Ansaldo STS
A Finmeccanica Company
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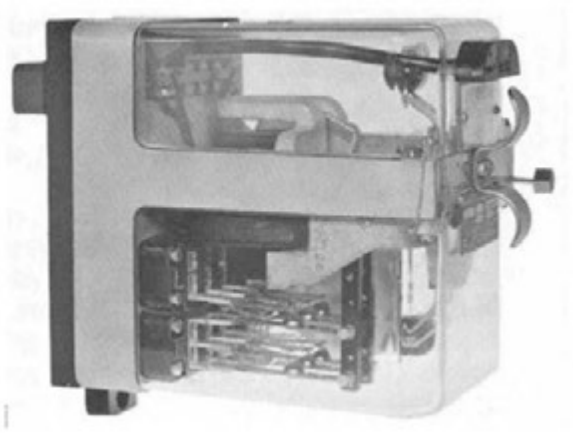
645 Russell Street, Batesburg, SC 29006

PV-250
2-Element AC Vane Relay
25 Hz

Part Number
N322555-002



- Installation
- Operation
- Maintenance

January 1999

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Revision History

Rev.	Date	Nature of Revision
Original	May 1977	Initial issue
*	October 1988	Maintenance Notice Addendum
*	January 1999	N. A.

* A revision number was not assigned when this revision was made.

Table of Contents

List of Figures

List of Tables

1. GENERAL INFORMATION

1.1. Introduction

This manual covers the PV-250 plug-in AC-vane relay used for track circuit applications. Since the relay is a two-element AC vane type, it must be provided with the appropriate equipment to provide the adequate phase displacement between the local and control (track) windings. The earlier and later designed relays have the same operating characteristics and fit into the same mounting base.

The design of the PV-250 relay conforms to all applicable AAR specifications.

1.2. Description

1.2.1. General

The PV-250 relay is factory calibrated to operate across a wide environmental range. All moving parts are enclosed in a sturdy, transparent, dust and moisture resistant cover. To ensure the relay is inserted in its proper mounting base, all relays have indexing pins. Relays lock securely in the plug-in position.

1.2.2. Coils

This relay uses a double-wound coil that may be used in series or parallel for the control element and a local element that presents the impedance to meet the specifications of specifications of Section 1.3.1.

1.2.3. Contacts

Contacts of the PV-250 relay are standard low voltage silver-to-silver impregnated carbon front and silver-to-silver back. See Figure 5-3 for an illustration of the contact assembly.

1.3. Specifications

This manual provides operating values and the parts list specific to PV-250 Track Relay N322555-002. This relay has the following general specifications:

115V Local, 25-Cycle, 48/48 Turn Track Coil

6F-4B Contacts

Local 0.128 amp. at 115V

The following subsections provide the electrical and mechanical specifications of the PV-250 relays covered in this manual.

1.3.1. Electrical Specifications

Check the current operating values using Figure 3-1 in section 3.3.2 with 15 volts more at the track transformer secondary. This will ensure that the resistance in series with the track winding is sufficient to provide suitable phase relations.

Table 1-1. Test Operating Values

TORQUE (INCH GRAINS)	TRACK COIL CONNECTED IN	± 10% PICK-UP		± 5% FULL STROKE		MIN. DROP-AWAY % OF ACTUAL P.U.	
		VOLTS	AMPS	VOLTS	AMPS	SHOP	FIELD*
275	Multiple	0.169	0.966	0.287	1.64	80	70
275	Series	0.338	0.483	0.574	0.82	80	70

* It is recommended that relays be taken out of service if the Drop-Away value falls below the value shown for field test.

The values given above are 9% higher than ideal and apply to tests using single-phase supply with resistance in series with the track winding. Calibration for current values is preferable.

Table 1-2. Operating Values at Ideal Phase Relations

TRACK COIL CONNECTED IN	PICK-UP		FULL STROKE		MIN. DROP-AWAY % OF ACTUAL P.U.
	VOLTS	AMPS	VOLTS	AMPS	
Multiple	0.155	0.884	0.263	1.5	80
Series	0.309	0.443	0.525	0.75	80

The values above are based on ideal phase relations, track volts lead line volts 93º and track amperes lead line volts 23º.

1.3.2. Mechanical

Dimensions: Height 7-1/16 in. (17.93 cm)
Width 4-15/16 in. (12.54 cm)
Depth 8-3/8 in. (21.5 cm)

Temperature: -40°F (-40°C) to +185°F (85°C)

Indexing: Determined by relay part number (see Section 2.3)

Weight: 8.0 lbs. (3.63 kg)

Mounting Base: N376442 (Old Style) - 37 oz. (1.05 kg)
N438689-003 (Improved Style) - 18 oz. (0.51 kg)

Mounting Base Dimensions:	Height 7-15/16" (20.1 cm)
	Width 4-15/16" (12.54 cm)
	Depth 2-7/16" (6.19 cm) - (Old Style Base)
	Depth 1-25/32" (4.5 cm) - (New Style Base)


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2. INSTALLATION

2.1. General

Relays plug directly into a mounting base which is secured to a rack. The only installation instructions required are for the mounting base.

2.1.1. Care in Handling

It is very important that these vane relays be handled carefully in order that no undue stresses are applied to the vane structure, which might throw the vane out of adjustment.

A piece of twine, which firmly holds the vane, is applied to the relay when it leaves the factory. The twine must be removed when the relay is placed in service, and the plug screw must be inserted after removing the twine.

2.2. Mounting Base

Secure the mounting base directly to the rack using the hardware furnished. All wiring terminates at the rear of the mounting base to solderless terminals (contact receptacles).

Mounting base details are shown in the Figure 5-4.

2.3. Relay Indexing

Relays are factory equipped with indexing pins to prevent insertion of an incorrect relay into a mounting base. Each relay is accompanied by an indexing plate which is applied to the mounting base at the time of initial installation. A typical plug-in relay with indexing pins and base with corresponding indexing plate is shown in Figure 2-1.

The following data defines the indexing that has been established for relays covered by this manual.

1. The index code always consists of four figures (such as 5501, 5502, or 5510), and is used for both the relay and the indexing plate on the mounting base. The index code for N322555-002 is 5502.

2. The index code for each relay can be determined from the relay part number and its suffix which is marked on the name plate attached to the front of the relay. The first two digits of the index code are the last two digits of the part number, and the second two digits of the index code are the last two digits of the suffix. The index number thus obtained should agree with the placement of the indexing pins in the numbered vertical rows on the back of the relay starting with the top pin and reading down.

3. The index code for each mounting base is determined by the placement of the holes in the numbered vertical rows of the large white nylon indexing plate which is affixed to the front of the mounting base. This indexing plate should not be removed from the mounting base, unless it is damaged or the indexing is to be purposely changed to accommodate a relay of a different part number.

Warning

Never drill new holes in a base indexing plate which will permit application of relays with different part numbers. Never change indexing pins on the back of a relay unless it is being converted to a new part number. Otherwise, a hazard will be created which may compromise safety circuit functions.

2.4. Receptacle Contact Springs

2.4.1. Old Style Base Only

The N376442 mounting base is normally equipped with the required quantity of solderless receptacle contact springs (J680165), and will accommodate one or two #14 or #16 wires. It can, however, be equipped with receptacle contact springs for one or two #10 or #12 wires (J680181), or for one or two #18 or #20 wires (J680179). Make certain which type of solderless receptacle contact springs accompany the mounting base before proceeding with their installation.

NOTE

These receptacle springs cannot be used in the Improved One-Piece Base.

2.4.2. Improved One-Piece Base Only

The new one-piece mounting base (N438689-003) with hardware includes a full complement of receptacle contact springs (M451142-2702) to accommodate one or two #14 - #16 wires, mounting fasteners, and tags. It can, however, be equipped with receptacle contact springs for one or two #10 - #12 wires (M451142-2703), or for one or two #18 - #20 (M451142-2701). Make certain the type of solderless receptacle contact springs that accompany the mounting base before proceeding with their installation.

Each solderless receptacle contact springs should be inspected for physical damage before proceeding with installation.

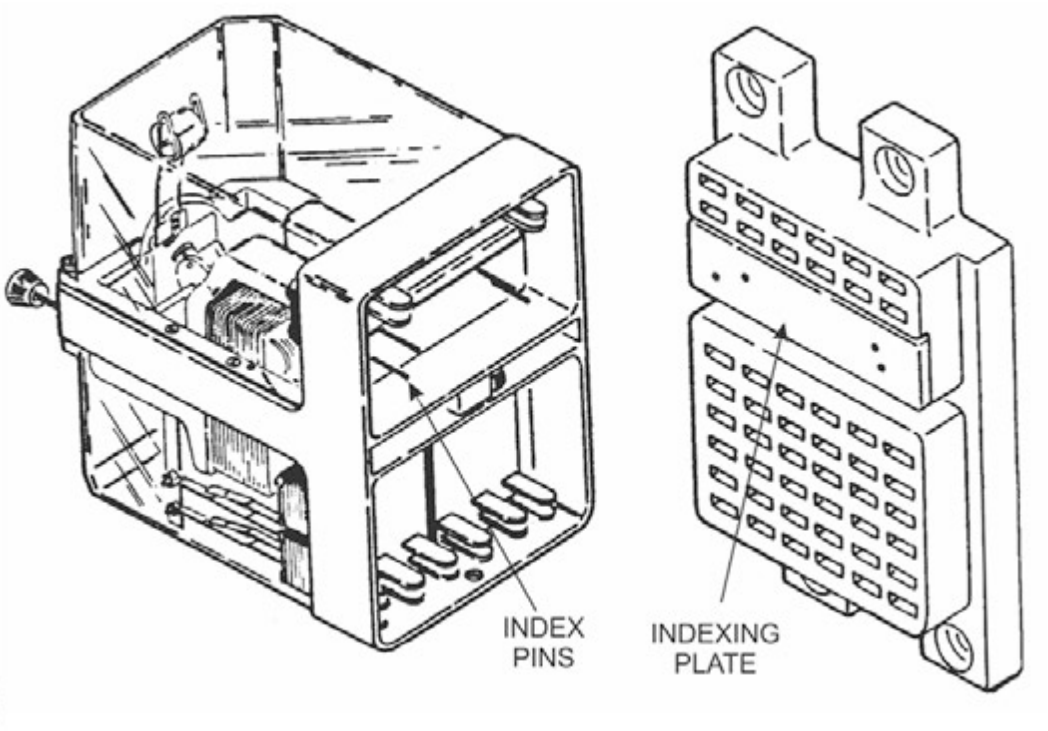

Figure 2-1. Typical Plug-in Relay and Mounting Base

The following is recommended when installing solderless receptacle contact springs after crimping wires:

1. Receptacle contact springs must be inserted into the base with the lock side down or lanced tab up (see Figure 2-2).

2. Make certain that the lanced tab is slightly compressed as the receptacle contact spring is inserted along the top of the cavity. The lanced tab could have been bent during handling, and, if so, would not provide the required contact pressure after the relay is inserted. If the lanced tab does not touch, pull it up slightly using fingers or a suitable tool.

3. After insertion, pull firmly on the wire to make certain the receptacle contact spring is locked in the cavity.

NOTE

These receptacle springs cannot be used in the Improved One-Piece Base.

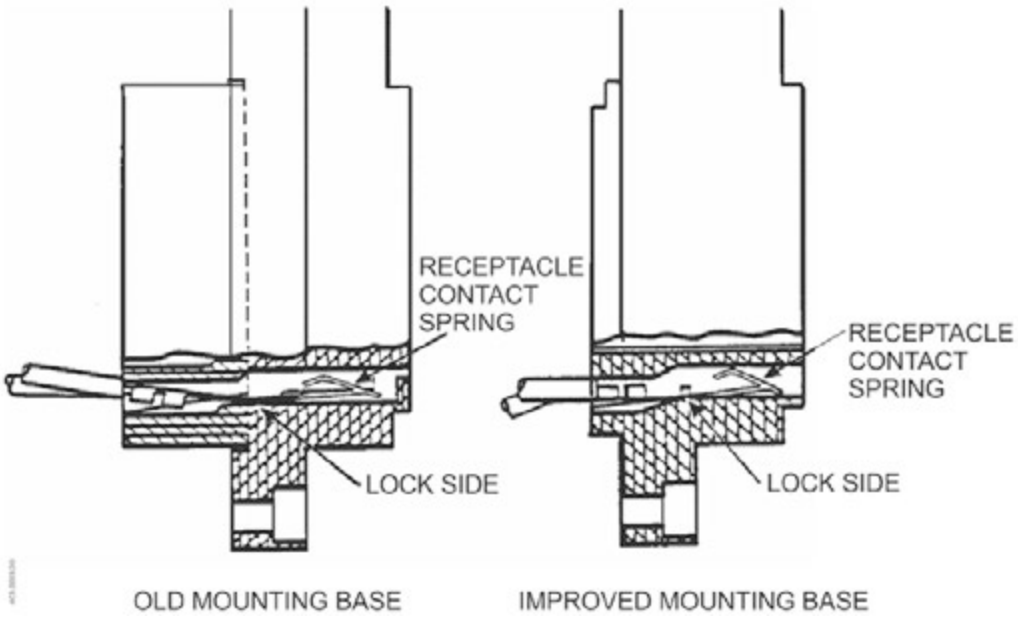

Figure 2-2. Receptacle Contact Springs Installed

2.4.3. Installing Wires in Receptacle Contact Springs

Use the following procedure to ensure a good electrical and mechanical connection between the conductor wire and the receptacle contact spring. The following table identifies the correct crimping tool to be used when installing wires in the receptacle contact spring.

Table 2-1. Crimping Tool for Installing Wires in a Receptacle Contact Spring

CRIMPING TOOL	WIRE SIZE	OLD STYLE BASE RECEPTACLE CONTACT SPRING	IMPROVED BASE RECEPTACLE CONTACT SPRING
J397138	#10/#12 AWG	J680181	M451142-2703
J397139	#14/#16 AWG	J680165 (Standard)	M451142-2702
J397188	#18/#20 AWG	J680179	M451142-2701

1. Strip 3/16 in. (0.187 in. or 0.47 cm.) of insulation from the end of the wire.

2. Place the receptacle contact spring into the jaws of the proper crimping tool. When using only one terminal, of any wire size, use the shortest terminal.

3. Partially close the crimping tool jaws against the receptacle contact spring to hold it in place. (Do not crush the receptacle contact spring barrel at this time.)

4. Insert the stripped end of wire all the way into the receptacle contact spring barrel. Squeeze the tool handles until crimping is completed and the jaws release. When using both terminals, it is more convenient to attach the first wire to the longest terminal.

5. Remove the crimped receptacle contact spring from the tool and inspect the connection. Make certain that the wire is flush with the crimped barrel, and that there are no loose strands of wire.

2.5. Relay Insertion

Orient the relay to the mounting base with the name plate right side up; then plug the relay into the base. The relay should be pushed firmly against the mounting base while depressing the latch rod. After the relay is completely seated in the base, release the latch rod and pull on the handle to ensure that the relay has locked in place.


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3. FIELD MAINTENANCE

3.1. Introduction

This section provides the necessary periodic preventive maintenance procedures which must be performed to ensure continuous, proper, and efficient operation of the PV-250 style relays covered in this manual. Field maintenance covers periodic inspections and performance tests.

3.2. Periodic Performance Test

3.2.1. Cleaning

Before inspecting and testing the relay, use a soft cloth to clean the exterior to remove any dirt or dust that may have collected, if necessary. A safe cleaning solution of alcohol and water or common laundry detergent may be used for removal of accumulated dirt, grease, etc.

3.2.2. Service Requirements

3.2.2.1. General

Track relays must be inspected and tested at least every two (2) years. The tests and inspections are to include: pick-up current, drop-away current; and visual inspection of contacts for damage or misalignment, corrosion or other contamination of parts, loose parts inside of the cover, broken seal, and cracked or broken cover

Relays not passing the above stated tests and inspections must be replaced and not returned to service until the operating characteristics and conditions are in accordance with ASTS USA specifications.

3.2.2.2. In-Service Test

Track relays not meeting test and/or calibration specifications must be removed from service for shop repair.

3.3. CALIBRATION

3.3.1. Recommended Test Equipment

Variable autotransformer (Variac) - 115 V @ 1.0 Amp.

AC Ammeter

AC Voltmeter

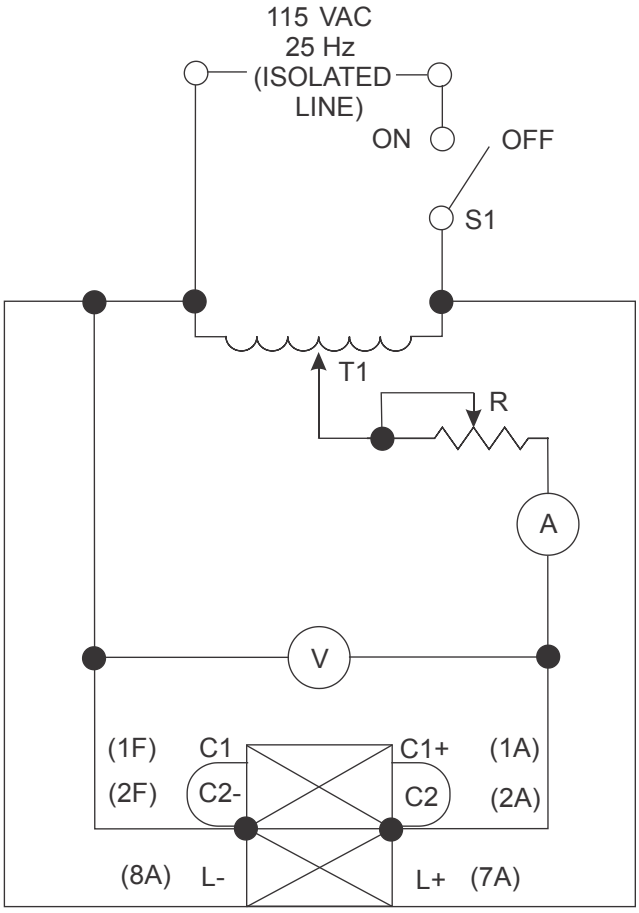
2 Resistors - variable, 0-200 ohms, 100 watts

SPST switch

3.3.2. Relay Test Procedure

NOTE

When performing calibration, set local voltage as specified to within ± 1%.



RELAY UNDER TEST
(New Style Base Contacts Shown with Parentheses)
Old Style Base Contacts Shown without Parentheses

4.01.003100

Figure 3-1. AC Vane Relay Test Circuit

1. Connect the circuit shown in Figure 3-1, with the control windings in parallel.
2. Connect circuit to 115V + 1%, AC, 25 Hz line.
3. Set Variac output control to minimum output setting.
4. At full output of Variac, adjust resistor so the current flowing is 10% above full-stroke value.

5. Slowly adjust the Variac control to increase the output until the front contacts just close and note the value indicated on the AC Ammeter. This is the pick-up value and should be within ±10% of the pick-up value specified in Table 1-1.

6. Again slowly increase the output until the vane just touches the top roller and note the value indicated on the AC Ammeter. This is the full stroke value and should be within ±5% of that specified in Table 1-1.

7. Slowly adjust the Variac control to decrease the output until the front contacts open and note the value indicated on the AC Ammeter. This is the minimum drop-away and should not be less than the percentage (specified in Table 1-1) of actual pick-up value measured in Step "5".

3.3.3. Balanced Magnetic Circuit Test

Track relays should be tested from a single phase source of the proper frequency and local voltage in accordance with Figure 3-1. In shop tests of newly overhauled relays, it should be possible to meet the values for pick-up and full-stroke shown in Table 1-1. A drop-away value lower than shown, as a percentage of the actual pick-up obtained, indicates excessive friction in the armature pivots, the vane crank connections or in the contact operating arms, which should be corrected.

3.4. CALIBRATION REQUIREMENTS

3.4.1. Test for Balanced Magnetic Circuit

With the relay standing on its back so that the vane hangs down with front and back contacts open, apply normal voltage and frequency to the local winding. There should not be any appreciable movement of the vane, particularly no tendency to close the front contacts.

3.4.2. In-Service Test

Calibration requirements will be met when the relay calibration values are the same as those given in Table 1-1 of this manual.

After any shop adjustments are made, check the calibration values (Subsection 3.3), and if they are not within the values given in Table 1-1 of this manual the relay should not be placed in service.

3.4.3. Contact Resistance

Resistance of front contacts should be measured with the armature in its full-stroke position, and resistance of back contacts should be measured with the armature fully released. Cleaned contact resistance should not exceed the following values.

Type of Contacts	Front Contacts	Back Contact
Silver-to-Silver Impregnated Carbon	0. 09	----
Silver-to-Silver	----	0. 03

Contact surfaces should not be disturbed unless there is evidence of severe pitting from excessive loading or an accidental short through the contacts. When contacts must be dressed, refer to Subsection 4.2.1 and 4.2.2.

4. SHOP MAINTENANCE

4.1. Introduction

This section provides the information necessary to perform shop level repairs of the PV-250 style relays covered in this manual. In general, relays arriving at the shop for repair have been checked in the field and have been found to perform unacceptably or have been physically damaged.

4.2. Cleaning and Inspection

Before inspecting the relay and initiating repairs, use a soft cloth to clean the exterior carefully to remove any dirt or dust that may have collected. A safe cleaning solution of alcohol and water may be used for removal of accumulated dirt, grease, etc.

Inspect the relay exterior for signs of physical damage, such as cracked or broken cover, cracked or damaged housing, and damaged and or missing contact block terminals and indexing pins. If severe external damage is found, a careful inspection of the interior components should be made for obvious physical damage.

4.2.1. Recommended Cleaning Materials

Table 4-1. Recommended Cleaning Materials

TOOL	ASTS USA PART NUMBER
Burnishing Tool, P.K. Neuses Co. No. 3-316	J397187
Burnishing Tool, P.K. Neuses Co., No. N318 (Heavy Duty)	J397187-001
Paper Cleaning Kit (50 strips, 5/8" x 7½")	J793094
Paper Strip, strips cut from 67 pound white Springhill Vellum Bristol Paper	J793094

Individual items from the kit are also available by ordering the part number designated beside each item.

Also recommended (commercially available):

Emory Paper (Wet or Dry): 600 Grit, cut in strips

Alcohol #1 Solvent (Ethyl Alcohol Proprietary 190 or Equivalent)

NOTE

In the final cleaning procedures outlined in the following sections, it is recommended that all silver contacts be cleaned first, followed by all silver impregnated carbon contacts, to prevent contamination of the silver tips with residue that adheres to the cleaning tool after cleaning the silver impregnated carbon contacts.

When using the paper strip, clean the back contacts first and the front contacts. Discard the paper strips when dirty.

4.2.2. Contact Cleaning Procedure

4.2.2.1. Contacts that are Severely Burned

1. Using a 600-grit emery paper strip, folded with grit side out so that both contacts can be burnished simultaneously, stroke the contacts in the direction of the contact wipe.
2. Using the burnishing tool, stroke the contacts several times in the direction of the contact wipe.
3. Place the paper strip between the open contacts, then close the contacts and withdraw the paper strip.
4. Repeat Step “3" several times, if necessary.
5. Using the alcohol spray, give the contacts a degreasing/wash.
6. Place the paper strip between the open contacts, then close the contacts and withdraw the paper strip.
7. Repeat Step “6" several times, if necessary.

4.2.2.2. Contacts with Heavy Tarnish, Slightly Rough or Pitted Surface

1. Perform the procedure in Section 4.2.2, Steps “2" through “7."

4.2.2.3. Contacts with Surface Film or Oxidation (not Pitted)

1. Perform the procedure in Section 4.2.2, Steps “6" and “7."

4.3. Check-Out Procedure (Performance Test)

Perform calibration in accordance with Subsection 3.3.

4.4. Repairs and Replacement

Since the contacts are the major wearing parts in this relay, in most cases the relay can be restored to proper operation by dressing and readjusting them.

4.4.1. Recommended Tools and Test Equipment

Screw Driver - Torque Measuring
Thickness Gauges - 0.001 - 0.060 in.

4.4.2. Disassembly

Dismantle the relay only to the degree necessary to complete repairs. Refer to the Section 5 for part information and location of parts. In general, to dismantle the plug- in relay, proceed with the following sequence:

1. Remove relay cover seal.
2. Carefully remove plastic cover.
3. Remove the vane assembly as required.
4. Remove contact block as required.
5. Remove Local/Control Field as required.

4.4.2.1. Vane Assembly Removal

Remove the bottom roller stop by bending the left bracket, looking at the relay, about 1/4" to the left. The brackets should not be moved forward or to the rear. Disengage the contact operating arms from the clips on the heel contact springs by pulling the arms forward at the lower ends. Remove all bushings and pins from these arms. Remove the counterweight nuts from the front end of the vane assembly and loosen the look nuts from the trunnion screws.

To remove the vane, place the relay on its mounting surface with the contacts forward. A piece of paper may be inserted in the air gap on each side of the vane to protect it from being scratched by the pole pieces during removal. Turn the trunnion screws out until they are flush with the inside surface of the support casting. Remove the trunnion lock nuts from the shaft. Lower the shaft until the vane edge rests on the machined slot of the contact blocks. With the operating arms held clear of the heel springs, move the shaft forward and up until the upper back contact heel springs (No. 4 and 5 can be pushed in back of the shaft). Then rotate the counterweight stud toward the contacts and slide the hub out between the heel springs and the roller stop guide. This will require a slight deflection of the upper front heel contact springs. The crank pins and contact operating arms can then be removed after the vane is out of the relay.

The foregoing procedure applies to a six-front, four-back relay with a machined slot in the contact blocks to accept the vane and machined slots in the relay frame to allow the trunnion screws to be backed out flush with the inside surface of the support casting.

Relays with fewer contacts and machined slots in the contact blocks, such as the two-front, two-back relay, follow the same general procedure except that removal of the vane past the contacts is more readily accomplished.

A limited number of early production relays did not have the machined slots in the contact blocks and the relay frame. Also, a limited number had the machined slot in the contact block but not in the relay frame. In order to remove the vane from a relay with no machined slots, it is necessary to remove the contact blocks entirely and lower the support casting sufficiently to allow the trunnion screws to clear the relay frame. Relays with only the machined slot in the contact blocks require that the support casting be lowered sufficiently to allow removal of the trunnion screws. The support casting should then be put back in place and the vane removed as formerly described in detail.

If it is necessary to remove the fields from the supporting bracket, care must be used in reassembling to make sure that the air gap is between 0.080 inch and 0.085 inch.

4.4.3. Reassembly

Reassembly is accomplished generally in the reverse order of disassembly. Do not over-tighten or force parts when reassembling a relay. The following Subsections provide additional instructions to be followed during reassembly of this relay. Upon completion of reassembly, calibrate the relay as directed in Subsection 3.3.

4.4.3.1. Installing Vane Assembly

The pivots and trunnion bearings should be checked for excessive wear and should be wiped clean with a dry, lint-less cloth before reassembling the vane. The reverse procedure to that for removal should be used. The contact operating arms and crank pins should be assembled on the vane cranks first, then the vane should be inserted. At least one of the trunnion screw lock nuts should be started on the trunnion screws in advance, but it may be found necessary to slide the other nut on one end of the vane shaft in order to bring it into position. Care must be used in tightening the trunnion screws so as not to damage the pivots. These screws should be adjusted to center the vane in the air gap and to provide 0.010" to 0.016" end play of the vane shaft and then should be locked in position with the lock nuts.

The stroke of the vane is established by adjusting the roller stop brackets to permit maximum travel of the vane. In either extreme position of the vane permitted by the roller stops (rollers at the top of the slot) the buffer clips on the vane should be 3/32 inch from the cores. This provides for maximum travel of the vane and avoids any possibility of the clips ever becoming wedged in the air gap.

A check should be made that the heads of the crank pins have at least 1/16" clearance from the lock nuts on the trunnion screws when the pin and vane shaft are shifted to make this clearance minimum and the pins securely locked at the split ends so that this clearance cannot be reduced. The operating arms must swing free without any tendency to bind.

4.4.3.2. Installing Operating Arms

Operating arms should be checked to see that warpage does not exceed 0.010".

The operating pins and bushings should be assembled and pushed into the clips on the heel contact springs. The lower clips should have moderate tension to hold the bushings in place once they are assembled.

The clips may be closed in by the use of pliers as shown in Figures 4-1 and 4-2. All bushings should be positioned with the flanges against the heel clips.

With the side play of the operating arm taken up in either direction, the heel spring supporting members should be bent sideways using alignment tool J397164-0020, as shown in Figure 4-3, so that there is clearance of not less than 0.005" nor more than 0.055" to each contact bushing. The jaw of the tool should be applied over the portion of the supporting member where it is riveted to the contact spring.

Check to be sure that all split pins in the operating arm connections are properly spread.

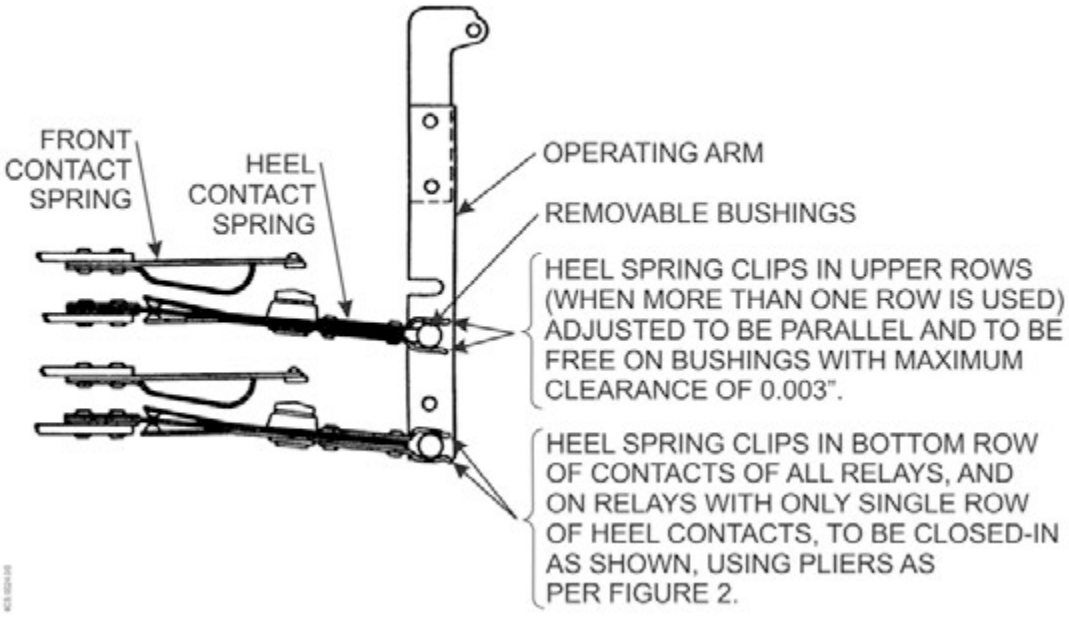


Figure 4-1. Adjustment of Heel Spring Clips

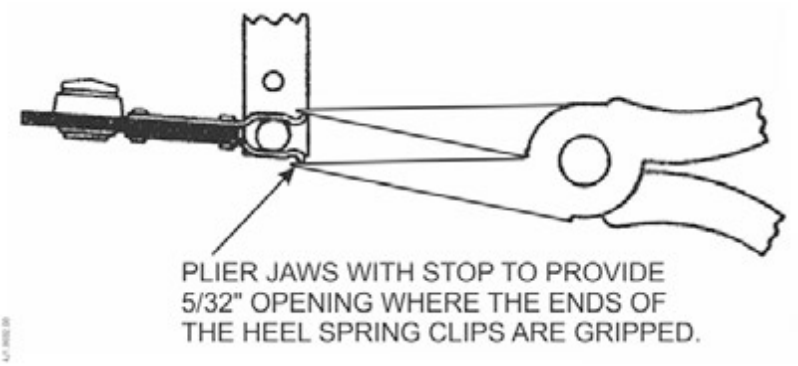


Figure 4-2. Method of Closing in the Lower Heel Spring Clips

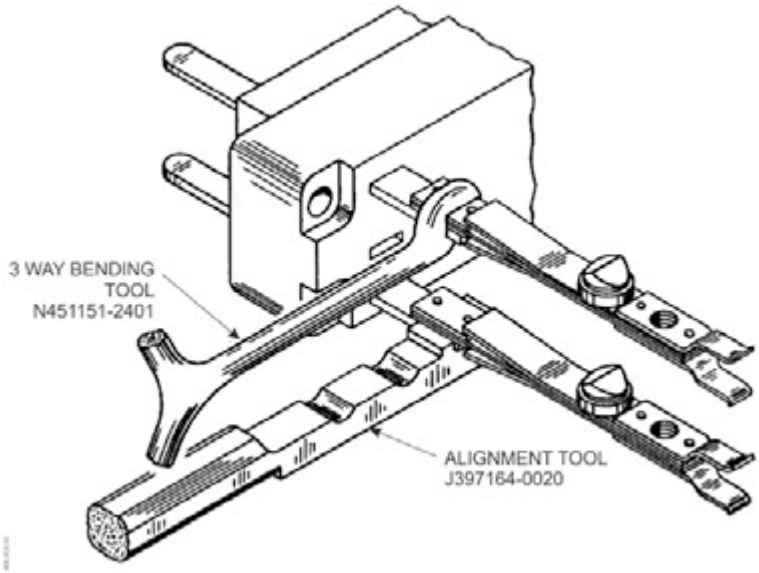


Figure 4-3. Applicaton of Bending Tools

4.4.4. General Parts Replacement

4.4.4.1. Replacing Contact Block

If the contact block is to be replaced by another, remove the old block, then use a small punch to remove the small dowel pins. Attach the new block with the four screws. Run a #42 drill (0.0935 Diameter) through the dowel pin holes into the epoxy contact block for a total depth of 9/16" + 1/32 - 0.

NOTE

Replacement contact blocks MUST be of the same general design.

Carefully install the dowel pins, tapping in until they are flush with the aluminum surface.

If it is necessary to install a used contact block from another relay, remove only one of the dowel pins from the aluminum frame. Carefully press the block on the remaining pin and fasten in place with the screws. One dowel pin will adequately hold the block in place. Install the contact block mounting screws and torque them to 10 ± 2 inch pounds.

Do not over-tighten or force parts when reassembling a relay. Upon completion of reassembly, calibrate the relay as directed in Subsection 3.3.

4.5. Adjustments

All adjustments of contacts should be made by bending the brass support member with the bending tool applied between the rivets that fasten the contact spring to it. Because of the effect of the weight of the contact tips, all checks of contact adjustment should be made with the relay in the normal upright position.

4.5.1. Recommended Tools

Gap Gauge - 0.001" to 0.060"

Gram Scale - 0 to 30 grams

Pliers (Heel Clip)

Bending Tool - J397164-0020

Bending Tool - N451151-2401

Adjustable Torque Arm - N171156

4.5.2. Contact Adjustments

4.5.2.1. Initial Contact Adjustment

a. Front and Back Contacts

All front and back contact springs should be adjusted to have an initial pressure of 20 grams (10 grams each tip). This may be reduced to 12 grams, corresponding to 6 grams at each tip, as required to meet calibration values. On the back contact springs, a gram scale applied at the center of the contact tip should just barely move the flexible bronze spring away from the curved stop member. The stop member should be bent if necessary, not the spring, in obtaining this adjustment. In order to make this check on the front contact springs, using the scale, the spring

assembly will have to be checked in the inverted position and the pressure should be 18 grams (9 grams each tip), to compensate for the weight of-the contact tip. The contact buttons of the bifurcated springs should close at the same instant.

b. Heel Contacts

The design of heel contact provides a flexible hinge arrangement with a rigid assembly on the outer part of the member. The thin center spring should be straight and the projection, on the upper and lower pressure plates should both bear against the thin center spring. This heel spring assembly should deflect through its full motion - with very slight pressure from the operating arm. The heel spring has to be handled carefully in order not to distort the thin center member.

The heel springs should be adjusted so that when the relay is held with the base horizontal and the contact springs pointing downward, the heel spring will take a free position when not connected to the operating arm without appreciable bias either toward the front or back contacts.

4.5.2.2. Final Contact Adjustments

The front and back contact springs should be lined up with their associated heel springs using alignment tool J397164-0020 as explained for the heel contact springs.

The normal contact adjustment provides 0.031" compression of the front contacts with the vane just touching the upper roller stop, 0.025" compression of the back contacts when the vane just touches the lower roller stop, and 0.025" opening of the back contacts with the fronts just barely closed. These adjustments can be obtained by using the proper section of 3-way bending tool N451151-2401 applied as shown in Figure 4-3. Set the front contacts to have 0.055" opening with the vane resting against the lower roller stop, then adjust the back contacts so that they have 0.025" opening with the fronts just barely closed. When the vane is up against the upper roller stop, the opening of the back contacts should check approximately 0.055", and as a further check, each front contact spring should have approximately 0.010" opening from its stop spring.

When the vane is touching the lower roller stop, each back contact spring should similarly have approximately 0.010" opening from its stop spring.

Recheck calibration per Section 3.3.

4.5.3. Counterweight Adjustment

The values for vane torque given in Table 3.3 refer to the counterweight torque needed to just balance the vane so that the front contacts just barely close when the relay is in the normal mounted position without current in the windings and the case is tapped lightly. Unless the adjustment of the counterweight nut or the heel contact springs has been changed, or the operating values are not met, this check will not ordinarily have to be made. In general, it is permissible for the torque to be more than the value shown, provided the operating values are correct.

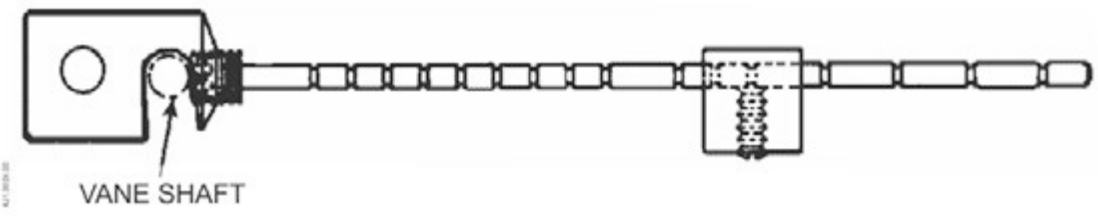


Figure 4-4. Adjustable Torque Arm

A torque arm Figure 4-4, when used, should be slipped on the vane shaft of the relay with the opening of the slot at the bottom, as shown. Hold it in place by turning the arm, which is threaded on the end, until it is tight against the vane shaft. The small weight on the arm should then be moved to give the desired counterweight, and the counterweight nuts on the relay adjusted so that the front contacts of the relay will just make with the torque arm in a horizontal position. This can be most easily determined by tapping the relay case lightly.

The notches on the arm are spaced to provide the counterweights ordinarily used, with the small weight in the notch nearest the vane shaft a counterweight of 100 inch-grains as indicated; in the second notch 125 inch-grains; in further 25 inch-grain steps to 300 inch-grains and 50 inch-grain steps to 600 inch-grains, except an extra notch at 375 inch-grains.

Adjust the counterweight nuts on the vane so that a torque as specified in Table 3.3 is required to just close the front contacts. This torque should be measured with the relay in its normal operating position and with all operating arms connected to the heel contacts, using an adjustable torque arm.

At least 1/16" clearance should exist between the end of the counterweight screw and the main support casting. The counterweight lock nut shall be securely locked and the end of the screw spread slightly to prevent the nuts backing off.

4.5.4. Inspection for Loose Counterweights and Loose Trunnion Screw Locknuts

WARNING

The following procedure involves the opening of a vital relay. This procedure must be performed by individuals qualified to work on vital relays.

Instructions for inspecting for loose counterweights and loose trunnion screw locknuts:

1. Remove the bottom cover from the relay. This exposes the contact assembly. Exercise extreme caution not to disturb the adjustment of the contacts. Remove nameplate to gain access to the counterweight assembly on the vane crank.

2. Carefully rotate the vane so that the counterweight assembly is visible. This will reveal one or more counterweights, with or without a locknut, on the counterweight screw.

3. As shown in Figure 4-5, check to determine if (a) the counterweight and locknut are tight, (b) at least two threads are visible on the counterweight screw end, and (c) the split screw end is slightly spread apart. Tighten any loose counterweights and locknut.

4. Perform a visual inspection of the relay. Check for rubbing vane, debris inside the relay, and for obviously misaligned contacts. Check to see that the vane is approximately centered and that it has the correct amount of end play (0.010 to 0.016 inch). Readjust if required. Check the vane for freedom of movement. Check to see that the operating arms, clips and bushings are in the proper position and are free to move. Using a wrench, check the trunnion locknuts for tightness. Tighten any that are loose.

5. Perform an electrical calibration test in accordance with the applicable service manual. If the relay passes the field limit requirements outlined in the service manual, apply glyptal to the exposed threads of the counterweight screw and trunnion locknut, as shown in Figure 4-5. The relay can then be sealed and placed in service.

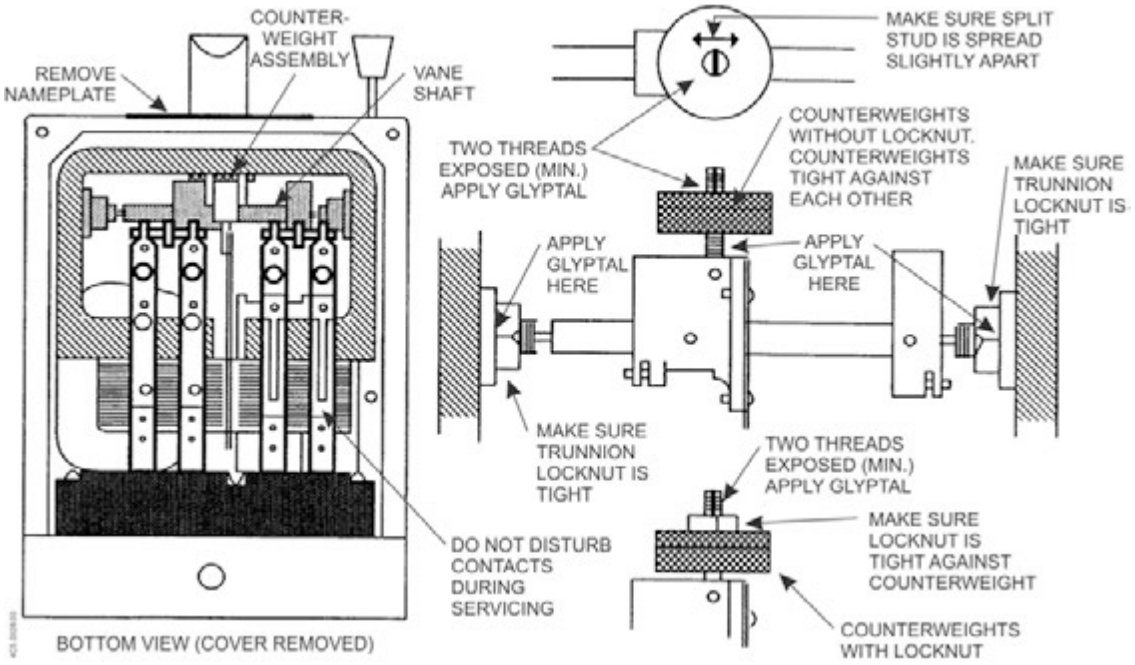


Figure 4-5. Inspecting Loose Counterweights and Loose Trunnion Screw locknuts

5. PARTS LISTS AND DIAGRAMS

5.1. MAIN ASSEMBLY N322555-002

See Figure 5-1

Table 5-1. Main Assembly Parts Listing

ITEM	DESCRIPTION	ASTS USA PART NUMBER	NOTE
1	Frame	M376046	
2	Rod, Latch	M375913	
3	Knob Knurled Th. Nut	J770536	
4	Nut	M395496	
5	Latch	M321728	
6	Pin S. Stl. Rl. Elas. Stop	J048716	
7	Spring	M321861	
8	Pin - Roll	J487087	
9	Screw	J522042-001	
10	Bottom Cover	M436922	
11	Screw, #8 - 32 x 7/16" Fil. Stl. T.P.	J522042	
12	Gasket	J047081	
13	Screw, #8 - 32 x ¼" Rd. Stl. T.P.	J052639	
14	Handle	M321821	
15	Washer, #10 Int. Tooth, Ph. Brz.	J047710	
16	Screw, #10 - 32 x 3/8" Philp.	J525277	
17	Tag, Calibration	S002036	
18	Wire Seal	A043013	
19	Seal	J079351	
20	Plate, Name	M437859	
21	Screw, #4-40 x 3/16" Rd. Stl.(F) TP Par.	J525024	
22	Bracket, Support	M375890	
23	Screw, #10 - 32 x ½" Flat Stl. T.P.	J052091	
24	Field, Control	N377070	
25	Field, Local	N286393	
26	Vane Assembly	N380678	
27	Screw, Trunnion	N124889	
28	Bushing	M232934	
29	Bushing Insulation	M283459	
30	Roller	M069693	
31	Bracket, Upper Roller	M397483	
32	Bracket, Lower Roller	M161753	
33	Plate Clip	M090506	
34	Lock, Bracket	M109074	
35	Rivet 11 x 5/16 Rd. Ph. Bz	J049813	
36	Pin	M381128	
37	Washer Tension T.P. 012 x 9/32" O.D.	J475104	
38	Pin	M381129	
39	Pin	M232031	
40	Pin	M232935	
41	Block, Terminal	M386480	
42	Screw, #8-32 x 7/16" Rd4 St.	J525106	
43	Indexing Pin	J487090	
44	Parts Bag	N349711-5502	

ITEM	DESCRIPTION	ASTS USA PART NUMBER	NOTE
45	Block, Contact	N376449-0001	A
46	Block, Contact	N376450-0001	A
47	Screw, #8-32 x 7/8" Rd. Stl. T.P.	J052603	
48	Arm, Operating	N390324	
49	Counterweight	M451175-0303	
50	Counterweight Lock Nut	M083947	
51	Top Cover Device Testing	N384546	
52	Screw, #6-32 x ¼" Fil. Hd.	J052485	
53	Washer, Arc Spr. Stl.	J475114	
54	Term Pre Insul Diag. G	J730077	

NOTE A: When ordering the contact block, be sure to include the “-0001" suffix with the part number. This assures proper processing of the contacts for optimum performance in these relays.

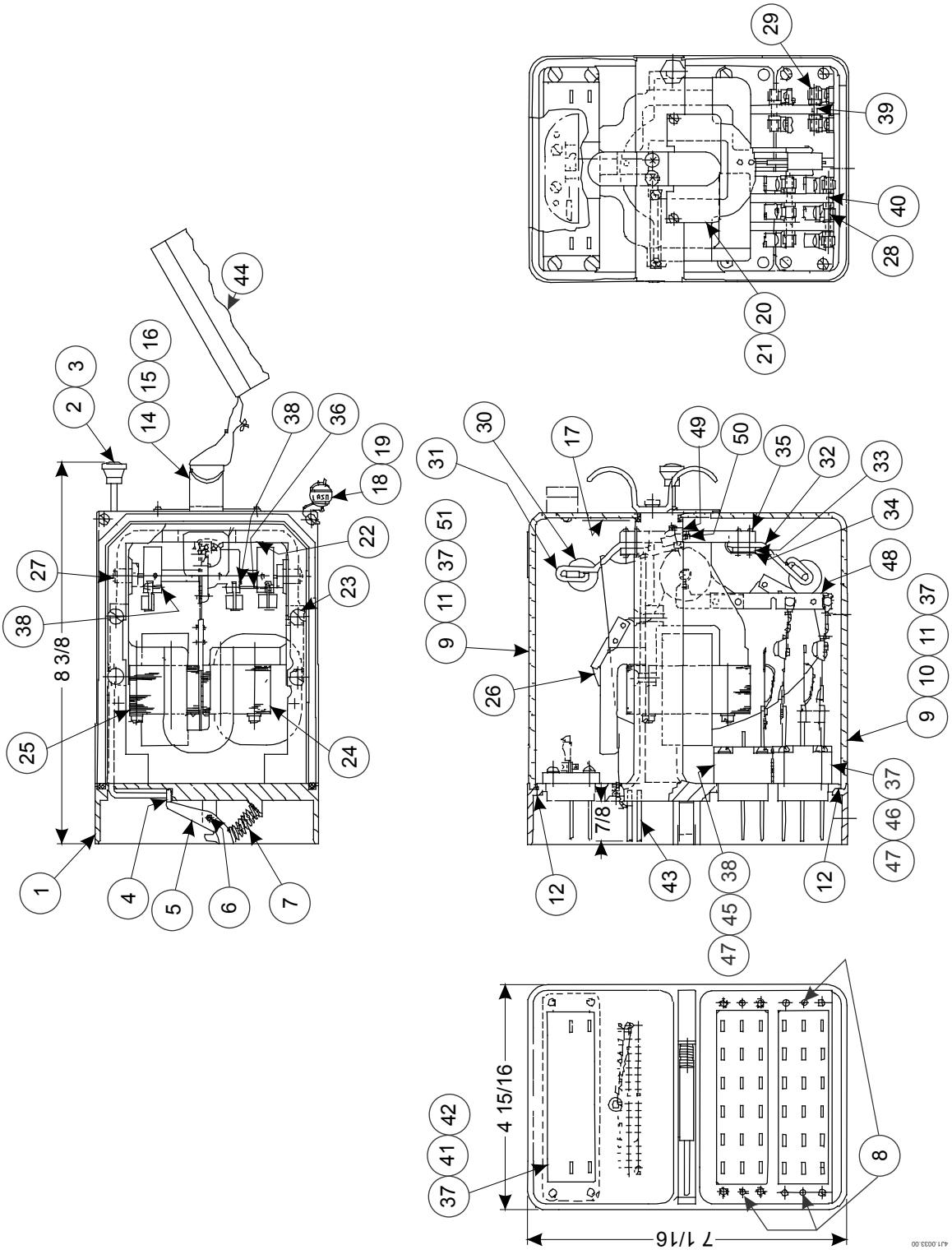


Figure 5-1. Assembly Drawings for PV-250 Part No. N322555-002

5.2. Parts List For Vane N380678 Used on Relay Pv-250 with Part No. N322555-002

See Figure 5-2.

Table 5-2. Vane Assembly Parts List

ITEM NUMBER	DESCRIPTION	SATS USA PART NUMBER
1	Vane Crank	N380677
2	Vane	M231734
3	Clips Buffer	M130658
4	Rivets 14 x 5/16 Rd. Ph. Bz.	J049804
5	Washer	M091997
6	Rivets 11 x 5/16 Rd. Ph. Bz.	J049812
7	Crank L.H. Oper. Arm	M381118
8	Crank R.H. Oper. Arm	M381119
9	Rivets 14 x 13/16 Rd. Ph. Bz.	J049819

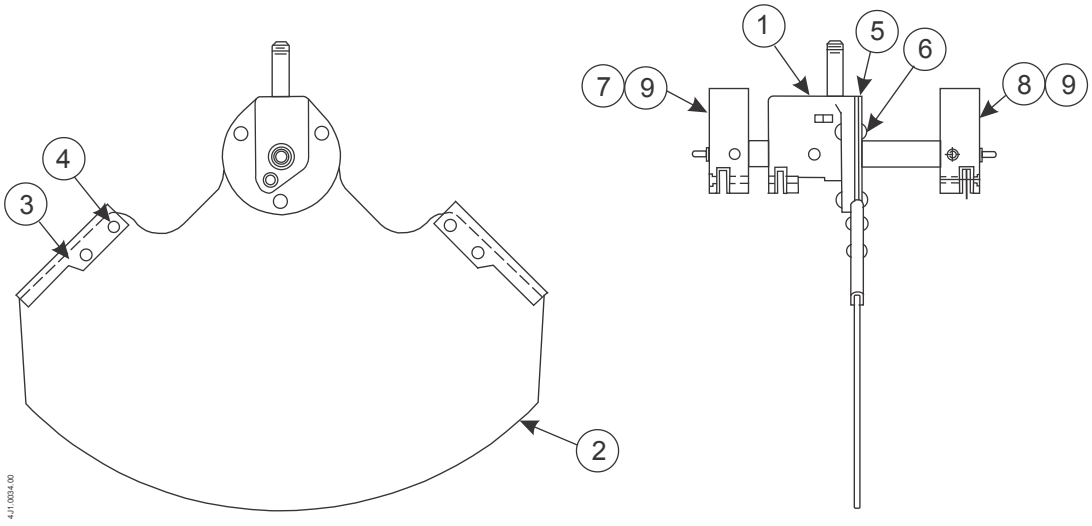


Figure 5-2. Parts Location for Vane Assembly (N380678)

5.3. Parts List for Contact Blocks with the Following PC Numbers: N376779 (Ref. “A") and N376450 (Ref. “B")

Used on Relay PV-250 - N322555–002.

See Figure 5-3.

ITEM	DESCRIPTION	ASTS USA PART NUMBER	REFERENCE
1	Spring Contact	N376006	B
2	Spring Contact	N376007	A-B
3	Spring Contact	N376002	B
4	Spring Contact	N375981	A
5	Spring Contact	N376003	A-B

CONTACT BLOCK	CONTACT SECTION ROW 6	5	4	3	2	1
N-376449	A	B	–	C	C	C
N-376450	E	E	–	D	D	D

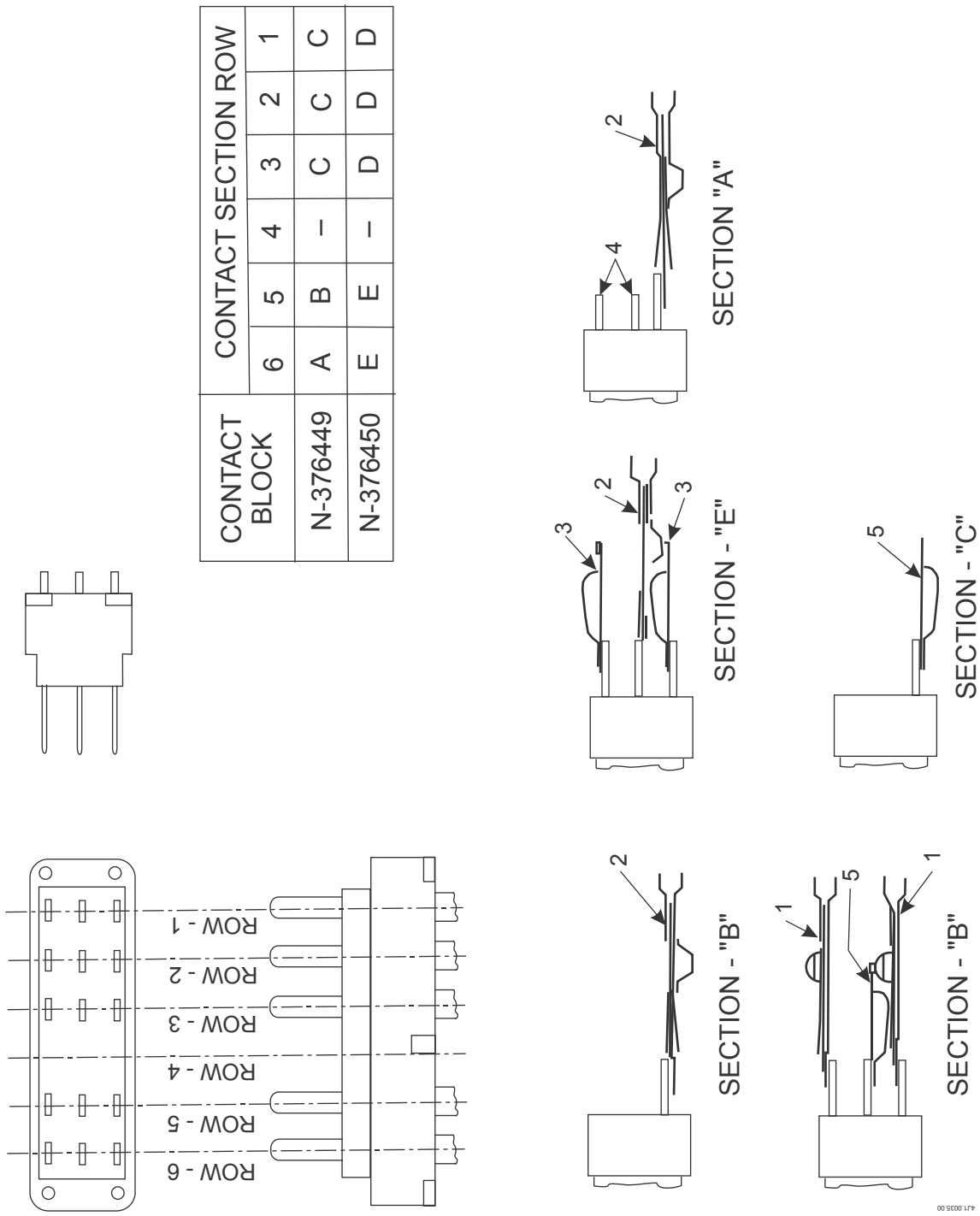


Figure 5-3. Contact Block Drawings

5.4. Parts List for Mounting Base N376442, Used on Relay PV-250 with Piece No. N322555-002

See Figure 5-4.

ITEM	DESCRIPTION	ASTS USA PART NUMBER	NOTE
1	Mounting Base Complete	N376442	A
2	Mounting Base Only	N376442-009	
3	Tag	J075828	
4	Contact Receptacle #10 to #12 Wire	J680181	
	Contact Receptacle #14 to #16 Wire	J680165	
	Contact Receptacle #18 to #20 Wire	J680179	
5	Meter Test Plug	M322965	
6	Insulated Test Plug (for opening any coil or contact circuit and for removing receptacle springs.)	J772383	

Note A: When Mounting Base Complete is ordered, a muslin bag of parts 4-1/8" x 5-1/2" is included in the inner carton with the mounting base and instruction prints.

Bag Contents:

QUANTITY	ITEM	ASTS USA PART NUMBER
2	Tags	
4	#4-40 x 3/16" Rd. Hd. Screws	
4	1/4" steel plate washers	
4*	1/4"-20 x 1-14" Rd. Hd. Stl. Screws	
4*	Washers	
4*	1/4" Steel Lock Washers	
4*	1/4"-20 Steel Hex Nuts	
Required Quantity	Contact Receptacles (solderless) for #14 to #16 wire.	J680165
	If other wire size is used, request the proper part number as shown in Item 4 when ordering base complete (i.e., N384243 except when using contact receptacles solderless J680181).	

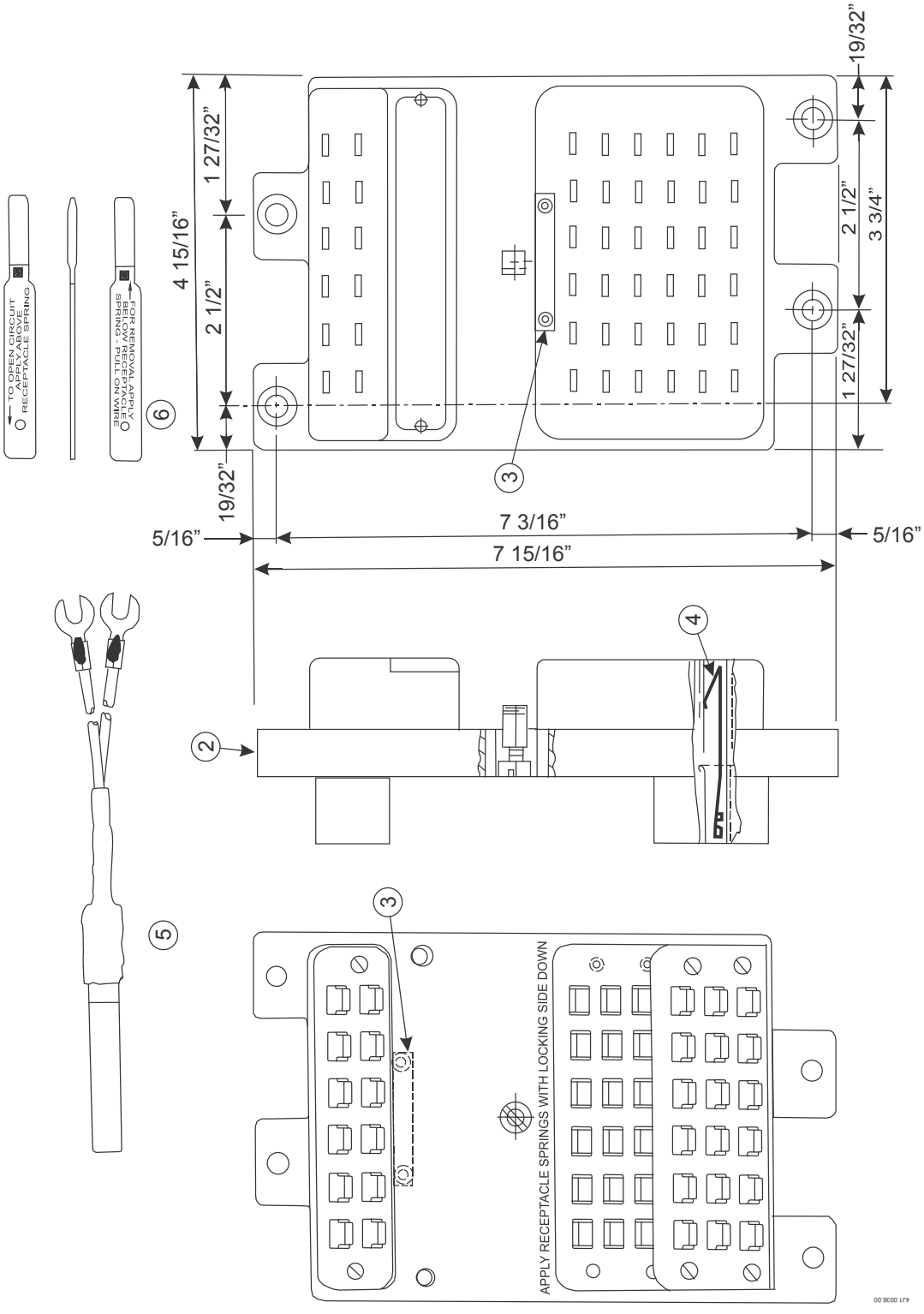


Figure 5-4. Mounting Base Assembly

6. TECHNICAL SUPPORT

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team in the United States at 1-800-652-7276 or by e-mail at railteam@ansaldo-sts.us.

End of Manual