

INSTALLATION AND SERVICE MANUAL
FOR PETERSON DUO-SET COMBINATION ACTION

This manual was written to cover a standard system where a _____ signal comes from the stop contact when the stop is "on". When negative sensing is employed, Memory and Tab drivers, Part #400265 built on circuit boards numbered 300098 (or 7214-2A) will be supplied. When a positive signal coming from the stop contact, Part #400271 built on circuit board numbered 300100 would be supplied and a positive signal from the stop contact would be sent to the combination action when the stop is "on".

This action was built for the following polarities:

Stop sensing polarity (from the stop contact)
is _____.

Stop coil return (magnet common) polarity is Negative.

Piston common polarity is Negative.

peterson
ELECTRO-MUSICAL PRODUCTS / WORTH, ILLINOIS 60482

312-388-3311

INSTALLATION INSTRUCTIONS FOR THE PETERSON DUO-SET COMBINATION ACTION

1. Carefully unpack all cartons and check for damage which may have resulted from shipping.
2. Mount mother boards, usually one for each division, using seven screws supplied for each one. Be sure to leave sufficient space around these boards to allow for neat cabling along each side. Provide a loop in all cables to allow easy removal of the connectors.
3. Cable the "on" and "off" coils and the "sense" contacts to their respective terminals, as indicated in figures 1 and 2. (The "sense" contact is usually the same contact which is also used to operate a relay or a stop action in the organ; this is the simplest and preferred arrangement). If this "sense" contact is connected to a magnet, it is necessary that a flyback (spark suppression) diode be connected across the magnet to protect the combination action from "back E.M.F." as is the case with all solid state components. The polarity of the diode is important. To determine polarity, operate the magnet involved and measure the voltage across it noting which end is positive; always connect the banded end (cathode) of diode to the positive end of the magnet. Flyback (spark suppression) diodes for the "on" and "off" coils are built into the "memory and tab driver" modules. Each stop tablet of each division should be assigned a number, in some logical manner (from left to right, for example). It would be a good idea to list the stop assignment on the form supplied (Figure 3), for future reference. Memory #1 "on", "off" and "sense" must all be connected to the same stop tablet action, (far left, for example). Stops can be controlled from more than one mother board (division). For example, the Swell to Pedal coupler might work from both the Swell and Pedal pistons but not the Great pistons. Simply wire the Swell to Pedal stop tablet action to a memory on both the Swell and Pedal mother boards (three wires to each). "Unison off" tablets must use a sense contact which is closed when that stop is in the same position as other stops when they are "on".
4. Cable pistons to their terminals on the "piston logic" boards. (See figures 1 and 4)

- A. Wire "set" terminals on all "piston logic" boards together and wire this to the "set piston on the organ. (Omit if you are not going to take advantage of the "capture" feature). "Set" piston has the same common (organ negative) as the other pistons.
- B. Wire your "division cancel" piston to a cancel terminal on the piston logic board on their respective mother boards. (Either cancel terminal may be used).
- C. Wire "general cancel" piston to the remaining cancel terminal on all piston logic boards.
- D. Wire "general" pistons to all "piston logic" boards.
Example: General #1 wires to Great #1 piston terminal, Swell #1 piston terminal and Pedal #1 piston terminal.
- E. Wire "divisional" pistons to the piston logic boards on their respective "mother" boards. Example: Swell #3 connects only to a piston terminal on the Swell piston logic board.
- F. Wire all piston commons to a convenient "piston common" terminal or any handy organ negative(-). (The "piston common" terminal is preferred, all pistons can be fed from one terminal)

NOTE: If more than 16 pistons are used in a given division, all stops must be wired in parallel to two mother boards (3 wires per stop). If more than 32 stops, but not more than 16 pistons are used in any division, only the piston terminals would be wired in parallel to two mother boards for each division.

If more than 16 pistons and more than 32 stops are used in any division, at least four mother boards would be required for that division. If four mother boards were required, two would be connected with all their stops in parallel (up to 32), the two remaining mother boards would have the remaining stops in parallel. The first two mother boards would have the pistons divided between them. The second two

mother boards would have their pistons wired in parallel with the first two.

5. Mount power supply(s) in the organ securely bearing their weight and method of shipping in mind. Plug the four wired power cables from each mother board into any of the six 4-pin connectors on the power supply.
6. If a multi-fingered sforzando switch is used, wire one contact to the sforzando terminal on the combination action power supply. (See figure 4) This terminal, or contact, may be shared with an indicator bulb, but not with a stop. If a solid-state sforzando reversible is employed, wire the sforzando output terminal on the reversible to the "sforzando" terminal on the combination action power supply. (See figure 4)
7. Wire the first contact to "make", on the crescendo switch (roller, etc.), to the "crescendo" terminal on the combination action power supply. This terminal or contact may be shared with an indicator bulb but not with a stop.

NOTE: Steps #6 and #7 should be taken because of the "hold-and-set", or "tripper", feature. Steps #6 and #7 "lock-out" the "set" while either the crescendo or sforzando are in use. If this were not done and, say, the sforzando were in use and you were to press and hold a piston, the stops which are activated by the sforzando would be "set" onto the piston pressed.

8. Wire a single pole, single throw (S.P.S.T.) switch across the "lock out" terminals if you desire a "lock out" feature. With the contacts of this switch closed, the combination action cannot be "set", therefore, making it "tamper proof". A key operated lock out switch is available from Peterson Electro-Musical Products. It is part #140012.

9. Connect organ positive (+) and negative (-) from the "rectifier" or generator to their respective terminals on the combination action. The negative (-) lead connects to the "organ negative" screw on the power supplies. The positive (+) lead would go to each divisional mother board under the screw terminal. Bear in mind that the positive (+) lead has to be of sufficient size to carry feed current to all stop tablet magnets simultaneously. Likewise, the negative (-) lead connected to the "on" and "off" coil returns must be of sufficient size to carry return current from all stop tablet magnets simultaneously. It is a good practice to run one wire of adequate size from place to place rather than to run two smaller conductors in parallel, unless the smaller conductors are the same length and follow identical paths. Check polarities carefully before applying power to the system. Reversed polarities will most likely result in damage to the equipment. Warranty does not cover this kind of damage.

10. Install reversible mother board (required if Peterson reversibles other than sforzando are to be used) with screws supplied and connect as indicated on the mother board. All terminals are labeled. Up to six reversibles may be accommodated on each reversible mother board. "Sense" and "coil" terminals wire in parallel with any other wires already on the stop tablet action to be activated by the reversible. Note that there is one "on" coil terminal and two "off" coil terminals. This allows for a situation as in this example: Swell to Pedal 8' works as a reversible. The Swell to Pedal 4' can be made to cancel if it is "on" by simply wiring the second off coil terminal to the "off" coil on the Swell to Pedal 4' stop tablet action. The reversible piston must be fed by organ negative (-).

11. Install sforzando type reversible (if included), with screws supplied. This is separate from the above reversibles. Connect power, pistons, etc., to terminals as indicated on the sforzando reversible card proper. Pistons must be fed from organ negative (-). The sforzando piston(s) sometimes called tutti, will cause an output to appear at the "sforzando output" on alternate pressings. The sforzando reversible is "self holding", therefore the output will continue to be present indefinitely with only a momentary signal at the sforzando piston terminal. Sforzando output can be removed by:

- A. Re-pressing the sforzando reversible piston.
 - B. Pressing a cancel piston (usually general cancel) (if connected to the cancel piston terminal on the sforzando reversible), or
 - C. Turning the organ "off" for a short period of time. (When the organ is turned "on" the sforzando will automatically stay "off". The only way to turn it on is with a momentary organ negative (-) applied to the sforzando piston terminal. (As by pressing the sforzando piston)
12. Apply 117V 60 C.P.S. A.C. power to the combination action power supply(s). This power must be maintained 24 hours per day. The built-in, automatically recharging battery will "hold" your pre-set combinations in the "memories" for several hours in the event of failure of the A.C. power. The length of time the battery will "hold" the memories is dependant on the number of memory cards in the system. Experience has shown that something around an eight hour "hold" is typical.
13. Insert the fuses ($\frac{1}{2}$ amp "slo-blo" and 5 amp standard (AGC or 3AG)) into their sockets as indicated on the name plate. The $\frac{1}{2}$ amp "slo-blo" line fuse is closest to the line cord and the 5 amp standard battery fuse is furthest from the line cord. If a fuse replacement is ever needed be sure to replace only with the proper type fuses. This is important to prevent damage to the system and to assure safe operation.
14. Proceed to the "test" section of the instruction manual.

TEST PROCEDURE FOR PETERSON DUO-SET COMBINATION ACTION

NOTE: Several conditions are dangerous to the equipment. Should such conditions develop, determine the problem in the shortest possible time.

1. SMOKE (serious damage likely to result. Turn off power promptly, pinpointing source)
2. STOP TABS HUNG "OFF" OR "ON" (one coil energized)
This may cause the coil or output transistor to overheat.
3. CANCEL PISTON HUNG ON (May cause overheating of coils or output transistors).

1. Turn organ "on".
2. Check that all stop keys will stay in the "on" or "off" position when moved to either position. If they "spring back" to one position or the other with the organ "on", but not "off", turn organ "off" and refer to the trouble shooting section before proceeding.
3. Manually turn all stops "on".
4. Press divisional cancels. All stops in given division should go "off". If they do not, refer to trouble shooting section before proceeding.
5. Repeat Step 3
6. Press general cancel. All stops should turn off. If they do not, refer to trouble shooting section.
7. Set one piston for all stops, "on". Stops may be set as if the combination action were a capture action or a tripper (hold and set) action. To set as a capture action, select stops, press "set" piston, select and press piston desired, release piston, release set piston. To set as a tripper action, simply press piston desired, manipulate stops to desired combination, release piston.

NOTE: If action will not "set", check to be sure crescendo, sforzando, or "lock out" are not activated and that crescedco and sforzando indicator bulbs return to positive.

8. Set the divisional pistons in some easily recognizable sequence. For example: Piston 1, stops 1, and 2, on, all others, off. Press pistons to make sure they do what they were set to do. If they do not, refer to the trouble shooting section before proceeding.
9. Set general pistons to some easily recognizable sequence. For example: Piston 1, stops 1, 2, and 3, on, all others, off. Piston 2, stops 4, 5, and 6 on, all others, off. Press pistons to make sure they do what they were set to do. If they do not, refer to the trouble shooting section before proceeding.
10. Remove A.C. power for a short period of time (at least 1 minute) and reapply. Check to be sure the combination action has remembered the previously set combinations. If they do not, refer to the trouble shooting section.

END OF TEST

TROUBLE SHOOTING

Trouble shooting the Peterson "DUO-SET" COMBINATION ACTION is easily accomplished once a few basic things are understood. Our modular design greatly simplifies trouble shooting; field repairs to the electronic circuits are generally not necessary, since it will usually be easier to plug in a replacement module than to attempt to repair a defective one. Be sure you read this Trouble Shooting Guide in its entirety before attempting any repairs.

ALWAYS TURN THE ORGAN "OFF" WHEN REMOVING AND REPLACING MODULES!

BE SURE ALSO, TO PLUG THE MODULES IN CAREFULLY AND BE SURE THEY ARE FACING IN THE PROPER DIRECTION. REMEMBER, TOO, THAT IF A MEMORY AND TAB DRIVER BOARD IS REMOVED, IT WILL BE NECESSARY TO RESET THE COMBINATIONS AFFECTING ITS ASSOCIATED TABLETS. A SHORT CIRCUIT IN A STOP TABLET MAGNET OR ITS ASSOCIATED WIRING CAN "TAKE OUT" A TRANSISTOR OR OTHER

ELECTRONIC COMPONENT, SO BEFORE CHANGING MODULES, CHECK THE TABLET COIL RESISTANCE AND ITS WIRING TO AVOID DAMAGING THE REPLACEMENT MODULE.

WARRANTY DOES NOT COVER DAMAGE AS A RESULT OF CARELESSNESS OR ABUSE

Before suspecting individual modules, it is a good idea to check for proper operating voltages. The four pin connector at one corner of the mother board should provide readings as shown on Figure 1. The terminal marked -5V should measure almost exactly 5 Volts with respect to the Org. + terminal. The Lock Out Terminal should read approximately 5 Volts (again with respect to Org +) unless the set function is to be locked out, in which case the 5 Volts is removed from the lock out terminal (i.e., "0" Volts). The Org + and Org - are connected to the power supply ("rectifier" or generator) intended to move the stop tablets. This will usually be between 10 and 16 Volts depending on the stop tablets used. For the stop tablets to operate dependably, this power supply must have adequate capacity and voltage regulation. If the voltage drops under load, it is not a fault of the combination action. Note, however, that about .5 Volt will be lost in the combination action so that the actual voltage reaching the tablet will be .5 Volt less than the power supply.

As shown in Figure 1, there are only 4 basic module types (not counting special modules for reversibles, etc.). The modules plug into a large printed wiring panel called a "mother board".

A separate "Memory and Tab Driver Board" is provided for each four stop tablets or draw knobs. All memory elements associated with a specific group of four tablets, as well as all electronic components associated with "driving" (operating) the same four tablets, are included as a part of each of these boards. The chart shown in Figure 3 shows which tablets go with which Memory and Tab Driver Board. When installing the system, it is well to fill out this form and keep it with the system. It is obvious that

any fault that affects only a single stop tablet, or a group of tablets that are all associated with the same Memory and Tab Driver Board would suggest trying a new board. Alternately, a suspect board can be "swapped" with a board associated with another group of tablets that are working properly, and if the suspect board is in fact defective, the "trouble" will move with the board.

Each mother board assembly requires one Logic Drive/Latch Module (300095-400267), one Timing Logic Module (300094-400266), and one Piston Logic Module (300096-400268). These modules work together to "address" the proper memories and to initiate the sequence that results in either the movement of the stop tablets, or the "setting" of a combination into the memory. Any malfunction that affects all of the stops in a division, would be a reason to suspect either of these modules. Generally, if pushing a piston does not move any stops in the division (in other words, if when you push a piston and nothing happens or stops "flutter"), try replacing the Timing Logic Module first. If there is evidence of improper operation, as if the wrong tabs move, suspect the Logic Drive/Latch Module or Piston Logic Module.

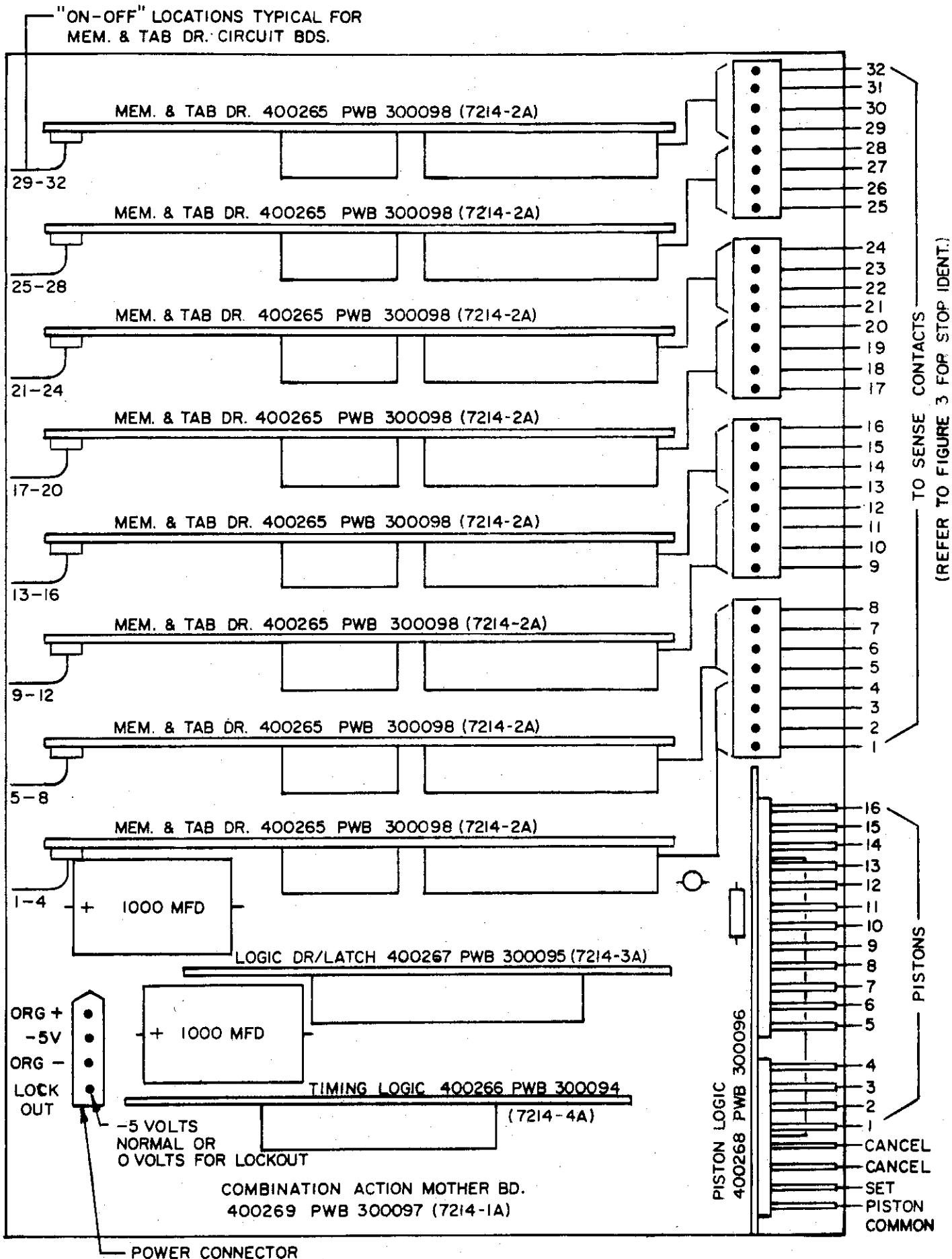
Only a few components are attached directly to the mother board. "Open" circuits can be located visually.

The diodes attached to the piston logic board are part of an address matrix that causes a given piston button to address the proper memory elements in the memory integrated circuits. Generally speaking, if a diode is open or shorted, it may result in improper addressing. An example of this type of malfunction would be when pushing a piston causes stops that were set on one piston to move when pushing a different piston. Any type of piston "inter-action" would be reason to check these diodes. This can be done with an ohm meter. All of the diodes should read very low resistance in one direction (typically around 15 ohms - but it depends on the meter used), and very high in the other direction (over 10 meg ohms). Turn the organ "off" and remove the piston logic board completely to avoid confused readings.

These symptoms are about the same for the piston logic board, the logic drive and latch board or mother board problems. Determine which board is at fault and use the following procedure:

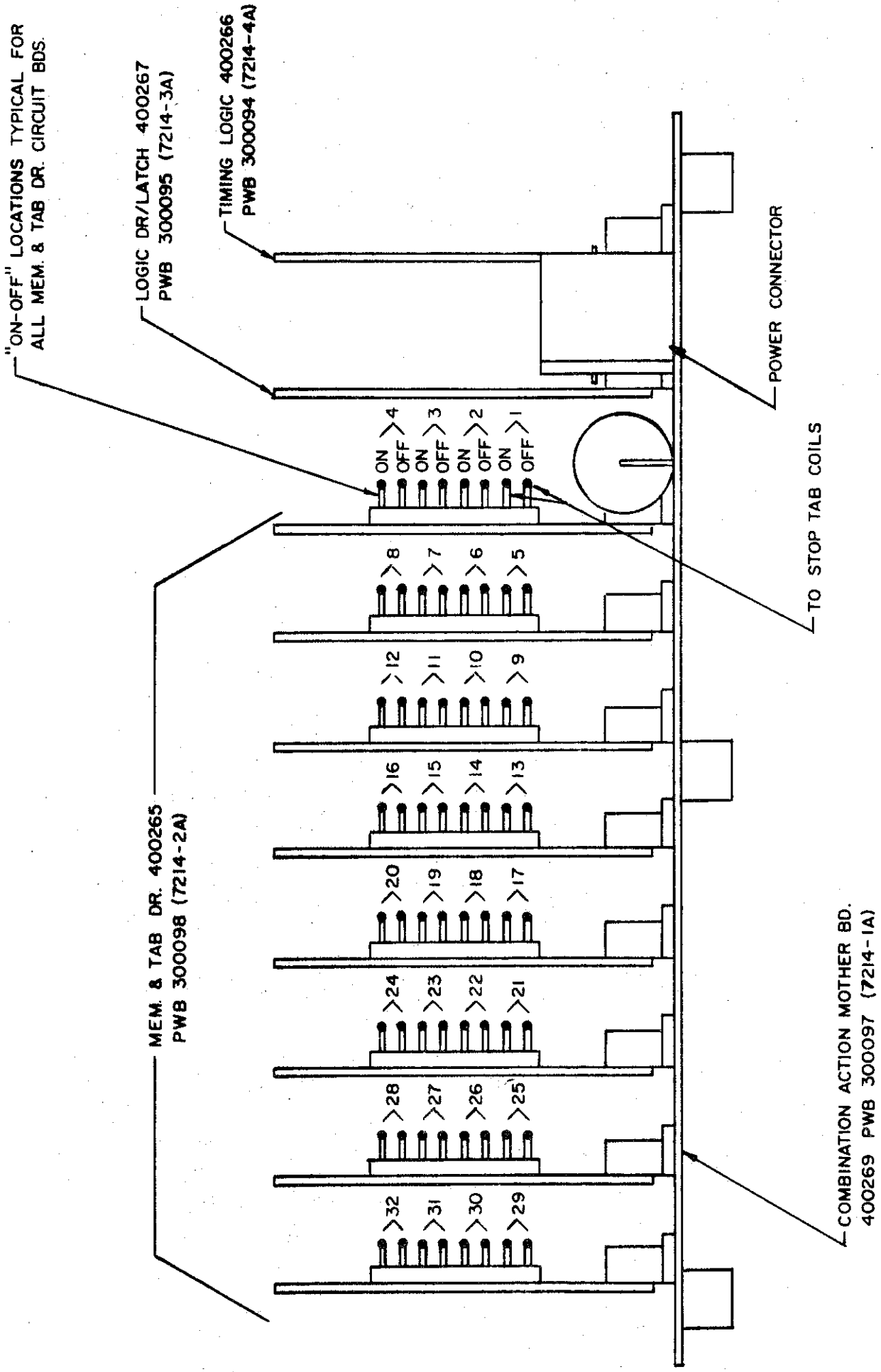
If apparent "piston shorts" occur in only one division, suspect the logic drive and latch board or piston logic board, first. Swap logic drive and latch boards to determine if one is defective. If the problem "moves" to a different division, suspect the logic drive and latch board. If the problem does not move, unplug all piston cables from all piston logic boards except the division where the problem exists. Then swap the piston logic board from an "unused" division and test the malfunctioning division. Avoid removing the piston logic or timing logic boards for more than 10 seconds with the organ "on". The reason for this is that whenever either of these are removed, the division in question will be put into a cancel condition. All "off" coils on that division will be energized possibly resulting in over heated "off" coils and driver transistors. This may cause damage. If it is necessary to remove either of these for a longer period, with the organ "on" remove the four wire power cable for that division until the logic boards can be returned. If swapping logic drive and latch or piston logic boards does not make the problem "move" suspect the mother board for "shorts" and "opens", or memory and tab drivers for shorts. Test for malfunctions by swapping modules. This should determine defective module in the least amount of time.

If you still have difficulty, feel free to phone 312-388-3311 for assistance in eliminating your particular problem.



TOP VIEW OF TYPICAL MOTHER BOARD ASSEMBLY

FIGURE 1



SIDE VIEW OF TYPICAL MOTHER BOARD ASSEMBLY

FIGURE 2

DIVISION

"A"	FUNCTION
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

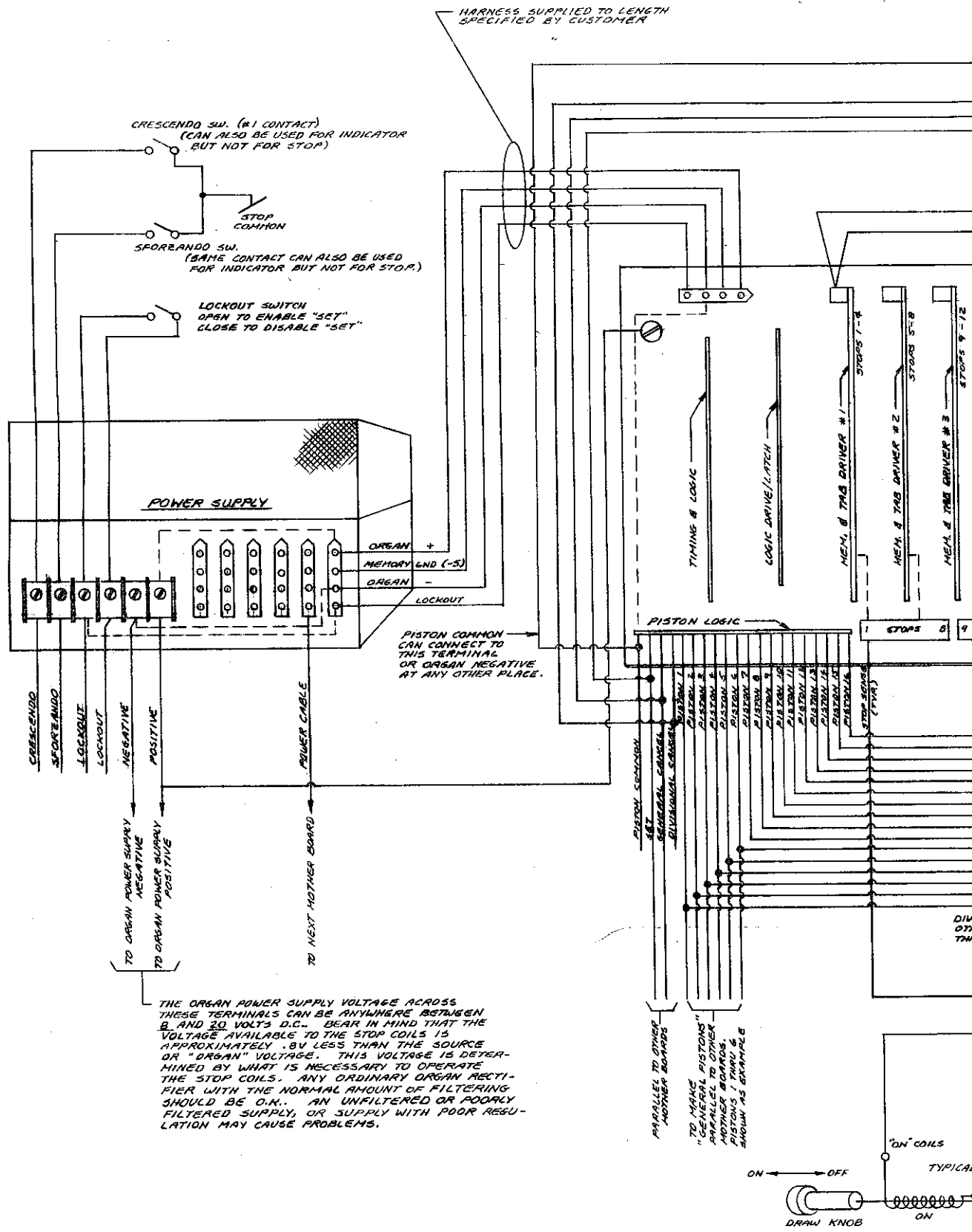
"B"	STOP IDENTIFICATION
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
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22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	

"A" = PISTON TERMINAL NUMBER
ON PISTON LOGIC BOARD

"B" = STOP NUMBER (FROM FIGURES
NUMBER 1 and 2)

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FIGURE 3



HARNES SUPPLIED TO LENGTH SPECIFIED BY CUSTOMER

CRESCENDO SW. (#1 CONTACT)
(CAN ALSO BE USED FOR INDICATOR
BUT NOT FOR STOP)

STOP
COMMON

SPORCANDO SW.
(SAME CONTACT CAN ALSO BE USED
FOR INDICATOR BUT NOT FOR STOP)

LOCKOUT SWITCH
OPEN TO ENABLE "SET"
CLOSE TO DISABLE "SET"

POWER SUPPLY

ORGAN +
MEMORY GND (-5)
ORGAN -
LOCKOUT

PISTON COMMON
CAN CONNECT TO
THIS TERMINAL
OR ORGAN NEGATIVE
AT ANY OTHER PLACE.

CRESCENDO
SPORCANDO
LOCKOUT
LOCKOUT
NEGATIVE
POSITIVE
TO ORGAN POWER SUPPLY
NEGATIVE
TO ORGAN POWER SUPPLY
POSITIVE
POWER CABLE
TO NEXT MOTHER BOARD

THE ORGAN POWER SUPPLY VOLTAGE ACROSS THESE TERMINALS CAN BE ANYWHERE BETWEEN 0 AND 20 VOLTS D.C. BEAR IN MIND THAT THE VOLTAGE AVAILABLE TO THE STOP COILS IS APPROXIMATELY .8V LESS THAN THE SOURCE OR "ORGAN" VOLTAGE. THIS VOLTAGE IS DETERMINED BY WHAT IS NECESSARY TO OPERATE THE STOP COILS. ANY ORDINARY ORGAN RECTIFIER WITH THE NORMAL AMOUNT OF FILTERING SHOULD BE O.K.. AN UNFILTERED OR POORLY FILTERED SUPPLY, OR SUPPLY WITH POOR REGULATION MAY CAUSE PROBLEMS.

TIMING & LOGIC

LOGIC DRIVE/LATCH

MEM. & TRG DRIVER #1

MEM. & TRG DRIVER #2

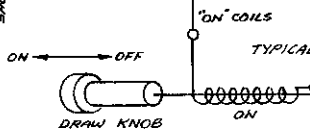
MEM. & TRG DRIVER #3

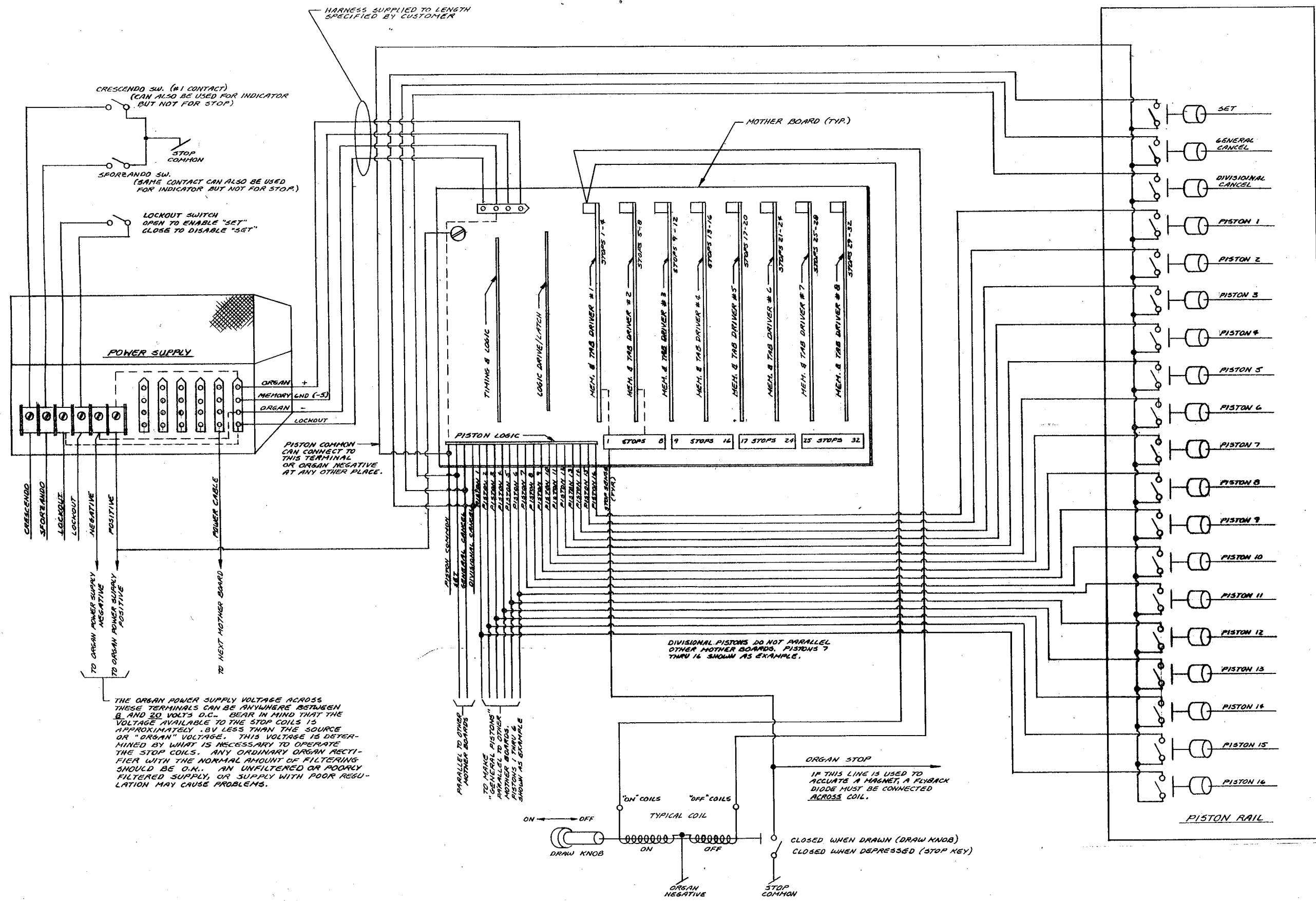
STOPS 1-8
STOPS 5-8
STOPS 9-12

PISTON LOGIC

PISTON COMMON
PISTON 1
PISTON 2
PISTON 3
PISTON 4
PISTON 5
PISTON 6
PISTON 7
PISTON 8
PISTON 9
PISTON 10
PISTON 11
PISTON 12
PISTON 13
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PISTON 92
PISTON 93
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PISTON 95
PISTON 96
PISTON 97
PISTON 98
PISTON 99
PISTON 100
STOP SETS (TRG)

PARALLEL TO OTHER MOTHER BOARDS
"TO MAKE PISTONS PARALLEL TO OTHER MOTHER BOARDS, PISTONS 1 THRU 6 SHOWN AS EXAMPLE"





HARNESS SUPPLIED TO LENGTH SPECIFIED BY CUSTOMER

CRESCENDO SW. (#1 CONTACT)
(CAN ALSO BE USED FOR INDICATOR BUT NOT FOR STOP)

STOP COMMON
SPORRANNO SW.
(SAME CONTACT CAN ALSO BE USED FOR INDICATOR BUT NOT FOR STOP.)

LOCKOUT SWITCH
OPEN TO ENABLE "SET"
CLOSE TO DISABLE "SET"

POWER SUPPLY

ORGAN +
MEMORY END (-5)
ORGAN -
LOCKOUT

PISTON COMMON CAN CONNECT TO THIS TERMINAL OR ORGAN NEGATIVE AT ANY OTHER PLACE.

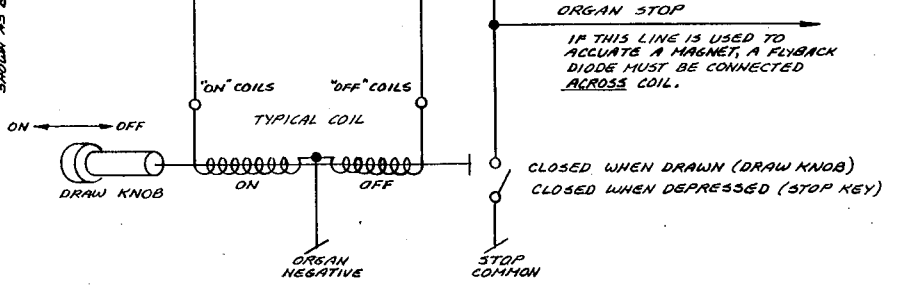
CRESCENDO
SPORRANNO
LOCKOUT
NEGATIVE
POSITIVE
TO ORGAN POWER SUPPLY NEGATIVE
TO ORGAN POWER SUPPLY POSITIVE
POWER CABLE
TO NEXT MOTHER BOARD

THE ORGAN POWER SUPPLY VOLTAGE ACROSS THESE TERMINALS CAN BE ANYWHERE BETWEEN 8 AND 20 VOLTS D.C. BEAR IN MIND THAT THE VOLTAGE AVAILABLE TO THE STOP COILS IS APPROXIMATELY 8V LESS THAN THE SOURCE OR "ORGAN" VOLTAGE. THIS VOLTAGE IS DETERMINED BY WHAT IS NECESSARY TO OPERATE THE STOP COILS. ANY ORDINARY ORGAN RECTIFIER WITH THE NORMAL AMOUNT OF FILTERING SHOULD BE O.K. AN UNFILTERED OR POORLY FILTERED SUPPLY, OR SUPPLY WITH POOR REGULATION MAY CAUSE PROBLEMS.

PISTON LOGIC
STOP 0 9 STOP 14 17 STOP 20 25 STOP 31

PARALLEL TO OTHER MOTHER BOARDS
TO MAKE "GENERAL PISTONS" PARALLEL TO OTHER PISTONS & DIVISIONAL PISTONS SHOWN AS EXAMPLE

DIVISIONAL PISTONS DO NOT PARALLEL OTHER MOTHER BOARDS. PISTONS 7 THRU 16 SHOWN AS EXAMPLE.



ORGAN STOP
IF THIS LINE IS USED TO ACTUATE A MAGNET, A FLYBACK DIODE MUST BE CONNECTED ACROSS COIL.

CLOSED WHEN DRAWN (DRAW KNOB)
CLOSED WHEN DEPRESSED (STOP KEY)

PISTON RAIL

- SET
- GENERAL CANCEL
- DIVISIONAL CANCEL
- PISTON 1
- PISTON 2
- PISTON 3
- PISTON 4
- PISTON 5
- PISTON 6
- PISTON 7
- PISTON 8
- PISTON 9
- PISTON 10
- PISTON 11
- PISTON 12
- PISTON 13
- PISTON 14
- PISTON 15
- PISTON 16