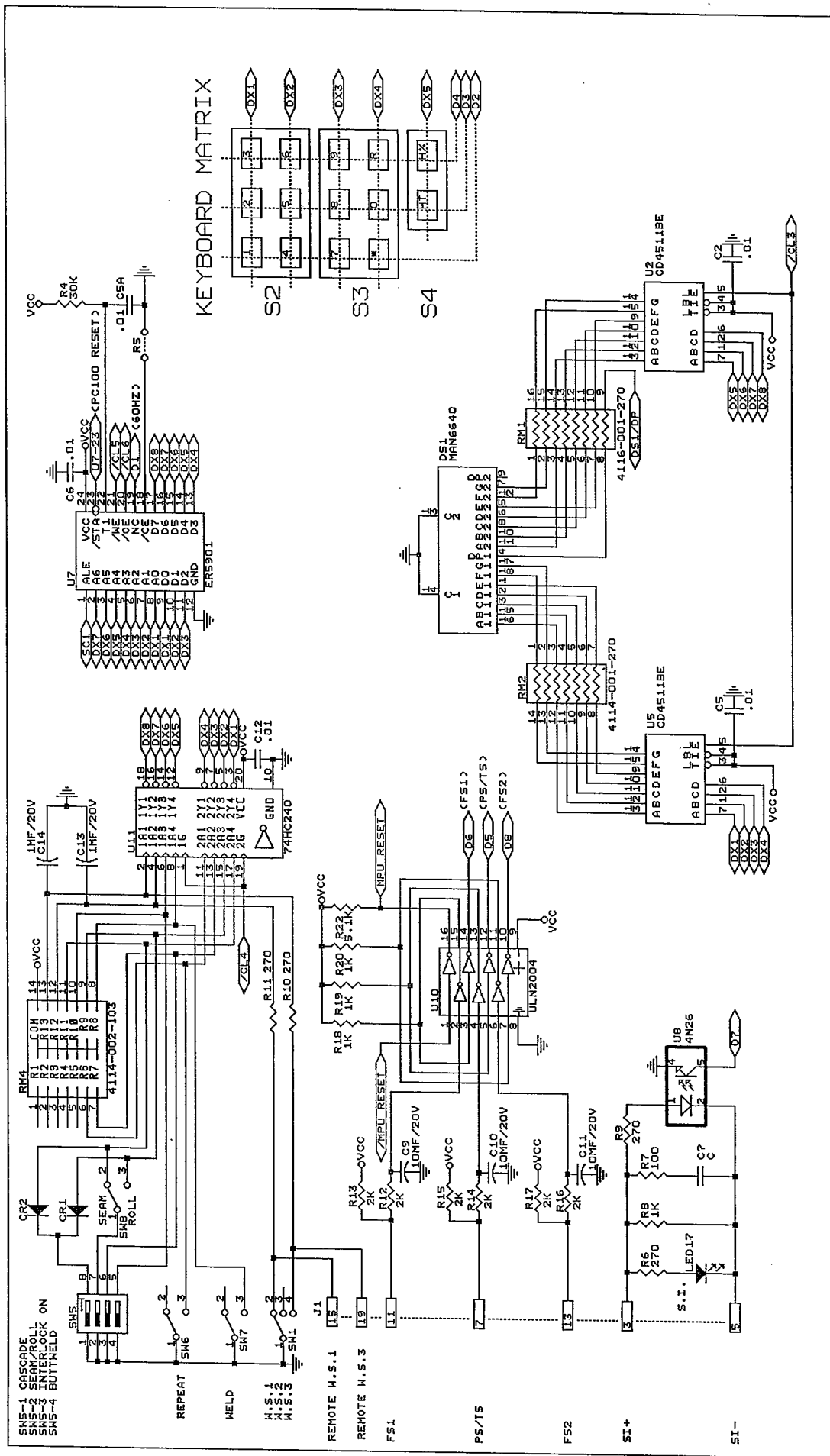
BUTT WELD MACHINE



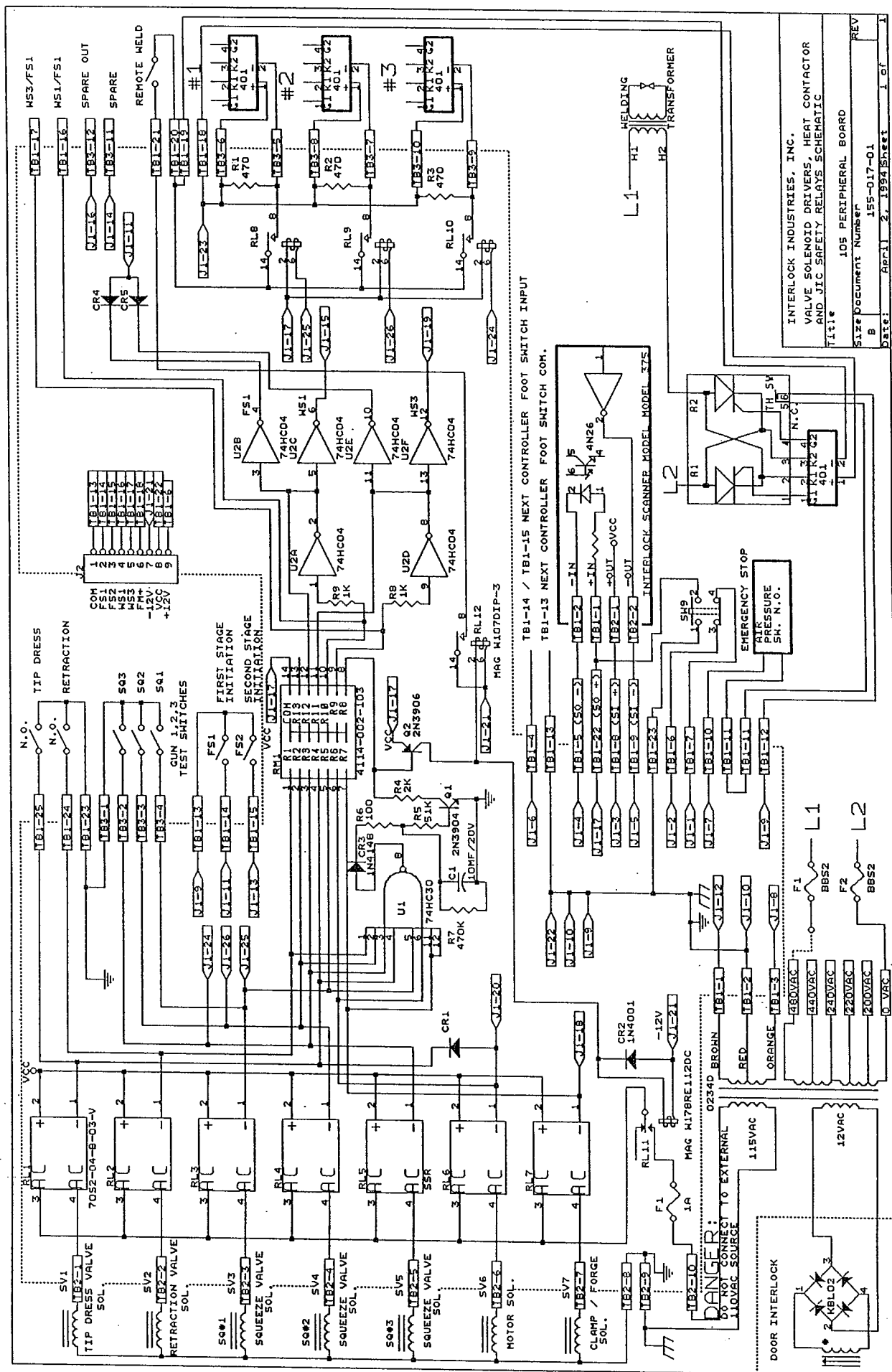


| | | | |
|---------------|----------|---|--------|
| iii | | IGNITRON AND SCR CONTACTOR INTERCONNECT MODEL 105 | |
| GW | 10SF.P04 | 150-010-01 | REV 1A |
| DATE: 6/30/88 | | SHEET 1 OF 2 | |

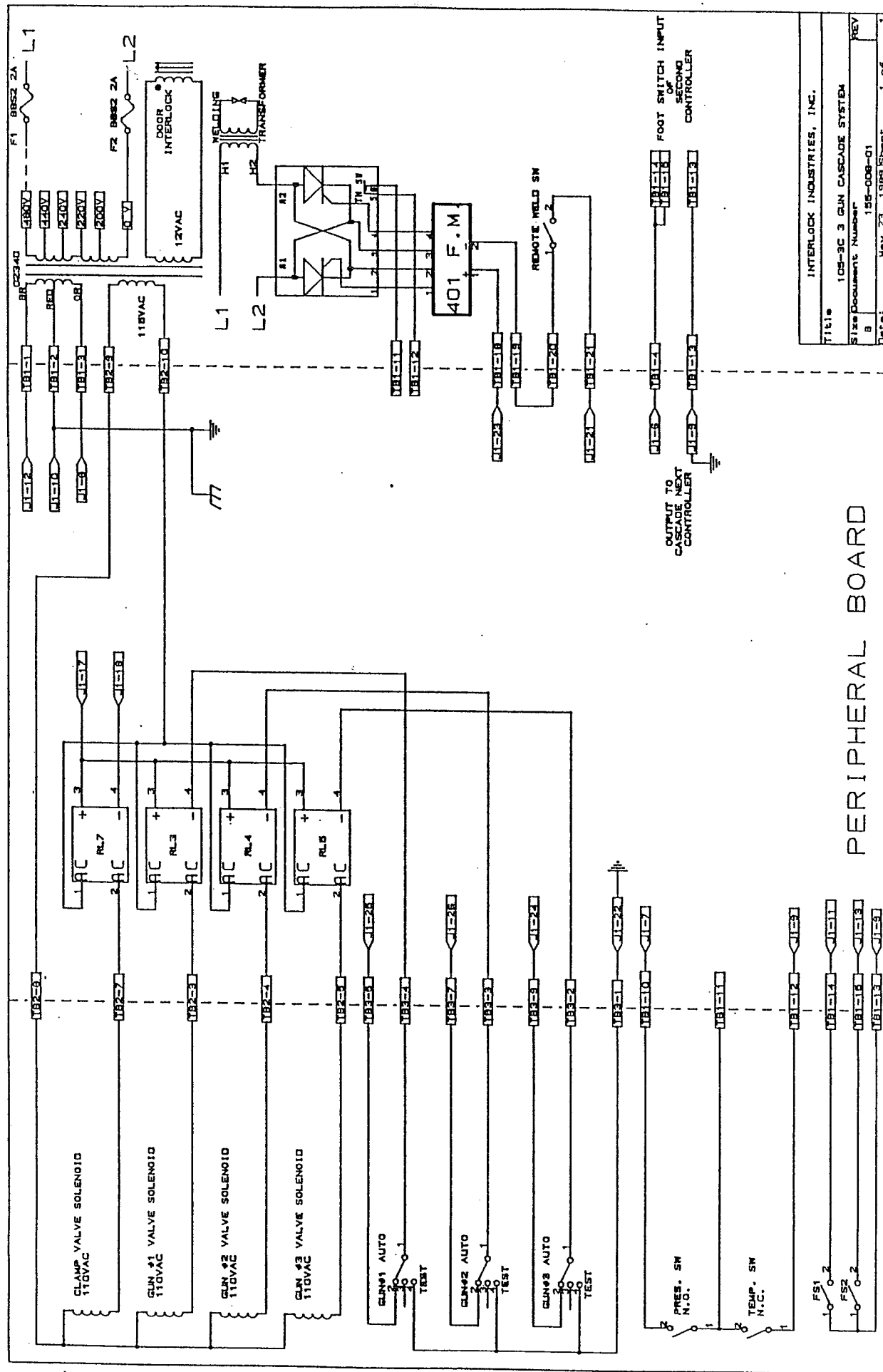




| | |
|----------------------------|-------------------------------|
| INTERLOCK INDUSTRIES, INC. | |
| SCHEMATIC | |
| Title | 1 PHASE BRAIN PANEL MODEL 105 |
| Size | Document Number |
| B | 150-020-02 |
| REV | C |
| Date: | April 3, 1991 Sheet 2 of 2 |



INTERLOCK INDUSTRIES, INC.
VALVE SOLENOID DRIVERS, HEAT CONTACTOR
AND JIC SAFETY RELAYS SCHEMATIC
Title
Size Document Number 105 PERIPHERAL BOARD
B 155-017-01
Date: April 2, 1994 Sheet 1 of 1



PERIPHERAL BOARD

MODEL 105

ASSY 155-017-02

TEMP. SW. (N.C.) INPUT

PHASE A SIG. +

PHASE A REMOTE WELD

PHASE B

PHASE C

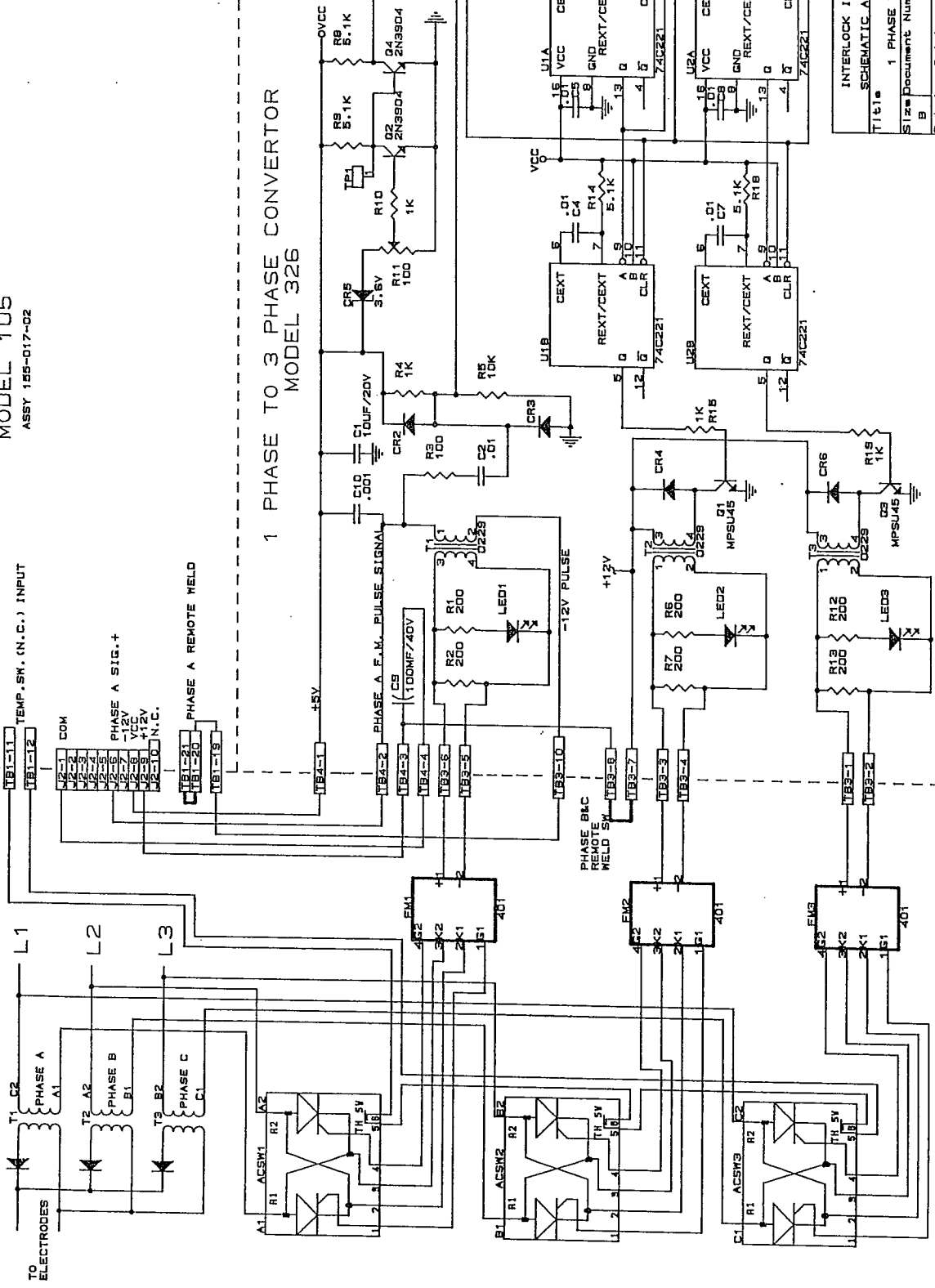
TO ELECTRODES

PHASE A

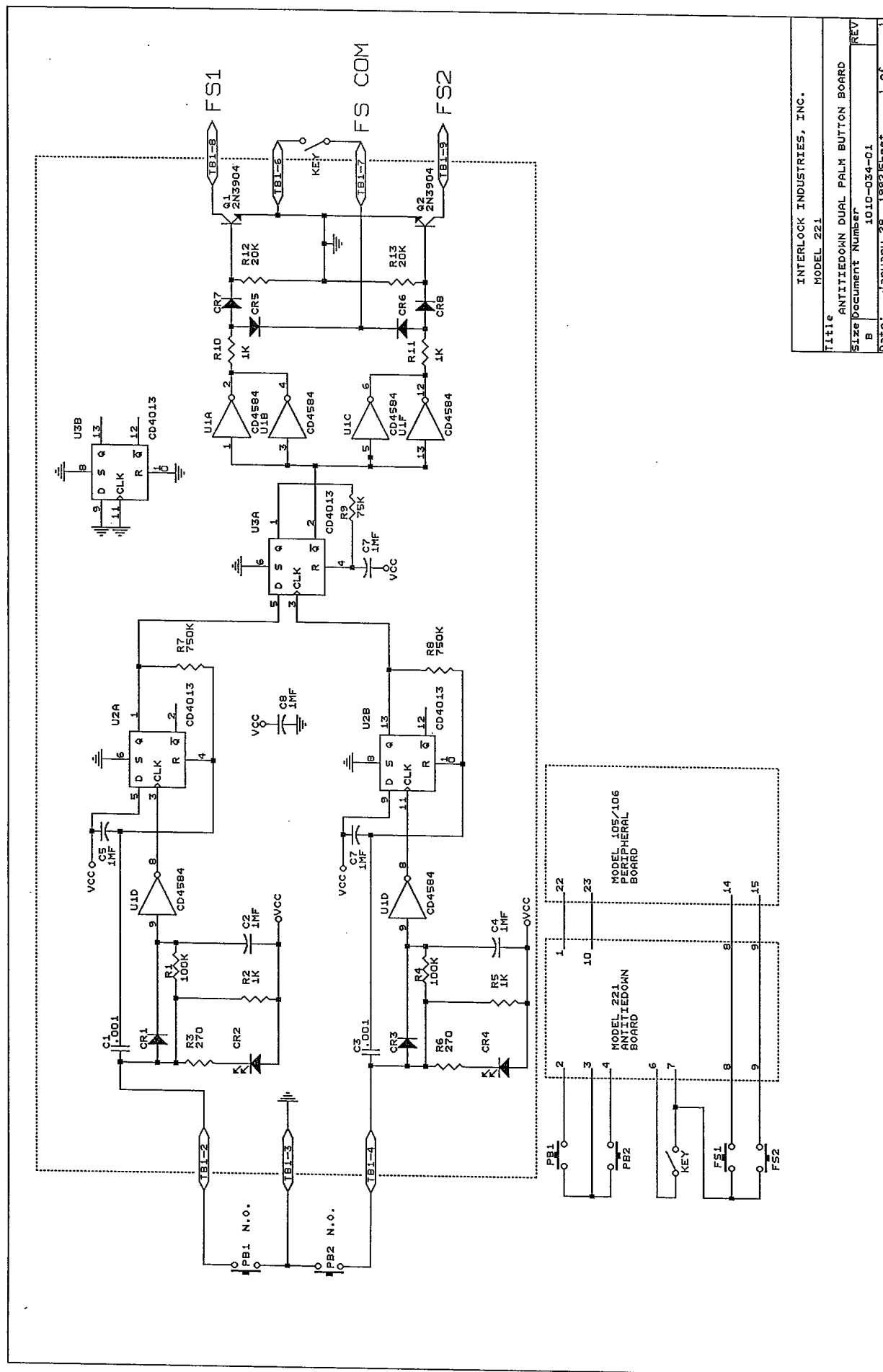
PHASE B

PHASE C

1 PHASE TO 3 PHASE CONVERTOR MODEL 326



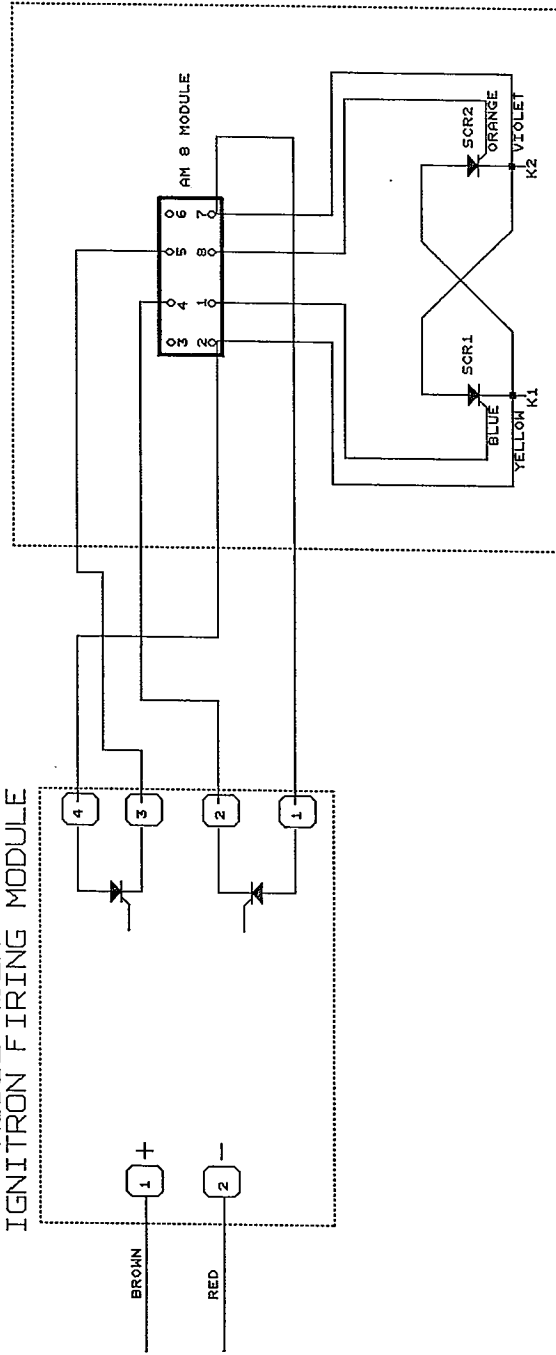
INTERLOCK INDUSTRIES, INC.
Title 1 PHASE TO 3 PHASE CONVERTOR
Size Document Number 155-021-01
Date: October 11, 1980 Sheet 1 of 1



| | |
|----------------------------|------------------------------------|
| INTERLOCK INDUSTRIES, INC. | |
| MODEL 221 | |
| Title | ANTITIEDOWN DUAL PALM BUTTON BOARD |
| Size | Document Number |
| REV | 1010-034-01 |
| Date: | January 28, 1992 |
| Sheet | 1 of 1 |

DARRAH ELECTRIC IGNITRON REPLACEMENT CONTROLLER

INTERLOCK INDUSTRIES MODEL 402A IGNITRON FIRING MODULE

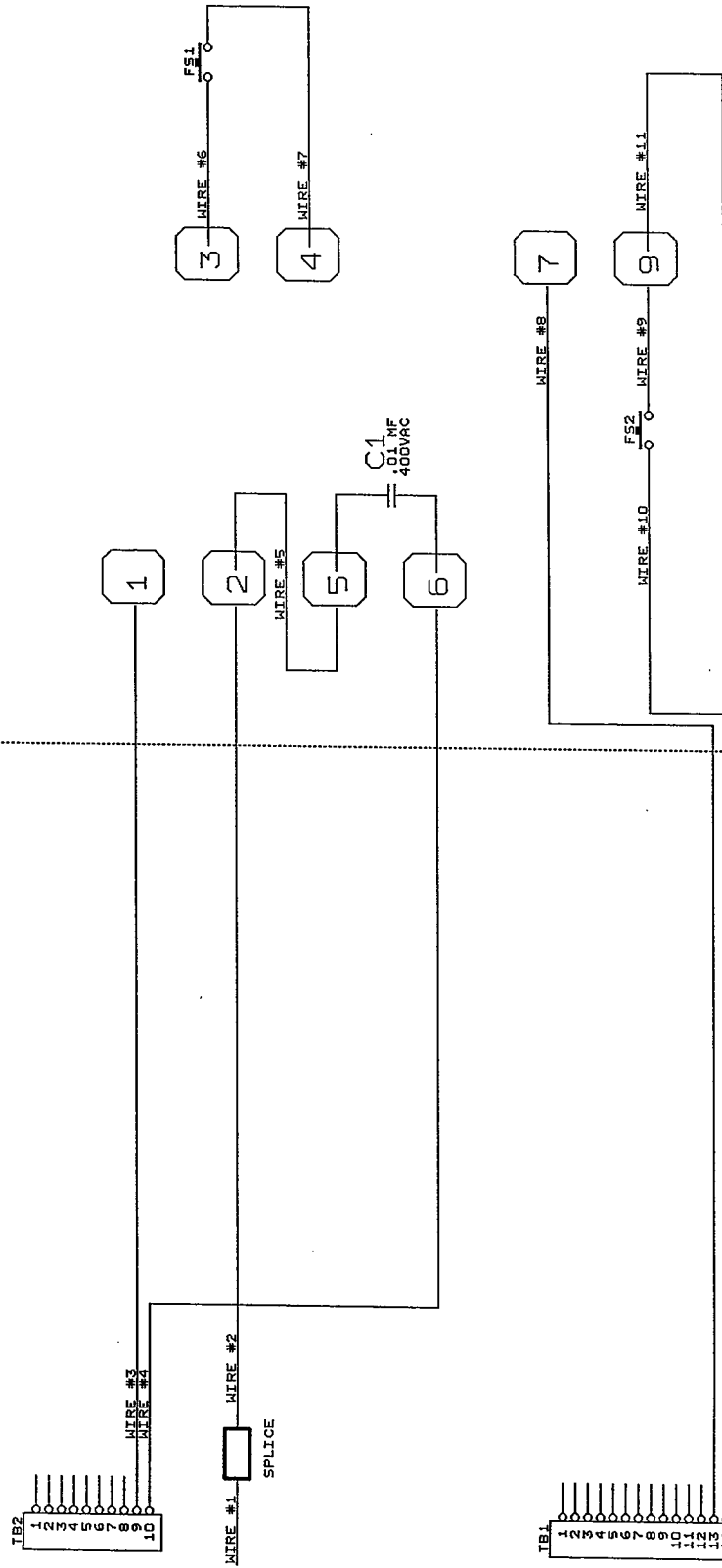


INTERLOCK INDUSTRIES, INC.
DARRAH ELECTRIC IGNITRON REPLACEMENT
WIRING DIAGRAM

| | | |
|-------|-----------------------------|--------------|
| Title | 402A IGNITRON FIRING MODULE | REV |
| Size | Document Number | |
| B | 150-022-01 | |
| Date: | July 26, 1991 | Sheet 1 of 1 |

105 PERIPHERAL BOARD

ROCKFORD DETECT A FINGER SAFETY DEVICE SYSTEM MODEL RKC-500



WIRE INSTALLATION INSTRUCTIONS

1. DISCONNECT WIRE #1 FROM TB2-10 AND SPLICE IT TO WIRE #2
2. DISCONNECT WIRE #2 FROM TB2-10 AND SPLICE IT TO WIRE #3
3. ADD WIRE #3 AS SHOWN IN THE ABOVE DIAGRAM
4. ADD WIRE #4 AS SHOWN IN THE ABOVE DIAGRAM
5. ADD WIRE #5 AS SHOWN IN THE ABOVE DIAGRAM
6. CONNECT WIRE #6 TO FS1 (FIRST STAGE FOOT SWITCH) AS SHOWN IN THE DIAGRAM
7. CONNECT WIRE #7 AS SHOWN IN THE DIAGRAM
8. CONNECT WIRE #8 AS SHOWN IN THE DIAGRAM
9. CONNECT WIRE #9 AND #10 TO FS2 (SECOND STAGE FOOT SWITCH) AS SHOWN IN THE DIAGRAM
10. CONNECT WIRE #11 AS SHOWN IN THE DIAGRAM

| | |
|-----------------------------|-------------------------------|
| INTERLOCK INDUSTRIES, INC. | |
| INSTALLATION WIRING DIAGRAM | |
| Title | DETECT A FINGER SAFETY SYSTEM |
| Size | Document Number |
| B | 155-018-02 |
| Date | February 18, 1975 |
| Sheet | 1 of 1 |