



Innovation in Mobility

FOLDOVER™
FR2-3000 Series
Low-Floor Vehicle
Access Ramp
for
Transit Buses

PRINT

SERVICE MANUAL

This Ricon service manual is for use by qualified service technicians, and is not intended for use by non-professionals (do-it-yourselfers). The manual provides essential instructions and reference information, which supports qualified technicians in the correct installation and maintenance of Ricon products.

Qualified service technicians have the training and knowledge to perform maintenance work properly and safely. For the location of a Ricon authorized service technician in your area, call Ricon Product Support at 1-800-322-2884.

REVISION RECORD

| REVISION | PAGES | DESCRIPTION OF CHANGE | ECR/ECO |
|----------------|---------------|--|-----------|
| 32DFR106. D | 5-10 | Updated drawing for reference # 7 (18668). | 3774/None |
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| | 5-5, 5-7, 5-9 | Added 19975 Bushing Rebuild Kit to parts lists. | |
| | 5-6 & 5-7 | Added 17192 Heater Mat (reference # 16) to drawing and parts list. | |
| | 3-11 | Added J5 to diagram. | |
| | 1-2 | Changed warranty coverage to two years, P&L. | |
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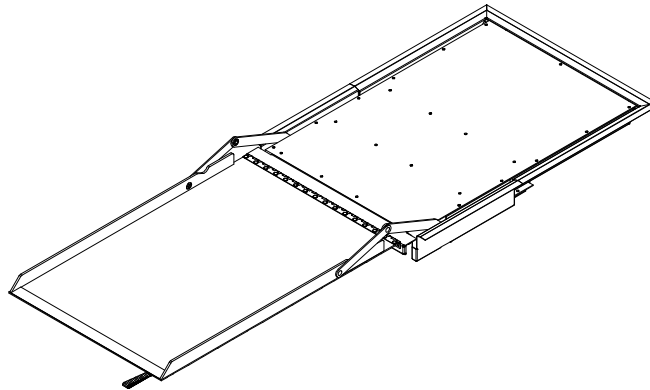
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I. FOLDOVER RAMP INTRODUCTION

This introduction applies to the Ricon FoldOver Low-Floor Vehicle Access ramp when installed in transit vehicles. The remaining chapters in this service manual contain a product description, operating instructions, maintenance instructions, and a spare parts list for transit vehicle applications of the Ricon FoldOver ramp.



A. RICON PRODUCT SUPPORT

If you have questions about this manual, or you need additional copies, please contact Ricon Product Support at one of the listed locations. Also, refer to the Ricon world wide website at: www.riconcorp.com

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B. RICON TWO-YEAR LIMITED WARRANTY

The following warranty provides two years of limited coverage for the Ricon FoldOver ramp.

RICON FOLDOVER RAMP TWO-YEAR LIMITED WARRANTY

Ricon Corporation (Ricon) warrants to the original purchaser of this product that Ricon will repair or replace, at its option, any parts that fail because of defective material or workmanship as follows:

- Repair or replace parts for a period of two years starting from the date ramp is put into service. Obtain a complete list of parts covered by this warranty from Ricon Product Support.
- Labor costs for specified parts replaced under this warranty for a period of two years from the date put into service. A Ricon rate schedule determines parts covered and labor allowed.

This Warranty Does Not Cover:

- Malfunction or damage of product parts caused by accident, misuse, lack of proper maintenance, neglect, improper adjustment, modification, alteration, mechanical condition of vehicle, road hazards, overloading, failure to follow operating instructions, or acts of nature (i.e., weather, lightning, flood).

NOTE: Ricon recommends this product be inspected by an authorized Ricon service technician at least once every six months, or sooner if necessary. Perform required maintenance at this time.



WARNING!

THIS PRODUCT HAS BEEN DESIGNED AND MANUFACTURED TO EXACT SPECIFICATIONS. ANY MODIFICATION OF THIS PRODUCT CAN BE DANGEROUS.

This Warranty is Void If:

- The product is not installed and maintained by an authorized Ricon service technician.
- The product is modified, in any respect from its original design, without written authorization from Ricon.

Ricon disclaims liability for any personal injury or property damage that results from operation or use of a Ricon product that is modified from the original Ricon design. No person or company is authorized to change the design of this Ricon product without written authorization from Ricon.

The Ricon obligation under this warranty is exclusively limited to the repair or exchange of parts that fail within the applicable warranty period.

Ricon assumes no responsibility for expenses or damages, including incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply.

Important: The warranty registration card must be completed and returned to Ricon within 20 days after product installation to validate this warranty. The warranty is not transferable.

The warranty gives specific legal rights. There may be other rights that vary in each state.

C. SHIPPING INFORMATION

Check the received product for freight damage. Make damage claims immediately to the freight carrier.

Be sure the ramp assembly contains all items listed on the included bill-of-material. Please report any missing items immediately to Ricon Product Support. Return the completed warranty and owner registration cards to Ricon within 20 days to validate.

D. GENERAL SAFETY PRECAUTIONS

Adhere to the following safety precautions during installation, operation, service, and maintenance:

- Do not attempt installation, maintenance, repairs, or adjustments without the presence of a person capable of rendering aid.
- Administer first aid or seek medical attention immediately for any injury, no matter how slight.
- Wear protective eye shields and appropriate clothing at all times.
- Exercise caution when operating ramp. Be certain hands, feet, legs, and clothing are out of the ramp path as it unfolds.
- Be cautious when using metallic (conductive) tools near battery.
- Check under vehicle before drilling or cutting to avoid damage to subframe members, wiring, fuel lines, hydraulic lines, etc.
- Thoroughly understand operating instructions before using ramp.
- Inspect ramp before loading passengers. Do not use ramp if it exhibits any unusual noise or movement.
- Keep others clear during ramp operation.
- The ramp requires regular maintenance. Ricon recommends a thorough inspection every six months. Maintain the product at its highest level of performance.

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II. FOLDOVER RAMP DESCRIPTION

The descriptions in this chapter apply to the Ricon FoldOver Low-Floor Vehicle Access ramp when installed in transit vehicles. The FoldOver ramp is installed in transit vehicles to accommodate handicapped passengers that cannot easily climb steps or are using mobility-aid equipment. The hydraulically powered ramp folds into the vehicle vestibule flooring when not in use.

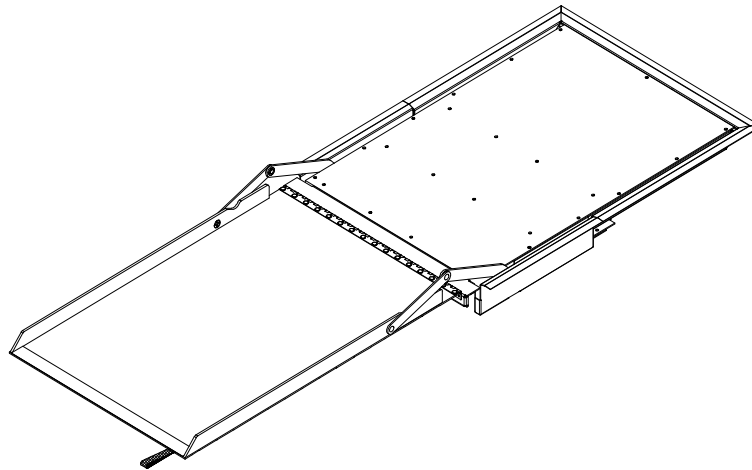


Figure 2-1: ricon FoldOver Ramp

1. RAMP FEATURES

1. INTERLOCK SUPPORT

The ramp electronics interface with the vehicle interlock circuitry to prevent unintentional departure while ramp is deployed. The ramp interlock circuitry senses the position of the ramp, stowed or deployed, and makes this information available at the J1 bus harness connector. A vehicle interlock circuit typically requires that the following conditions be met before operating power can be supplied to ramp:

- ? Park vehicle and set parking brake.
- ? Place transmission in park/neutral.
- ? Open vehicle door adjacent to ramp.

2. AUDIBLE ALERT

The ramp supports an audible alert device that sounds while the ramp is in motion. (This optional feature may not have been connected during ramp installation.)

3. RAMP CONTROL PANEL

Refer to **Figure 2-2**. Ricon does not provide a control panel. The ramp can be operated with one similar to that shown, however, the actual panel appearance will vary between transit authorities and vehicles. The control panel is normally installed in the driver area. It should have a power on/off switch, a power on indicator light and a three-position ramp control switch (center-off). The ramp receives power from the vehicle when the power on/off switch is ON and the interlock conditions are met. The control panel can then be used to transmit deploy or stow signals to the ramp hydraulic system.

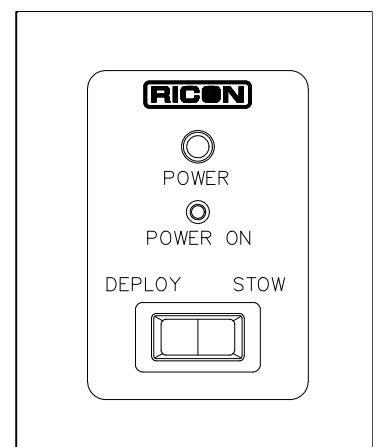


FIGURE 2-2: TYPICAL CONTROL PANEL

2. RAMP CAPACITY

Refer to **Table 2-1**. Passengers are required to use ramp one at a time; **do not overload ramp**. Be certain that passenger mobility-aid equipment fits easily between the left and right side barriers before allowing use of ramp.

| TABLE 2-1: RAMP CAPACITY | | | |
|---------------------------------|-------------------|----------------------|-----------------------|
| MODEL | LOAD LIMIT | USEABLE WIDTH | USEABLE LENGTH |
| FR2-3048 | 600 lb. (272 kg) | 30 in (76 cm) | 48 in (122 cm) |
| FR2-3248 | 600 lb. (272 kg) | 32 in (81 cm) | 48 in (122 cm) |
| FR2-3050 | 600 lb. (272 kg) | 30 in (76 cm) | 50 in (127 cm) |

3. MAJOR COMPONENTS

Figure 2-3 shows major components of the FoldOver Ramp. A description of each component is provided in Table 2-2.

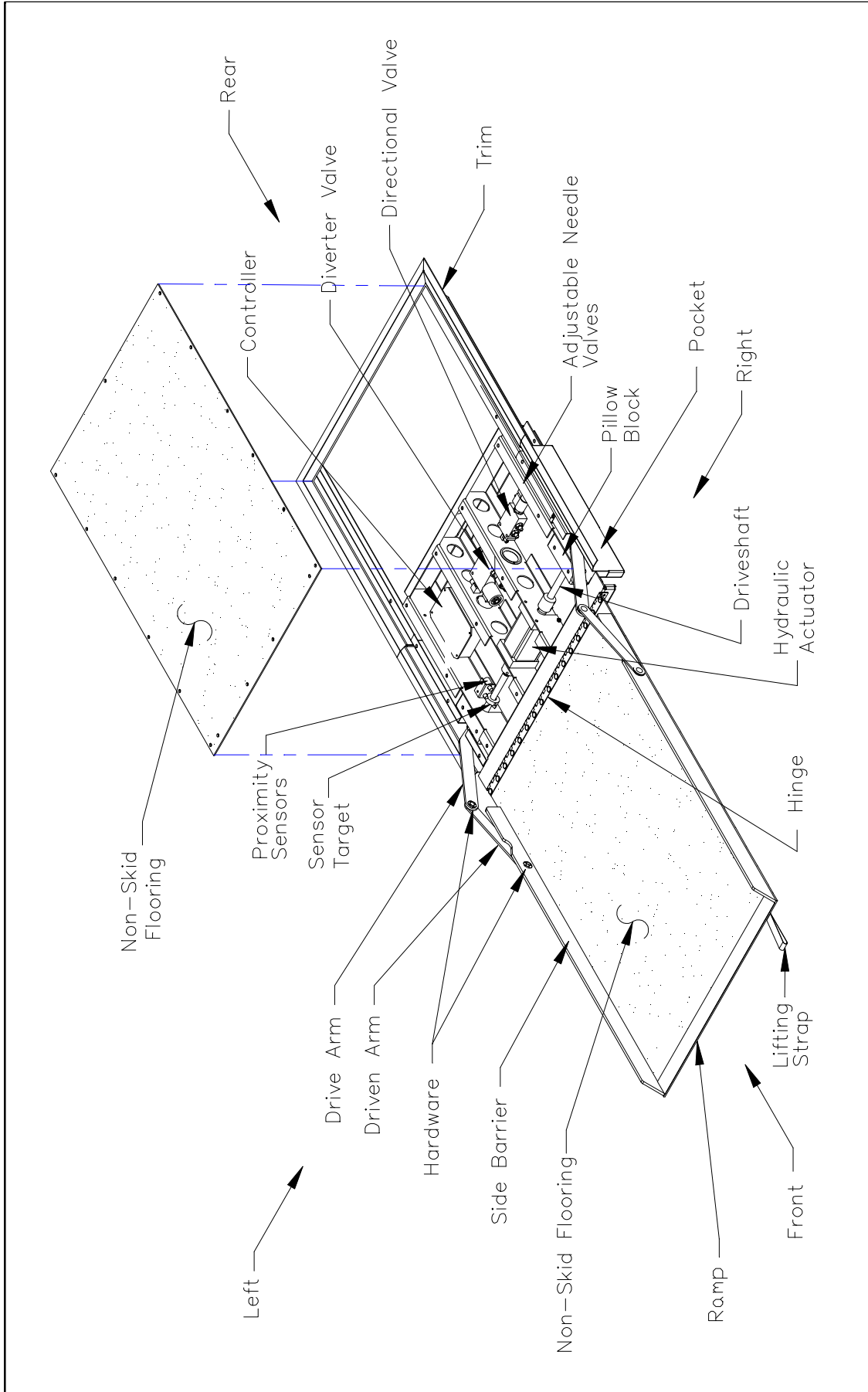


FIGURE 2-3: MAJOR RAMP COMPONENTS

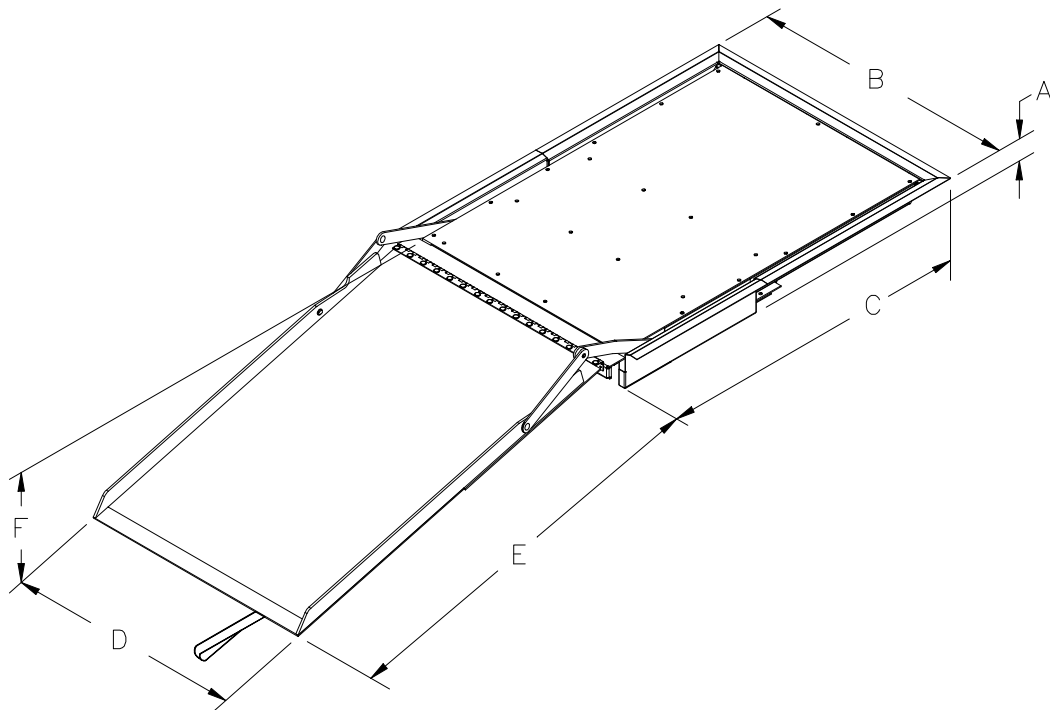
TABLE 2-2: MAJOR RAMP COMPONENTS

| NAME | DESCRIPTION |
|---|---|
| Controller | Translates electrical commands from bus control panel into signals that control ramp hydraulic components. |
| Directional Valve | Hydraulic component controls direction of ramp movement for deploy and stow commands. |
| Diverter Valve | Hydraulic component diverts vehicle hydraulic steering system power for use by ramp hydraulic components. |
| Driveshaft (Left & Right) | Transmits rotary actuator force to drive arms. |
| Drive Arm (Left & Right) | Ramp linkage arms connected to hydraulic actuator. |
| Driven Arm (Left & Right) | Ramp linkage arms connect drive arms to ramp; arms driven by drive arms/hydraulic actuator. |
| Adjustable Needle Valves | Manually adjusted valves control rate of ramp movement. |
| Hardware (Shoulder screws, bushings, thrust washers) | Pivoting, load bearing parts at both ends of driven arms. Bushings and washers are oilite material. Blue Loctite® is on threads of shoulder screws, making disassembly difficult, but possible. |
| Hinge | Pivoting connection between ramp and vehicle. |
| Hydraulic Actuator | Hydraulic powered component provides rotary force used to deploy and stow ramp. |
| Lifting Strap | Use to manually deploy or stow ramp. |
| Non-skid Flooring | Bonded to ramp flooring to reduce user slippage. |
| Pillow Block (Left & Right) | Provides support for outer ends of driveshafts. |
| Pocket | Small enclosure, integral with ramp frame, that arms fold into. |
| Proximity Sensors | Electrical sensors located near sensor target detect ramp when in stowed position; connected to controller. |
| Ramp | Unfolds (deploys) to provide a slight incline for handicapped passenger use. Folds into vestibule floor (stows) when not used. |
| Sensor Target | Rotating target on left driveshaft; provides ramp position for proximity sensors. |
| Side Barrier (Left & Right) | Vertical curbs restrict user to ramp area. |
| Trim | Metal molding around perimeter of ramp frame; mates ramp to surrounding vehicle floor. |
| END OF TABLE | |

4. RAMP SPECIFICATIONS

TABLE 2-3: RICON LOW-FLOOR-VEHICLE ACCESS RAMP SPECIFICATIONS

| | |
|---|-------------------------------|
| Power | Electro-Hydraulic |
| Power Requirements: | |
| Electric | 20VDC to 30VDC; 24VDC nominal |
| Hydraulic Pressure Requirement..... | 1,350±25 PSI |
| Hydraulic Flow Capacity Requirement | 30 - .70 gpm |
| Maximum Current Draw | 7 amps |
| Rated Load Capacity | 600 lbs. (272kg) |
| Ramp Weight..... | approx. 300 lbs. (136kg) |



DIMENSIONS – inches (cm)

| | A | B | C | D | E | F |
|----------|-------------------|-----------------|------------------|------------------------|-------------------------|-----------------------------|
| MODEL | Ramp Frame Height | Ramp Trim Width | Ramp Trim Length | Useable Platform Width | Useable Platform Length | Floor-to-Ground Travel, max |
| FR2-3048 | 4.8 (12.2) | 34.9 (88.6) | 47.5 (120.6) | 30 (76.2) | 48 (122) | 12.0 (30.5) |
| FR2-3050 | 4.8 (12.2) | 34.9 (88.6) | 49.5 (125.7) | 30 (76.2) | 50 (127) | 12.0 (30.5) |
| FR2-3241 | 4.8 (12.2) | 36.9 (93.7) | 40.5 (102.9) | 32 (81.28) | 41 (104) | 12.0 (30.5) |
| FR2-3248 | 4.8 (12.2) | 36.9 (93.7) | 47.5 (120.6) | 32 (81.28) | 48 (122) | 12.0 (30.5) |


END OF TABLE

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III. FOLDOVER RAMP MAINTENANCE

The maintenance information in this chapter applies to the Ricon FoldOver Low-Floor Vehicle Access ramp when installed in transit vehicles. The information consists of safety precautions, a maintenance schedule, component information, and diagrams for the hydraulic and electrical systems. This chapter is intended to supplement related sections of the vehicle manufacturer Owner and Service Manuals. Refer to Section A of chapter five for decal locations and part numbers.

A. GENERAL SAFETY PRECAUTIONS

| |
|---|
|  WARNING |
| THIS RAMP IS DRIVEN WITH HYDRAULIC PRESSURE DIVERTED FROM THE POWER STEERING SYSTEM. THE FLUID IS HIGHLY PRESSURIZED AND POSSIBLY VERY HOT. USE EXTREME CAUTION WHEN DOING MAINTENANCE AND REPAIRS. DO NOT DISCONNECT HOSES OR FITTINGS WHEN ENGINE IS RUNNING. |

Follow these safety precautions during service of the Ricon FoldOver ramp:

- ? Under no circumstances is maintenance, repair, or adjustment of the FoldOver ramp to be performed without the presence of an individual capable of giving aid.
- ? Give immediate attention to all injuries, and administer first-aid or seek medical attention as necessary.
- ? Protective eye shields and clothing should be worn during maintenance, repair, and adjustment of the FoldOver ramp.
- ? The user must be cautious when operating the ramp. Be certain that hands, feet, legs, and clothing are not in the path of ramp movement.
- ? Batteries contain acid that can burn. Wear protective clothing and eye protection at all times. If acid comes in contact with skin, immediately flush affected area with water and wash with soap. Do not place anything electrically conductive on top of battery. Do not smoke or use an open flame near battery.
- ? Work in a properly ventilated area.
- ? Read and understand all instructions before attempting to operate the FoldOver ramp.
- ? Inspect the ramp before use for any unsafe conditions, and unusual noises or movements. Do not use ramp if any are present, and bring ramp to an authorized Ricon service technician for inspection.
- ? Keep others clear of the ramp while operating.
- ? Ricon strongly recommends that the vehicle be on level ground when using ramp. It is dangerous to operate or use ramp when vehicle is sloped because it may produce a steep platform angle and incomplete contact between the ramp and ground.
- ? The FoldOver ramp and other system components require periodic maintenance. Ricon recommends a thorough vehicle inspection by an authorized Ricon service technician at least once every six months. To maximize safety the ramp and related components should be maintained at their highest level of performance.


B. DAILY INSPECTION

Check ramp daily, following the Daily Inspection outlined in **Table 3-1**. Meet all inspection criteria before allowing passengers on ramp.

| TABLE 3-1: DAILY INSPECTION | |
|-----------------------------|--|
| INSPECTION POINT | CHECK |
| Ramp Controller | <ul style="list-style-type: none"> • Power ON/OFF switch for correct operation. • Power On indicator lights when Power ON/OFF switch is ON. • DEPLOY and STOW switches for correct operation. • Indication of unusual noise or movement when ramp is deploying or stowing. |
| Ramp and Surrounding Area | <ul style="list-style-type: none"> • Make sure vestibule area is free of loose objects, and that the actuator drive arms are free of any debris. |
| Ramp Non-slip Flooring | <ul style="list-style-type: none"> • Make sure flooring is clean, and free of slippery or sticky substances that could compromise user safety. • Make sure non-slip flooring is intact and secure, and that loose edges cannot create a stumbling hazard. |

C. MAINTENANCE SCHEDULE

Regular maintenance and inspection of the Ricon FoldOver ramp provides optimum performance and reduces the need for repairs. Maintain the ramp as directed in **Table 3-2**. Perform ramp maintenance more frequently during heavy use (more than 20 cycles per day).

|  CAUTION |
|---|
| ~ This Ricon product is very complex ~ |
| Do required warranty period maintenance and repairs at a Ricon authorized facility. Improper maintenance, use of non-Ricon replacement parts, or product modification will void warranty and can result in unsafe operating conditions. We recommend that an authorized Ricon facility continue maintenance inspections when warranty ends. |

| TABLE 3-2: MAINTENANCE SCHEDULE | |
|----------------------------------|--|
| INSPECTION POINT | ACTION |
| – 6,000 MILE INSPECTION – | |
| Hydraulic Fluid Leaks | Check all hoses and fittings; tighten or replace as necessary. |
| Setscrews | Check for loose or missing setscrews at these locations: <ul style="list-style-type: none"> • Driveshaft couplers (2 x 4 ea) • Sensor target (2 ea) • Pillow blocks (2 x 2 ea) Tighten, or replace, as necessary. |
| Drive Arm T-nuts | Check for looseness; retighten as necessary. Tighten and/or apply thread locker (Loc-tite® blue), as necessary. |
| Ramp Interior (for debris) | Check ramp interior area, and remove any accumulated dirt or debris. |
| Side Barriers | Check for tight attachment to ramp. Tighten screws (on ramp bottom) and/or apply thread locker (Loc-tite® red), as necessary. |
| Non-Slip Flooring | Visually check for damage to surface, and loose or missing hardware. |

| TABLE 3-2: MAINTENANCE SCHEDULE | |
|-----------------------------------|--|
| INSPECTION POINT | ACTION |
| Decals | Visually check for damage or poor attachment. |
| – 12,000 MILE INSPECTION – | |
| Wiring Harnesses | Check wiring insulation for heavy abrasions, and connectors for looseness; replace as necessary. |
| Fasteners | Check all threaded fasteners for tightness and retighten as necessary. |
| Non-slip Surfaces | Check non-slip flooring for excessive wear or damage (rips, tears, peeling, etc.) and replace as necessary. |
| – 24,000 MILE INSPECTION – | |
| Pillow Blocks (lubrication) | Lightly grease pillow blocks (they are sealed). |
| Bushing & Thrust Washer (wear) | Refer to Figure 2-3 and Table 2-2 in Chapter 2. Check these hardware parts for excessive play, and replace if necessary. |
| END OF TABLE | |

D. RAMP COMPONENT INFORMATION

The electro-hydraulic Ricon FoldOver Ramp uses electric and hydraulic power from the host vehicle to deploy and stow ramp. Hydraulic and electrical components are described below. Please refer to **Figures 3-7, 3-8** and **3-9** for hydraulic schematics.

1. NEEDLE VALVES

Two manually-adjusted needle valves control the volume of hydraulic fluid passing through the actuator; their adjustment determines ramp movement rate. There is one valve for deploy and one for stow. Turning the valves **CCW increases** ramp movement rate, and **CW decreases** ramp movement rate. The optimal adjustment range for the valves is between ½ to 1 turn open (CCW) from fully closed.

Refer to Installation Notes in chapter four for the needle valve adjustment procedure.

2. DIVERTER VALVE

The ramp employs a diverter valve (installed inline with the vehicle power steering system) to redirect pressurized hydraulic fluid from the vehicle steering system to the ramp (when the ramp has power and the control box receives a DEPLOY or STOW signal). Excess pressure is returned to the vehicle catch tank.

NOTE: When the ramp is inactive (without electrical power), the diverter valve directs full pressure to the vehicle power steering system. The diverter valve solenoid controls the shuttle valve position. The shuttle valve diverts fluid from the vehicle steering system to the ramp directional valve when the ramp has power and either the DEPLOY or STOW switch is activated. The diverter valve default state supplies fluid to the vehicle steering system.

3. DIRECTIONAL VALVE

The directional valve controls the direction of fluid flow through the actuator.

When the controller sends a DEPLOY signal to the S1 valve solenoid, the shuttle valve then directs flow to the C1 flow control valve. From C1, fluid flows through the actuator (producing torque), then to the C2 flow control valve, back to the directional valve, and returns to the vehicle catch tank.

When the controller sends a STOW signal to the S2 valve solenoid, the shuttle valve then directs flow to the C2 flow control valve. From C2, fluid passes through the actuator (producing torque), then to the C1 flow control valve, back to the directional valve and returns to the vehicle catch tank.

4. CONTROLLER

The controller interprets deploy and stow commands, and controls ramp functions. It contains a programmable controller, relays, two fuses, and associated parts. The internal programmable controller cannot be accessed externally. The bus harness, connected to controller J1, inputs 24 volt power in addition to STOW and DEPLOY commands. J1 also outputs counter and interlock signals. J2 and J3 connectors accept signal inputs from the stow and deploy sensors. Connector J4 outputs control signals to the diverter and directional valves. Connector J5 outputs a timing signal to the auxiliary counter.

Refer to **Figures 3-1** and **3-2** for a side view and top view of controller, showing locations of J1, J2, J3, J4, and J5 connectors. Controller cover is not easily removed; it is sealed with silicone rubber. Note four mounting holes at corners of enclosure. Note locations of fuses F1 and F2 at left center. Refer to **Table 3-3** for functions and ratings of fuses located inside controller. Access to the controller is gained by removing bottom cover from ramp.

Refer to **Figure 3-3** for connector pin numbering and wire colors. The upper row of connectors are mounted on controller (as in **Figure 3-2**).

Refer to **Table 3-4** for signal descriptions of each connector pin.

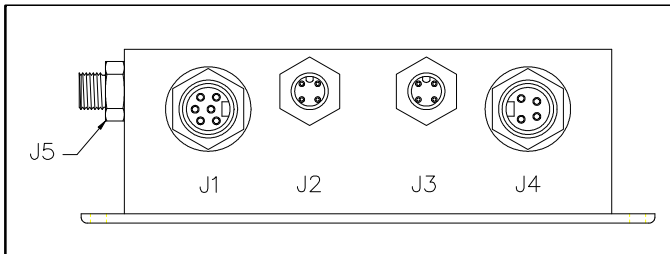


FIGURE 3-1: CONTROLLER SIDE VIEW

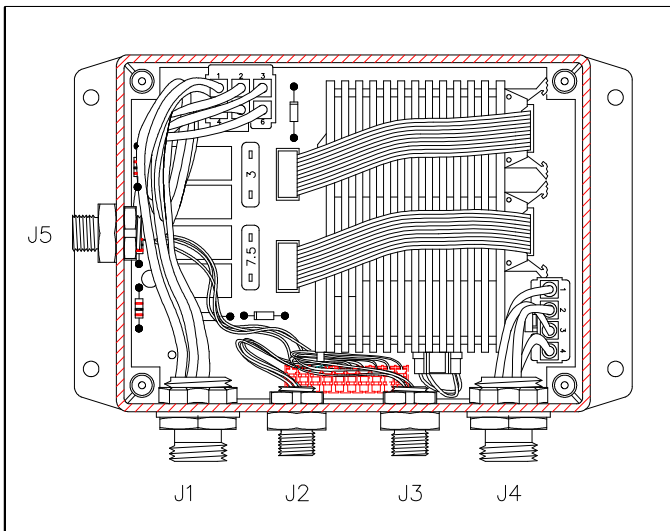


FIGURE 3-2: CONTROLLER TOP VIEW

| TABLE 3-3: CONTROLLER FUSES | | |
|------------------------------------|---------------|--|
| FUSE | RATING | CIRCUIT |
| F1 | 3.0 AMP | Interlock Output |
| F2 | 7.5 AMP | Main Power (Programmable Controller, Solenoid Valves, Sensors) |

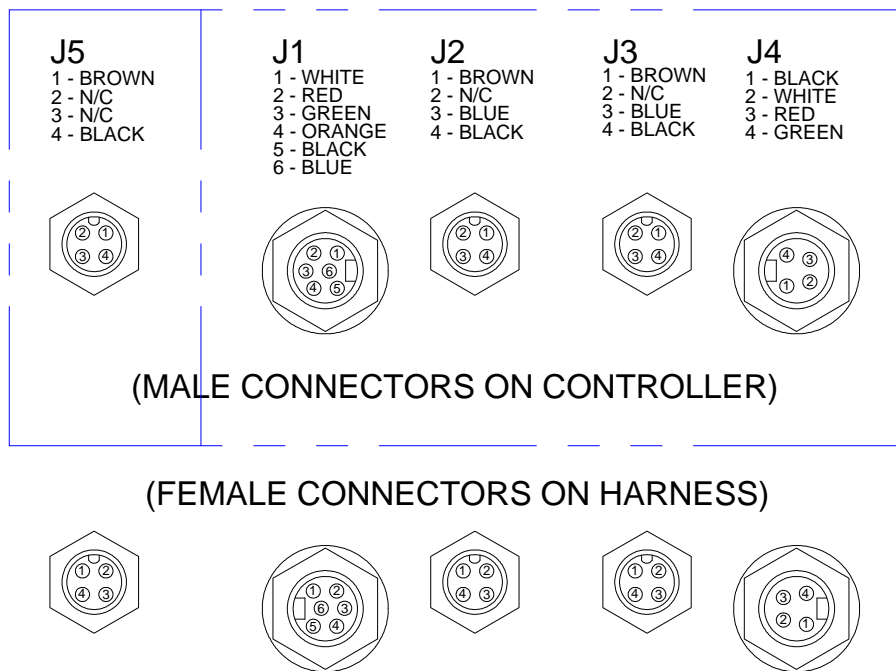


FIGURE 3-3: CONTROLLER CONNECTOR-PIN NUMBERING

| TABLE 3-4: CONTROLLER CONNECTOR-PIN DESCRIPTIONS | | | | | |
|---|-------|----------|------------------------------------|---------------------|------------------------------------|
| PIN | COLOR | FUNCTION | AT REST | IN ACTION | |
| J1 | 1 | White | Output signal to vehicle interlock | Ground; stowed | Off; ramp not stowed |
| | 2 | Red | Stow signal from control switch | 0 volts | 24 volts; stow switch activated |
| | 3 | Green | Ground | Ground | Ground |
| | 4 | Orange | Output signal to vehicle interlock | Off; stowed | 24 volts; ramp not stowed |
| | 5 | Black | Deploy signal from control switch | 0 volts | 24 volts; deploy switch activated |
| | 6 | Blue | 24 volts to controller (constant) | 24 volts | 24 volts |
| J2 | 1 | Brown | Power to stowed sensor | 24 volts | 24 volts |
| | 2 | (N/C) | | | |
| | 3 | Blue | Ground | Ground | Ground |
| | 4 | Black | Stowed sensor controller input | 0 volts; sensor off | 24 volts when sensor is activated |
| J3 | 1 | Brown | Power to deploy sensor | 24 volts | 24 volts |
| | 2 | (N/C) | | | |
| | 3 | Blue | Ground | Ground | Ground |
| | 4 | Black | Deploy sensor controller input | 0 volts | 24 volts when sensor is activated |
| J4 | 1 | Black | Deploy output to directional valve | 0 volts | 24 volts; deploy switch ON |
| | 2 | White | Stow output to directional valve | 0 volts | 24 volts; stow switch ON |
| | 3 | Red | Ground | Ground | Ground |
| | 4 | Green | Output to diverter valve | 0 volts | 24 volts; stow/ deploy switches ON |
| J5 | 1 | Brown | Output signal to auxiliary counter | Off | 24V pulse each deploy cycle |
| | 2 | N/C | N/A | N/A | N/A |
| | 3 | N/C | N/A | N/A | N/A |
| | 4 | Black | Ground for auxiliary counter | Ground | Ground |
| END OF TABLE | | | | | |

5. CIRCUIT BREAKERS AND FUSES

The bus builder installs an 8 amp circuit breaker (or fuse) to protect ramp electrical circuits. This circuit breaker provides power to the main ramp switches and the Programmable Controller.

Two fuses protect the controller, and are located inside its sealed enclosure. Please refer to **Figure 3-2** for their locations. The fuses must be replaced by a Ricon authorized service technician.

6. RAMP ARM ASSEMBLY

Please refer to **Figure 3-4** for the correct configuration of the arms and their hardware. Use a spanner wrench (Ricon p/n 18756) to tighten the T-nuts that bolt the ramp arms and hardware together. Apply a small amount of threadlocker (Loctite® blue) to T-nuts before assembling hardware.

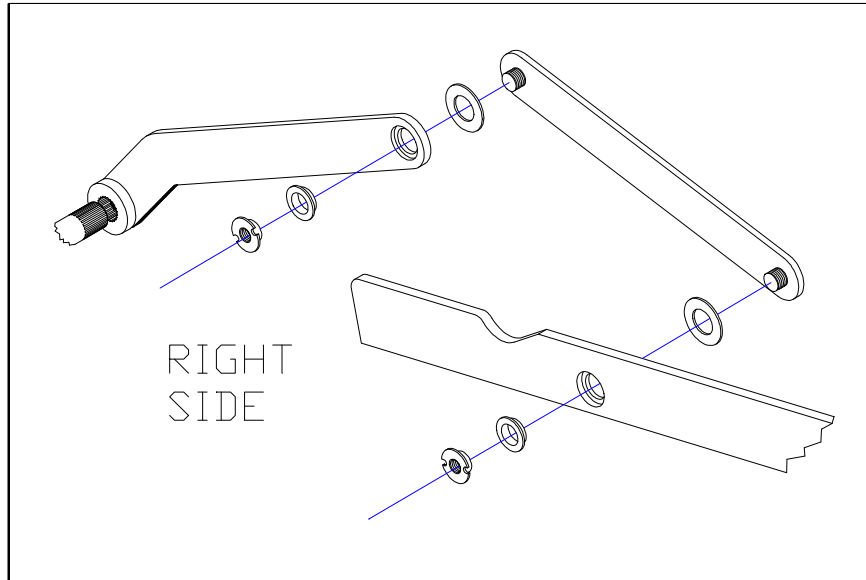


FIGURE 3-4: HARDWARE CONFIGURATION FOR RAMP ARM

E. ELECTRICAL AND HYDRAULIC DIAGRAMS

- ? Refer to **Figures 3-7, 3-8, and 3-9** for diagrams of the ramp hydraulic system in its inactive, deploy, and stow modes. The diagrams show the direction and path of fluid flow, and the positions of valves. The diagrams are located on the following pages.
- ? Refer to **Figure 3-10** for an overall electrical schematic of the ramp system, including that portion supplied by the bus builder. Refer to **Table 3-5** for wire color codes used on schematic. Refer to **Figure 3-5** for a description of plug and receptacle designations used on schematic. Refer to **Figure 3-6** for an explanation of schematic symbols used.

| TABLE 3-5: WIRE COLOR CODES | | | |
|-----------------------------|--------|------|--------|
| CODE | COLOR | CODE | COLOR |
| BLK | BLACK | RED | RED |
| BLU | BLUE | TAN | TAN |
| BRN | BROWN | VIO | VIOLET |
| GRN | GREEN | WHT | WHITE |
| GRY | GRAY | YEL | YELLOW |
| ORG | ORANGE | | |

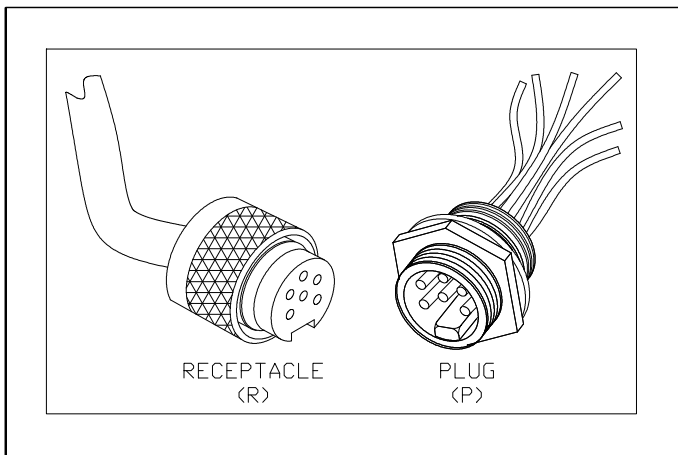


FIGURE 3-5: CONNECTOR CONFIGURATION

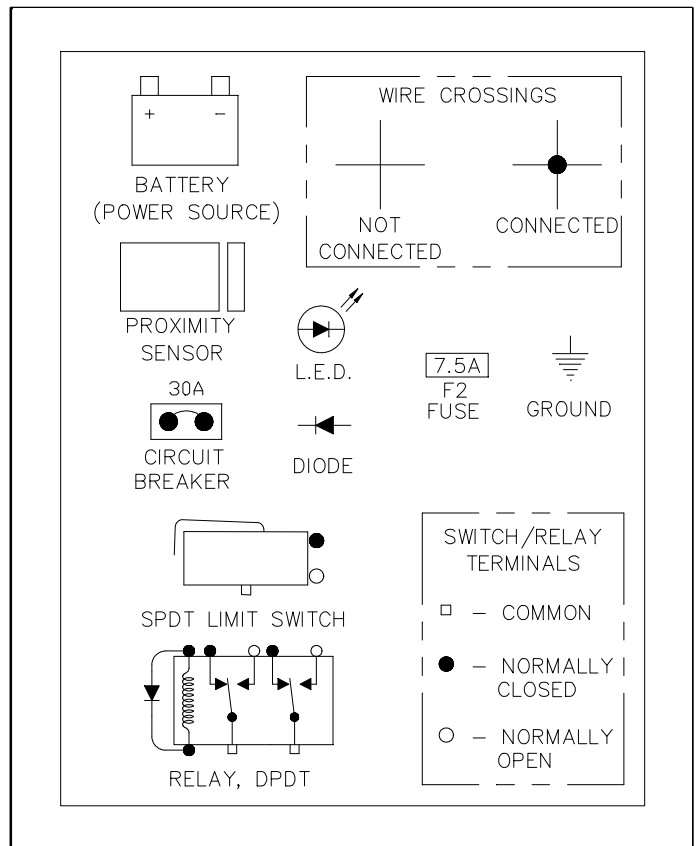


FIGURE 3-6: SCHEMATIC SYMBOLS

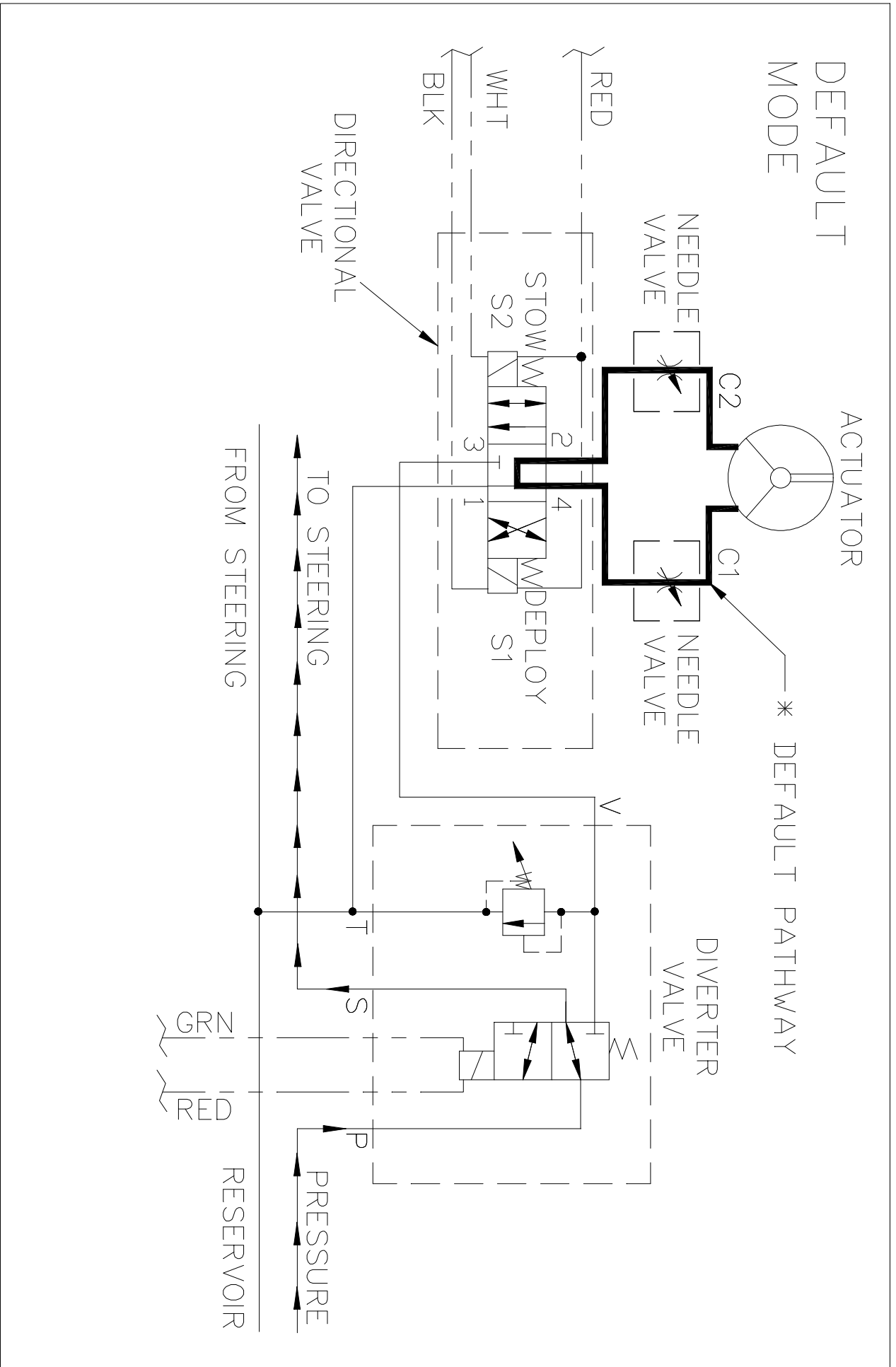
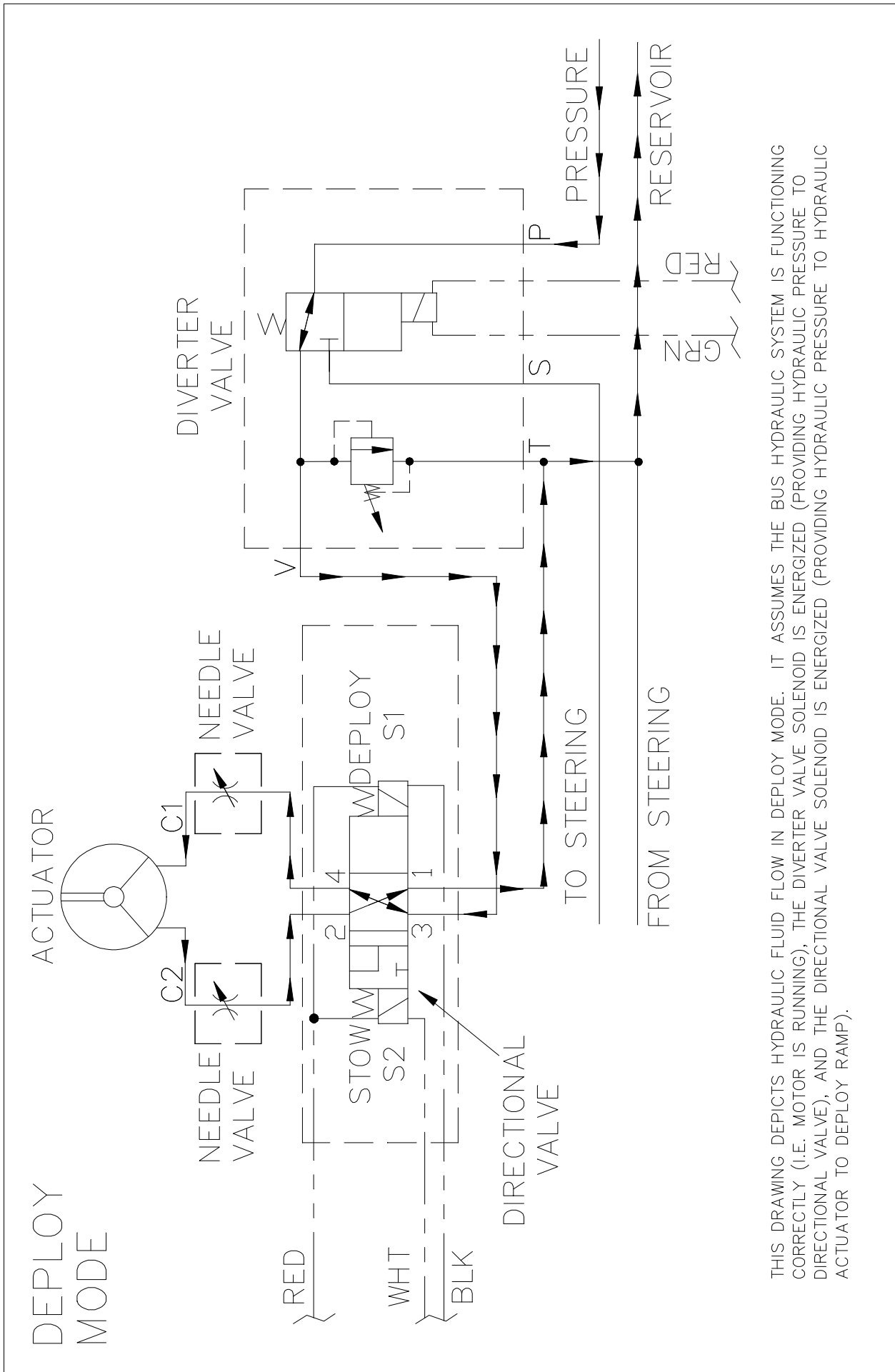


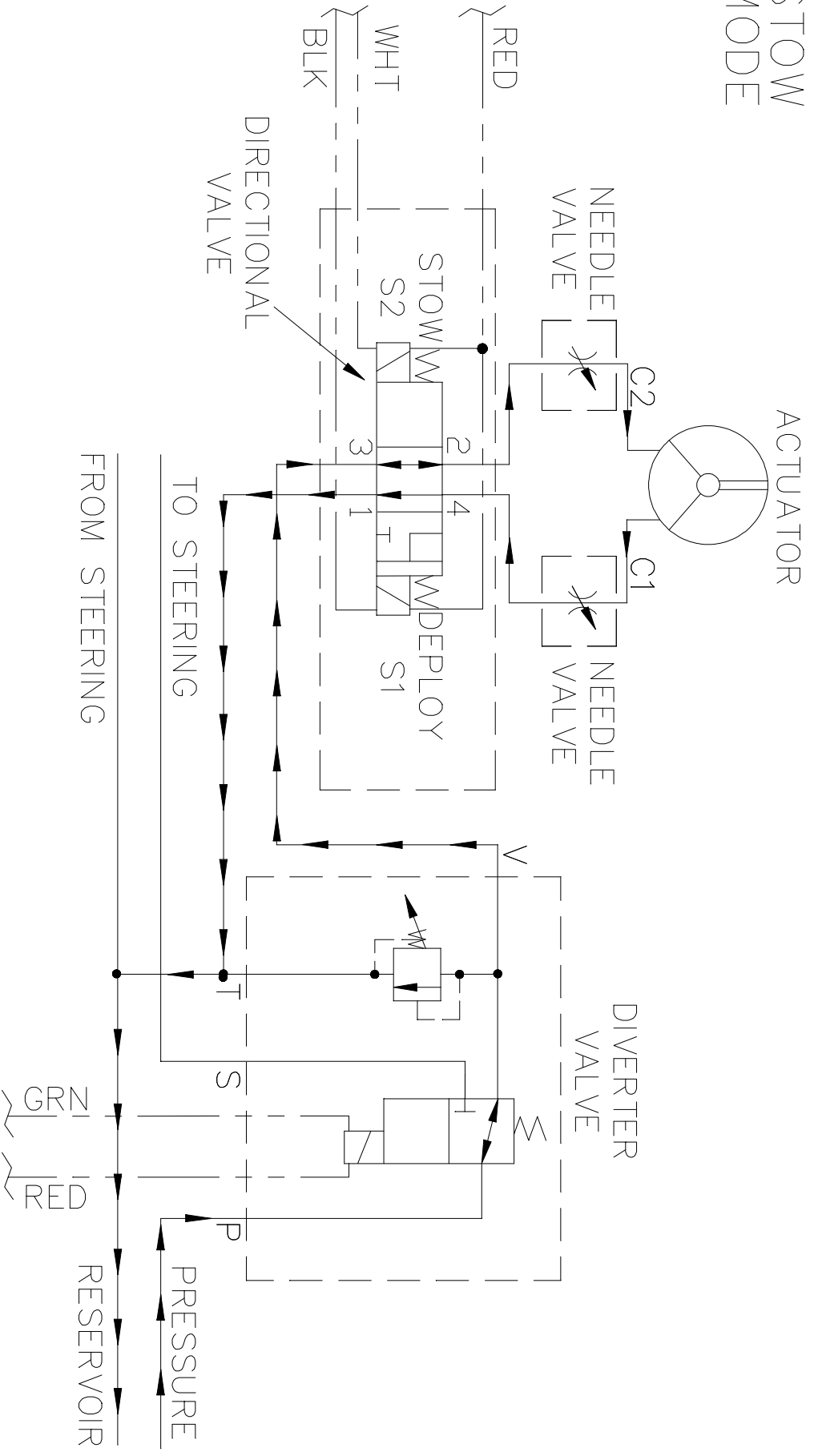
FIGURE 3-7: RAMP HYDRAULIC SYSTEM IN DEFAULT MODE



THIS DRAWING DEPICTS HYDRAULIC FLUID FLOW IN DEPLOY MODE. IT ASSUMES THE BUS HYDRAULIC SYSTEM IS FUNCTIONING CORRECTLY (I.E. MOTOR IS RUNNING), THE DIVERTER VALVE SOLENOID IS ENERGIZED (PROVIDING HYDRAULIC PRESSURE TO DIRECTIONAL VALVE), AND THE DIRECTIONAL VALVE SOLENOID IS ENERGIZED (PROVIDING HYDRAULIC PRESSURE TO ACTUATOR TO DEPLOY RAMP).

FIGURE 3-8: RAMP HYDRAULIC SYSTEM IN DEPLOY MODE

STOW MODE



THIS DRAWING DEPICTS HYDRAULIC FLUID FLOW IN STOW MODE. IT ASSUMES THE BUS HYDRAULIC SYSTEM IS FUNCTIONING CORRECTLY (I.E. MOTOR IS RUNNING), THE DIVERTER VALVE SOLENOID IS ENERGIZED (PROVIDING HYDRAULIC PRESSURE TO DIRECTIONAL VALVE), AND THE DIRECTIONAL VALVE SOLENOID IS ENERGIZED (PROVIDING HYDRAULIC PRESSURE TO HYDRAULIC ACTUATOR TO STOW RAMP).

FIGURE 3-9: RAMP HYDRAULIC SYSTEM IN STOW MODE

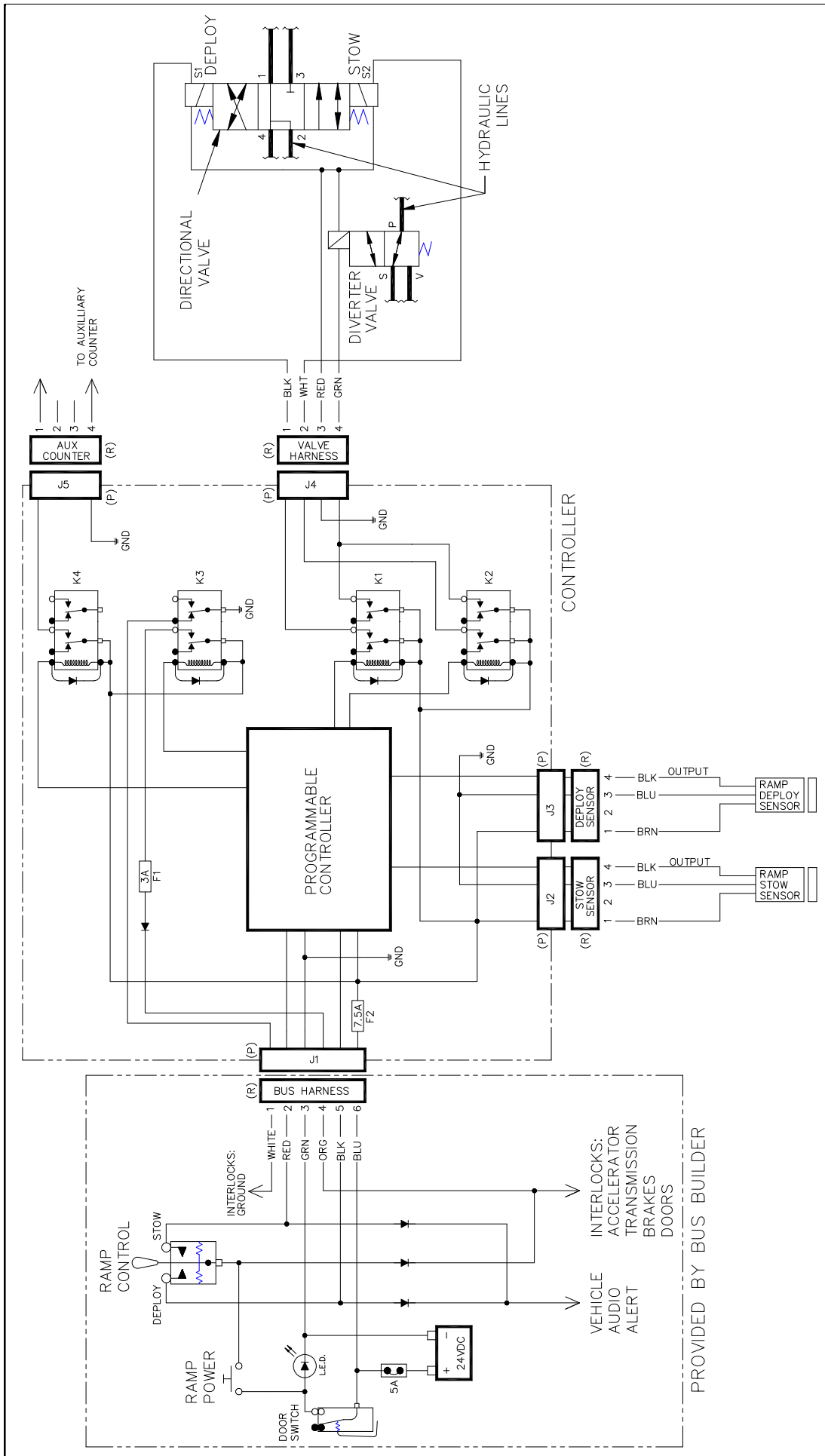


FIGURE 3-10: ELECTRICAL WIRING DIAGRAM

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IV. FOLDOVER RAMP TROUBLESHOOTING

The troubleshooting information in this chapter applies to the Ricon FoldOver Low-Floor Vehicle Access ramp when installed in transit vehicles. It provides two troubleshooting guides, one in table format, the other in flow-chart format. The table guide covers several possible failure modes, including complete lack of response, erratic behavior, and inability to stow. The flowchart commences with the general symptom of no ramp response, and then follows a step-by-step procedure to check all possible causes of this symptom.

A. TROUBLESHOOTING TABLE

| TABLE 4-1: TROUBLESHOOTING GUIDE | | | |
|-------------------------------------|--|---|---|
| Function | Symptom | Possible Cause | Remedy |
| FoldOver ramp will not deploy | Deploy switch is activated, but no sound or action occurs | No power to ramp at main input power (pin 6-blue wire on terminal J1) | Verify that circuit breaker is not tripped, reset circuit breaker |
| | | | Battery that feeds power to ramp is not sufficiently charged; check power chain |
| | | | Connect along J1 cable is loose or disconnected; securely close all connectors |
| | | No power from switch (pin 5-black wire on terminal J1) | Replace or repair deploy switch |
| | | | Replace or repair main ramp power switch |
| | | | Replace or repair door switch interlock |
| | | | Reset circuit breaker for door switch interlock |
| | Ramp deploy sensor is malfunctioning | Align ramp sensor target; set proper sensor to target distance Refer to section C.7 in this chapter. | |
| | Defective programmable controller | Replace programmable controller Refer to section C.4 in chapter 3. | |
| | Deploy switch is activated, a solenoid is heard clicking, but no ramp movement is observed | Vehicle steering lines are not supplying hydraulic pressure to diverter valve | Repair steering system; add fluid if necessary |
| | | Needles valves are closed | Open valves a quarter turn counter clockwise |
| | | Needle valves are clogged | Remove, clean, and re-install the valves Refer to section C.6 in this chapter. |
| | | Air in hydraulic system | Cycle ramp and/or bleed system Refer to section C.5 in this chapter. |
| | | Diverter valve is not functioning | Check harness going from programmable controller to diverter valve; repair or replace harness |
| Repair or replace diverter valve | | | |
| Hydraulic actuator is not operating | | Replace hydraulic actuator | |
| Air in hydraulic system | Cycle ramp and or bleed system Refer to section C.5 in this chapter. | | |
| FoldOver ramp deploys erratically | Deploy switch is activated, ramp either moves very slowly or stalls | Target sensor is not adjusted properly | Adjust sensor target Refer to section C.7 in this chapter |
| | | Leak in hydraulic lines of vehicle steering system | Repair steering system to assure sufficient pressure |

TABLE 4-1 TROUBLESHOOTING GUIDE

| Function | Symptom | Possible Cause | Remedy |
|---|---|---|--|
| | | Damaged or defective pressure relief valve in diverter valve assembly | Remove, clean, and re-install; replace diverter valve assembly |
| | | Damaged or defective directional valve | Replace directional valve assembly |
| | | Leak in hydraulic lines for ramp assembly | Repair or replace faulty hydraulic line |
| | | Damage or defective hydraulic actuator | Replace hydraulic actuator |
| | | Bind in ramp hinge or ramp arms | Repair or replace part that is binding |
| | Deploy switch is activated, ramp moves very slowly | Needle valves are set too restrictive | Turn both valves completely clockwise (to completely close valves) and readjust from this reference point Refer to section C.6 in this chapter. |
| | | Low hydraulic steering pressure | Repair hydraulic system for obstructions or leaking pump |
| | | Binding action in the hinge or actuator arms | Repair or replace part that is binding |
| | | Defective pressure regulator on diverter valve | Replace diverter valve assembly |
| | Ramp deploys to almost halfway and then falls short | Defective directional valve | Replace directional valve |
| Deploy sensor target is out of adjustment with deploy sensor | | Adjust target sensor Refer to section C.7 in this chapter | |
| FoldOver ramp stows erratically | Stow switch is activated, but no sound or action occurs | No power to ramp at main input power (pin 6-blue wire on terminal J1) | Verify that circuit breaker is not tripped, reset circuit breaker Insufficient voltage; charge vehicle battery |
| | | No power from stow switch (pin 2 red wire on terminal J1) | Replace or repair stow switch |
| | | | Replace or repair main ramp power switch |
| | | | Replace or repair door switch interlock |
| | Defective ramp controller | Replace ramp controller Refer to section C.4 in chapter 3. | |
| | Stow switch is activated, a solenoid is heard clicking, but no ramp action is occurring | Needle valves are clogged or closed | Open valves a quarter turn counter clockwise |
| Remove, clean, and re-install needle valves; replace needle valves Refer to section C.6 in this chapter. | | | |

TABLE 4-1 TROUBLESHOOTING GUIDE

| Function | Symptom | Possible Cause | Remedy |
|---------------------------------------|--|--|---|
| | | Vehicle is not supplying hydraulic pressure to the diverter valve | Repair steering system; add fluid if necessary |
| | | Diverter valve not functioning | Repair or replace harness from ramp controller to diverter valve |
| | | | Repair or replace diverter valve |
| | | Directional valve not functioning | Repair or replace harness from ramp controller to diverter valve |
| | | | Repair or replace diverter valve |
| | | Defective ramp controller | Replace ramp controller Refer to section C.4 in chapter 3 |
| Hydraulic actuator is not functioning | Replace hydraulic actuator | | |
| FoldOver ramp stows erratically | Stow switch is activated, ramp moves very slowly and then stalls | Air in hydraulic system | Cycle ramp and/or bleed system Refer to section C.5 in this chapter. |
| | | Leak in hydraulic lines of vehicle steering system | Repair steering system to assure sufficient pressure |
| | | Bind in ramp hinges or actuator arms | Repair or replace part that is binding |
| | | Leak in hydraulic lines for ramp assembly | Repair or replace faulty line |
| | | Damage or defective pressure relief valve in diverter valve assembly | Replace diverter valve assembly |
| | | Damage or defective directional valve | Replace directional valve assembly |
| | | Damaged or defective hydraulic actuator | Replace hydraulic actuator |
| | Stow switch is activated, ramp moves very slowly | Needle valves are set too restrictive | Turn both valves clockwise until completely closed, and readjust from this reference point Refer to section C.6 in this chapter. |
| | | Low hydraulic steering pressure | Repair hydraulic system for obstructions or leaking pump |
| | | Binding action in the hinge or actuator arms | Repair or replace part that is binding |
| | | Defective pressure regulator in diverter valve assembly | Remove regulator, clean, re-install; replace diverter valve, if necessary |

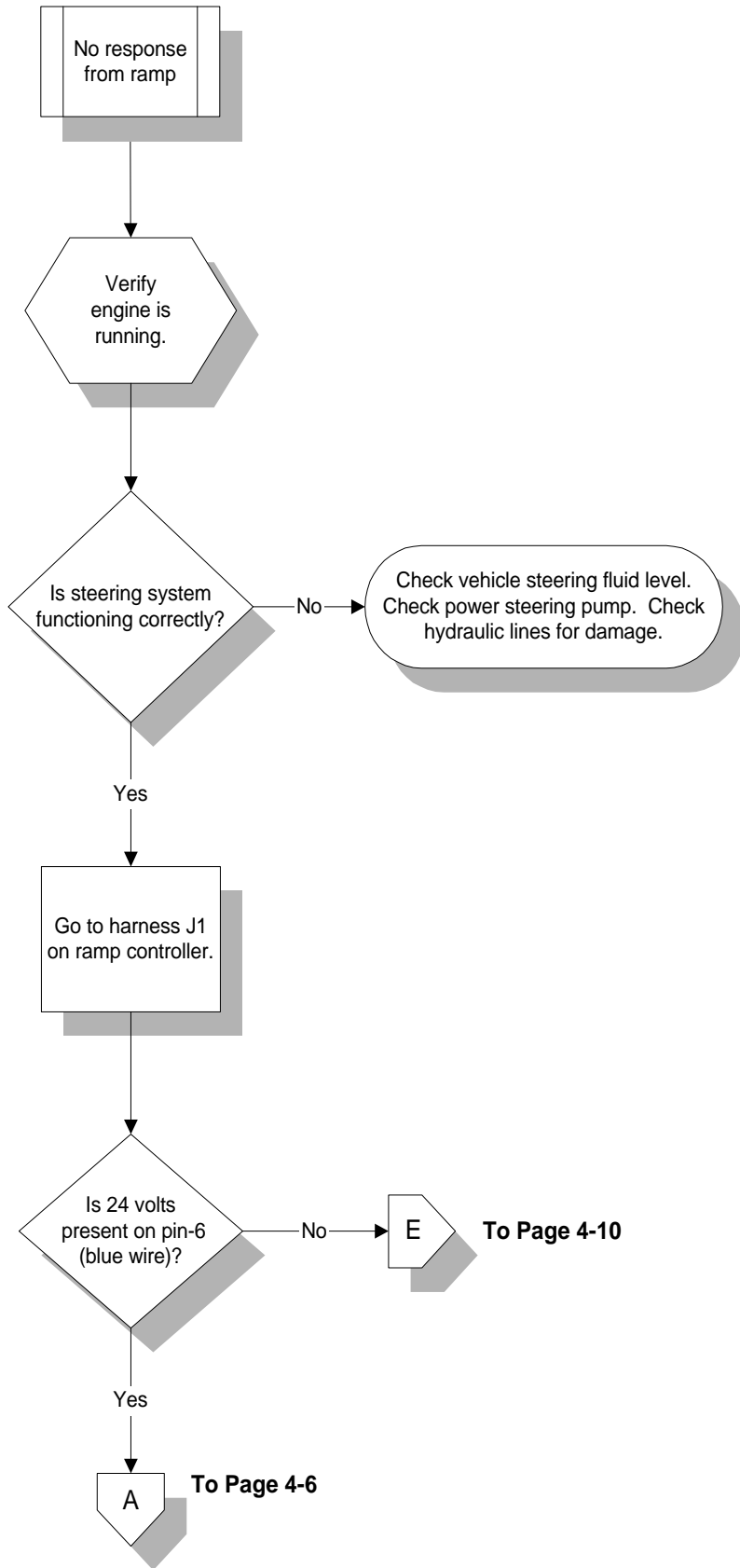
TABLE 4-1 TROUBLESHOOTING GUIDE

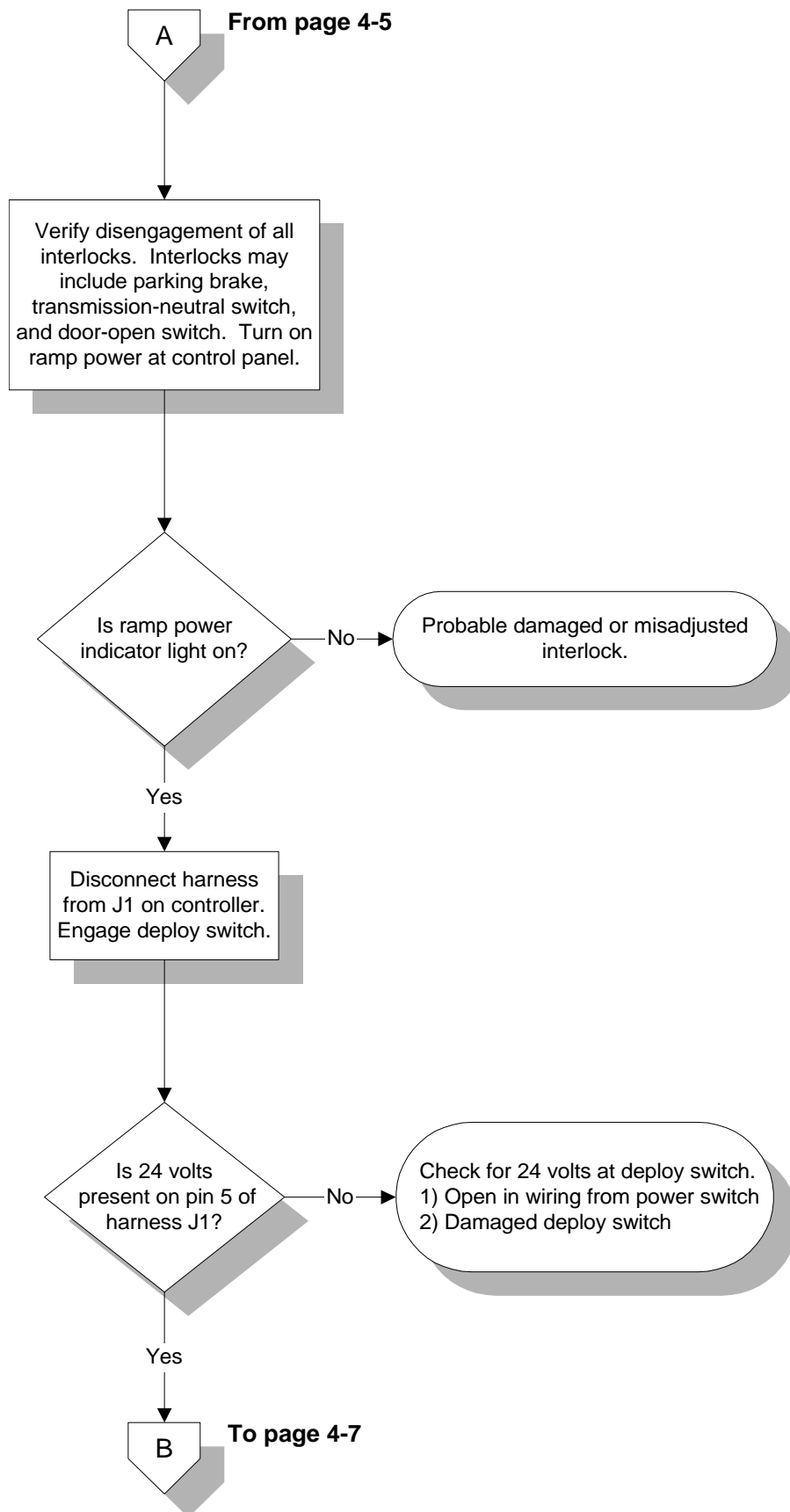
| Function | Symptom | Possible Cause | Remedy |
|------------------------------------|--|---|---|
| Reversed operation | Ramp will stow when deploy switch is depressed/or deploy when stow switch is depressed | Hydraulic lines are not connected correctly | Verify that line from port 4 of the directional valve goes to port C1 on the actuator; port 2 goes to C2 Verify that line from port V of the diverter valve goes to port 3 of the directional valve; port T goes to port 1 and then to tank return |
| | | Sockets are not connected to the right solenoid on directional valve | Verify that the socket with the black and red wires is connected to S1; white and red connect to S2 |
| | | Ramp control harness to J1 on the ramp controller is not wired correctly | Verify the stow command on switch is connected to the red wire (pin 2); deploy command is wired to black wire (pin 5) |
| | | | |
| Ramp will deploy but will not stow | Ramp will deploy but will not stow; unit will stow if the ramp is manually lifted to the vertical position | Two erroneous conditions exist (either hydraulic lines are incorrectly connected, ramp control harness not connected correctly, or sockets on the directional valves not connected correctly) | Verify that the line from port 4 of the directional valve goes to port C1 on the actuator; port 2 goes to C2 |
| | | | Verify that the line from port v of the diverter valve goes to port 3 of the directional valve; port t goes to port 1 and then to tank return |
| | | | Verify that stow command on switch is connected to the red wire (pin 2); deploy command is wired to black wire (pin5) |
| | | | Verify that the socket with the black and red wires is connected to S1; white and red is connected to S2 |
| Interlocks will not disengage | Constant 24 volt output on pin 4-orange wire (J1) | Ramp not fully stowed | Remove possible obstructions and verify that ramp is fully stowed |
| | | Misadjusted sensor target or stowed sensor | Adjust sensor target and/or stowed sensor Refer to section C.7 in this chapter |
| | | Ramp fully stowed sensor is damaged/defective | Replace stowed sensor |
| | | Defective or damaged ramp controller | Replace controller Refer to section C.4 in chapter 3. |
| END OF TABLE | | | |

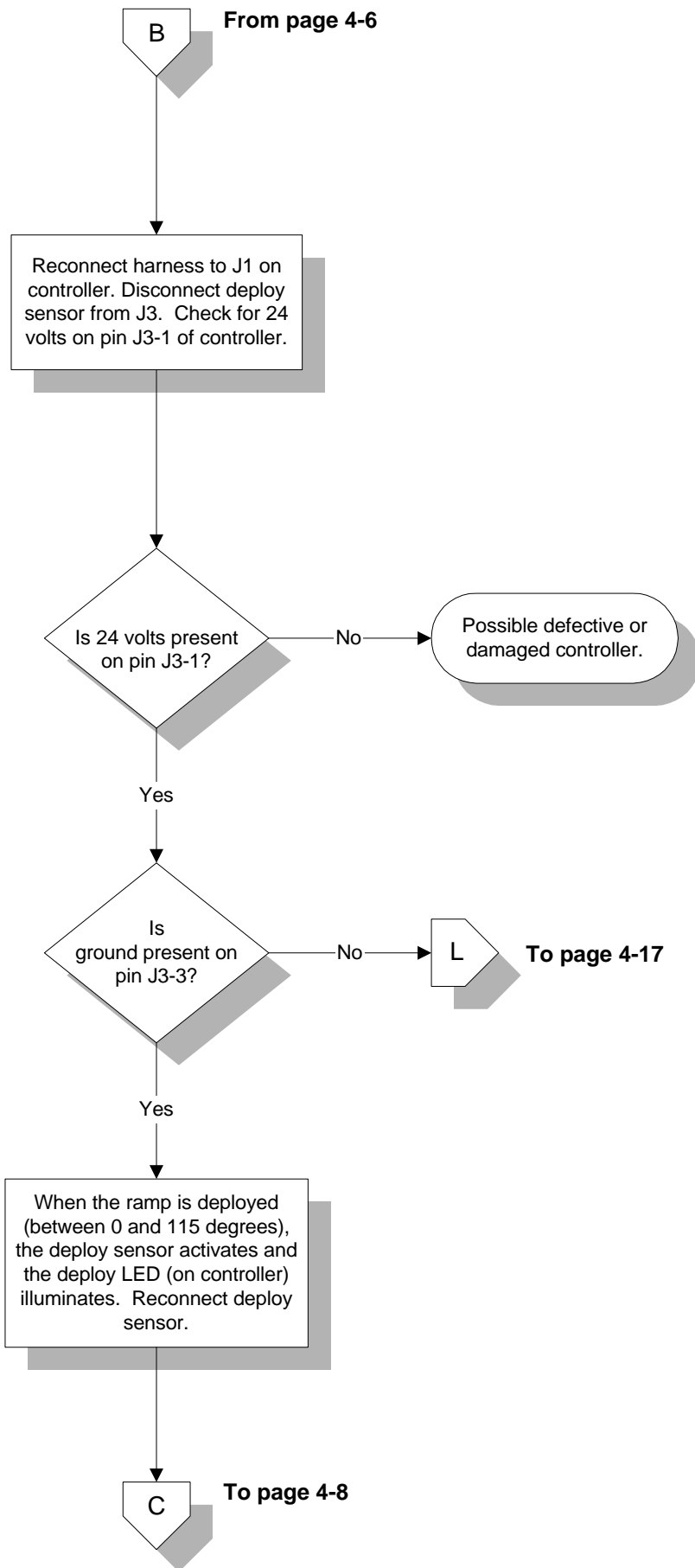
B. TROUBLESHOOTING FLOW CHART

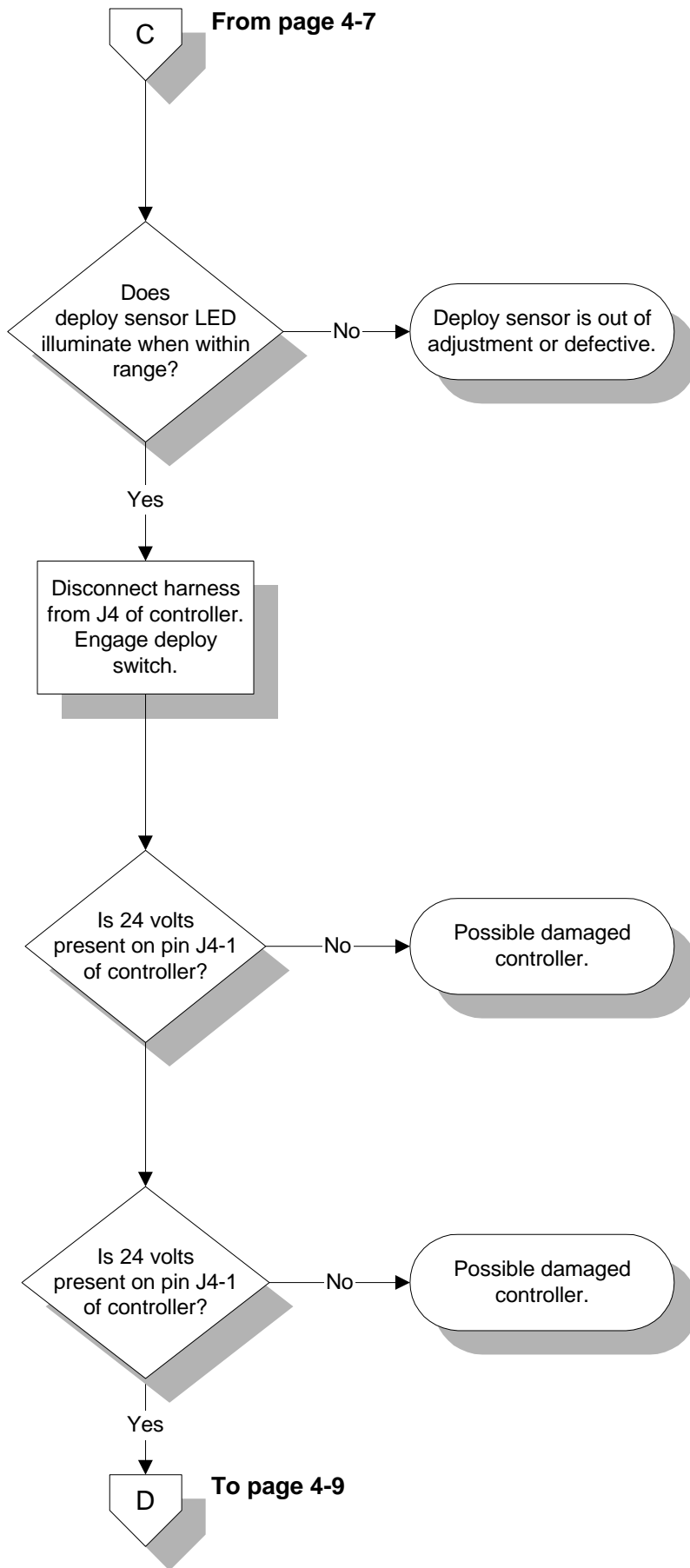
CHART 4-1: TROUBLESHOOTING GUIDE

1. NO RESPONSE FROM RAMP:









D

From page 4-8

Engage deploy switch;
check operation of
diverter valve solenoid

Is diverter
valve solenoid
activating?

No

Possible defective diverter
valve or shorted wire.

Yes

Engage deploy
switch; check
operation of
directional valve
solenoid.

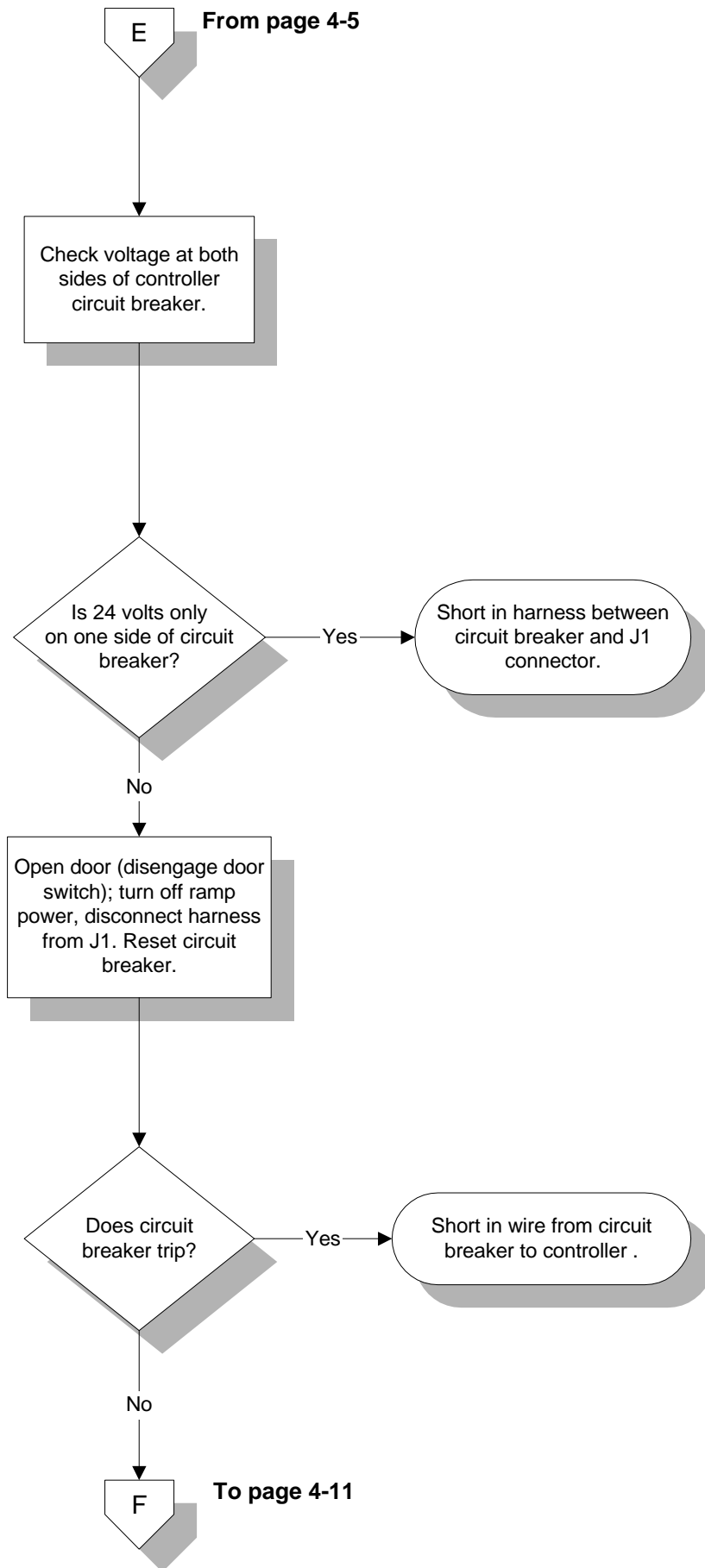
Is directional
valve solenoid
activating?

No

Solenoid is stuck or
defective if LED is
illuminated.

Yes

Possible obstruction in
hydraulic line. Possible lack
of hydraulic fluid.



F From page 4-10

Close vehicle door to engage door closed switch.

Does circuit breaker trip when door is closed?

Yes

Short in wire from door switch to ramp switch.

No

Disconnect harness at J1 on controller. Turn on ramp power switch.

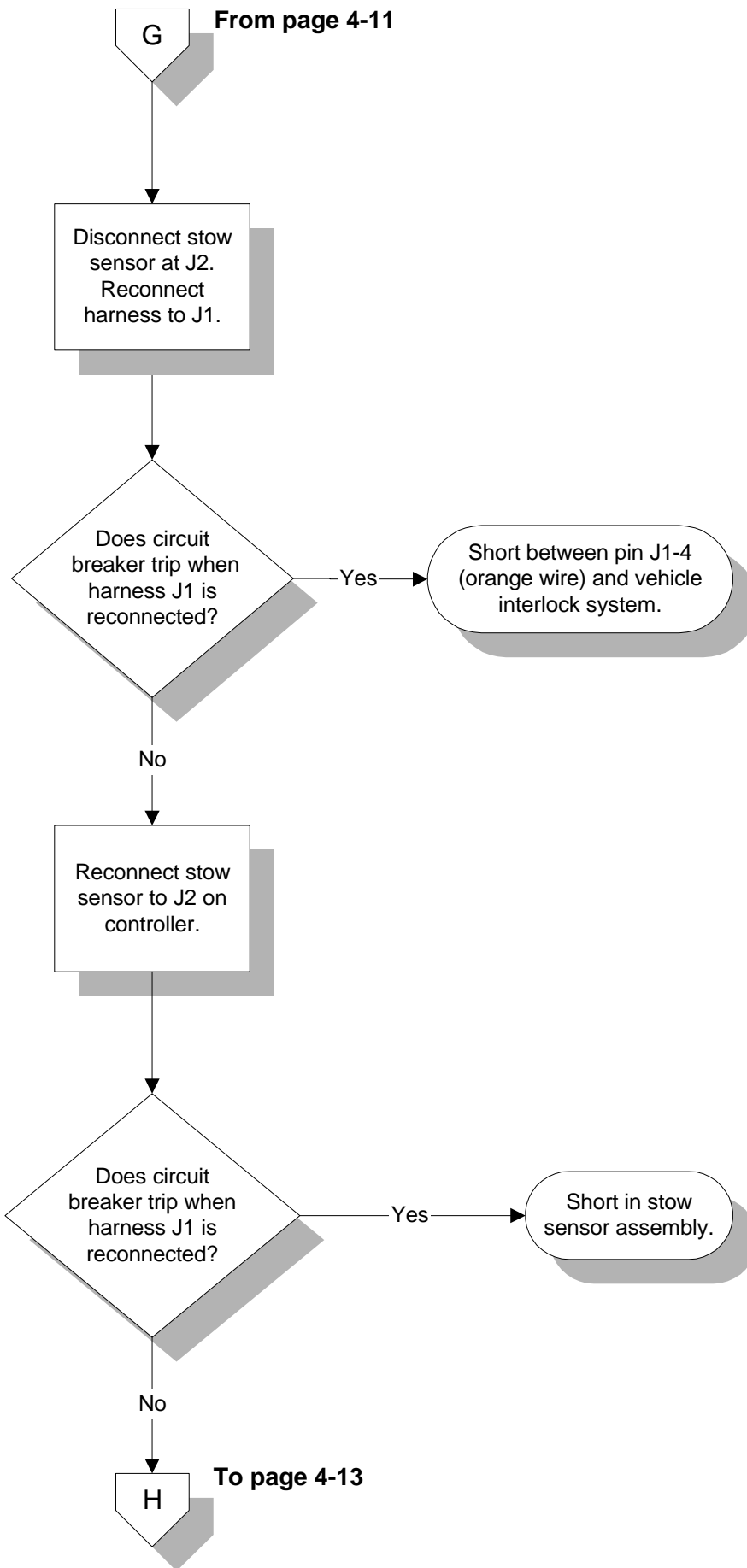
Does circuit breaker trip when switch is engaged?

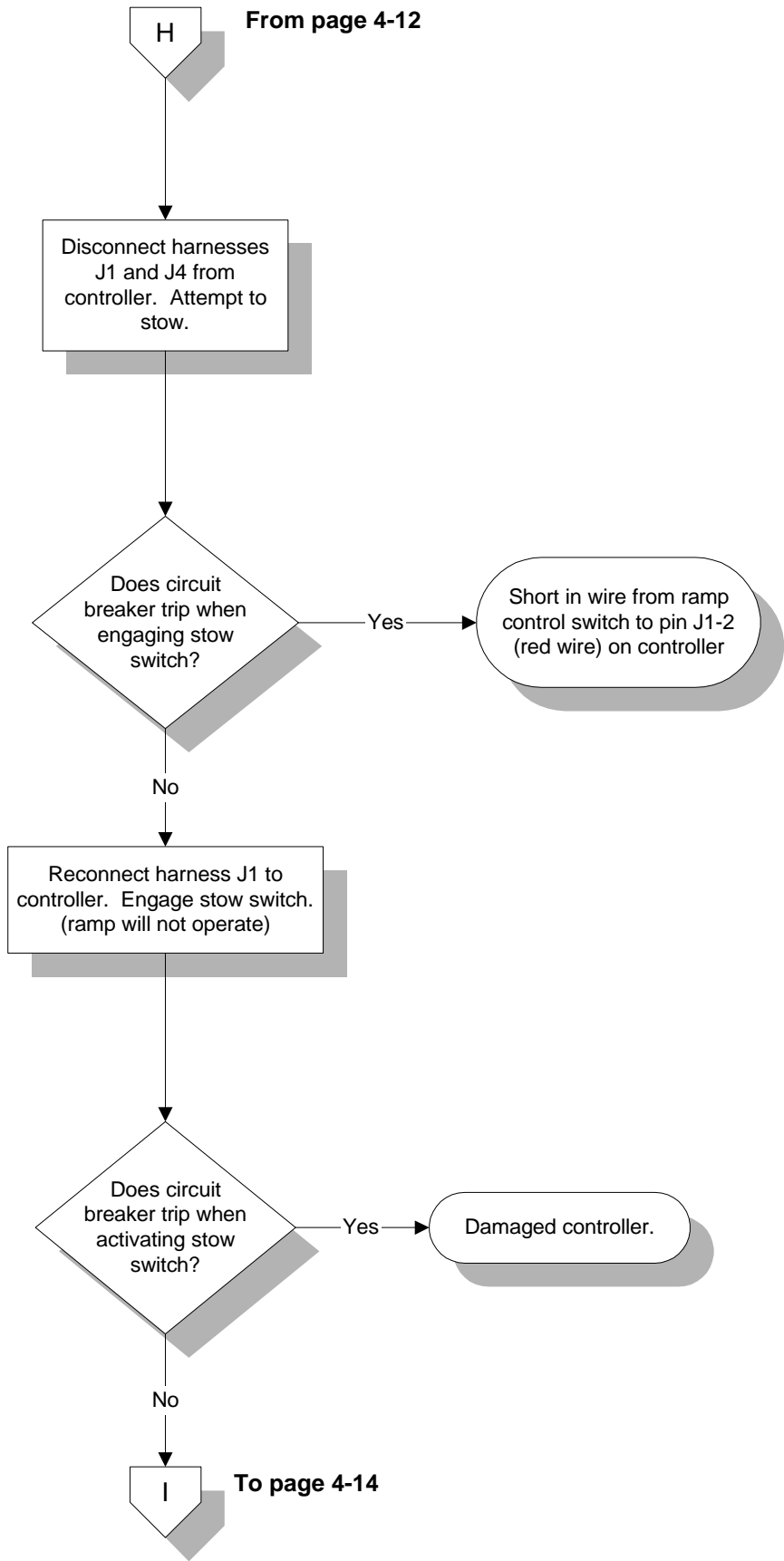
Yes

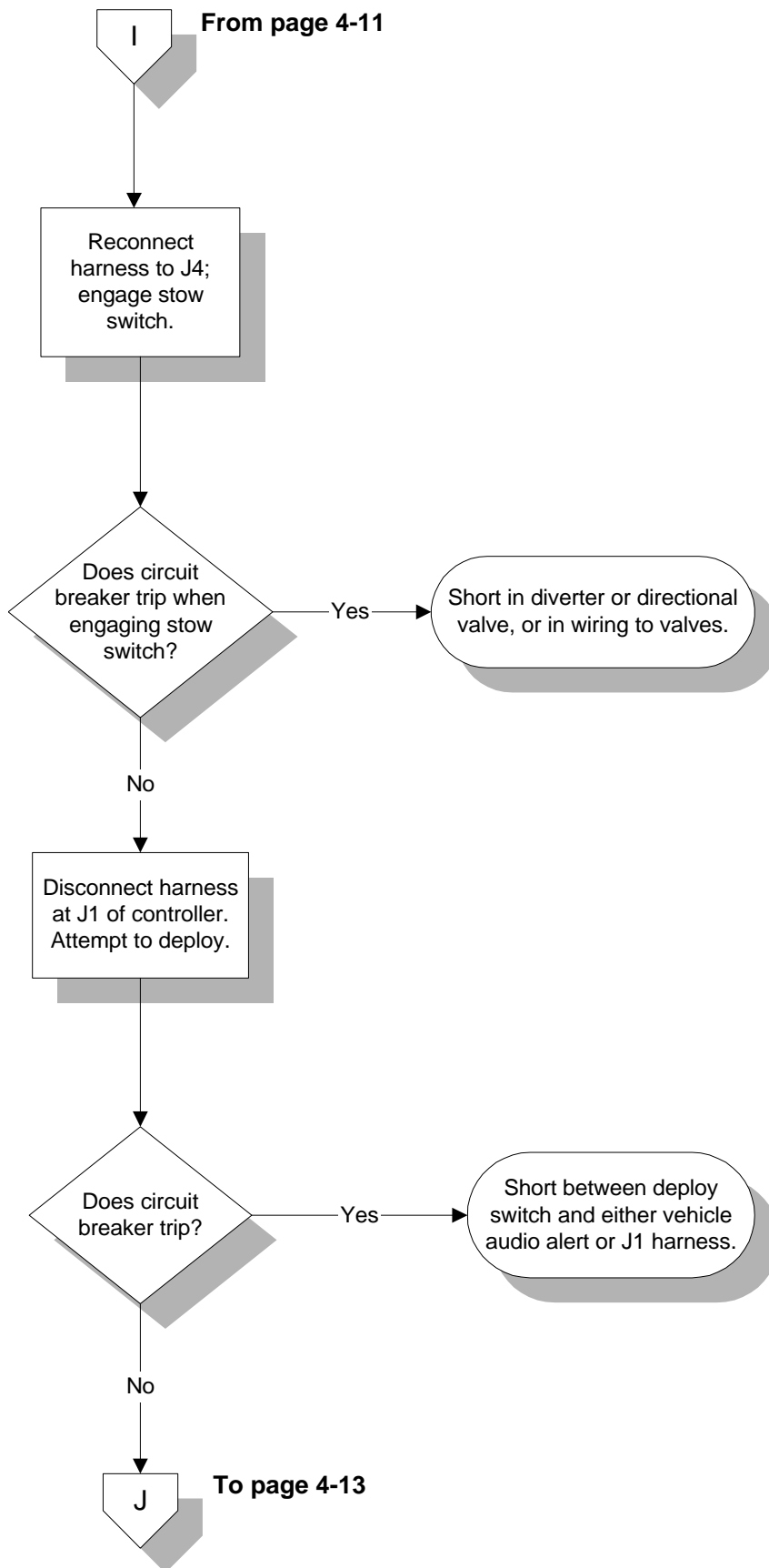
Short in wire from ramp power switch to ramp control switch (via interlocks).

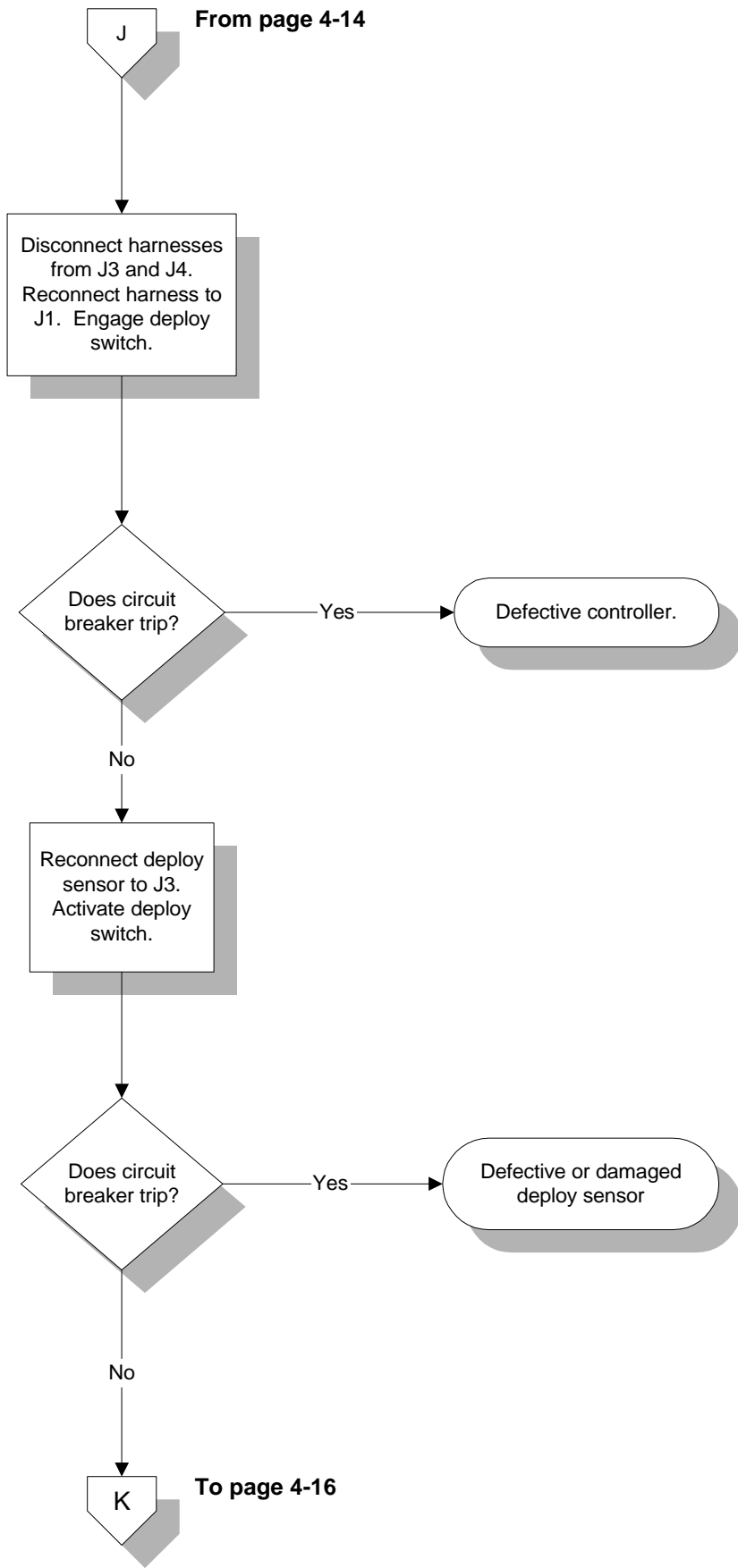
No

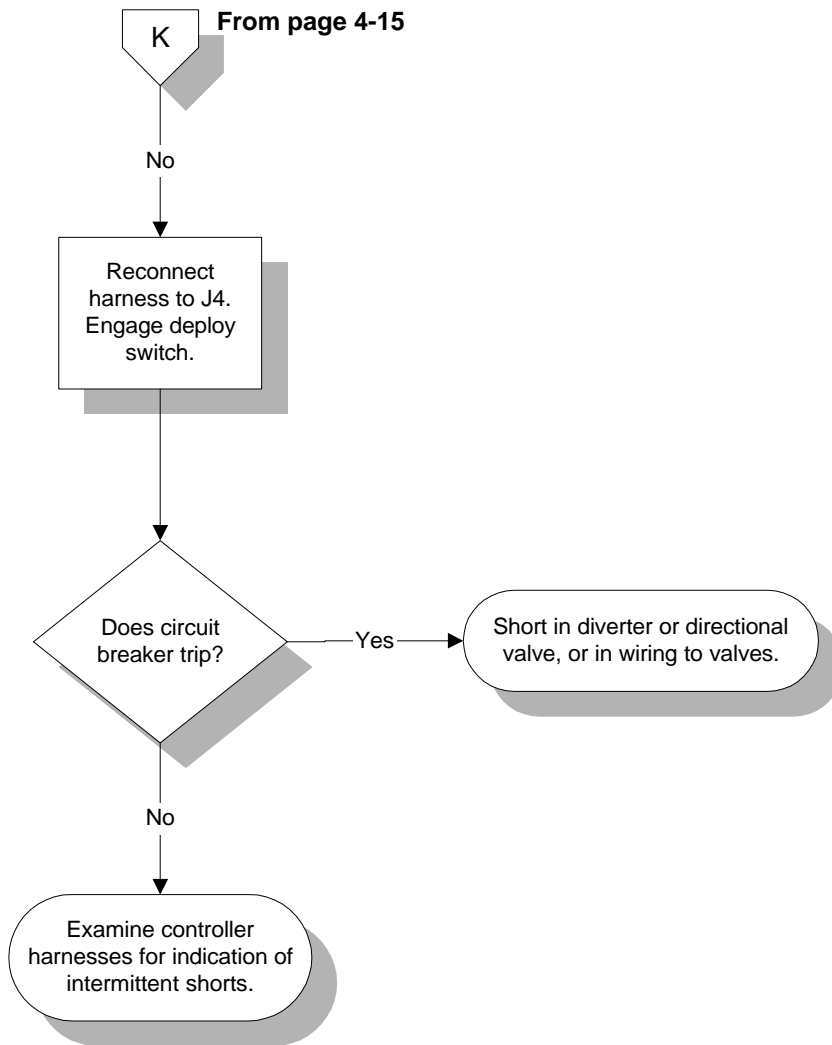
G To page 4-12



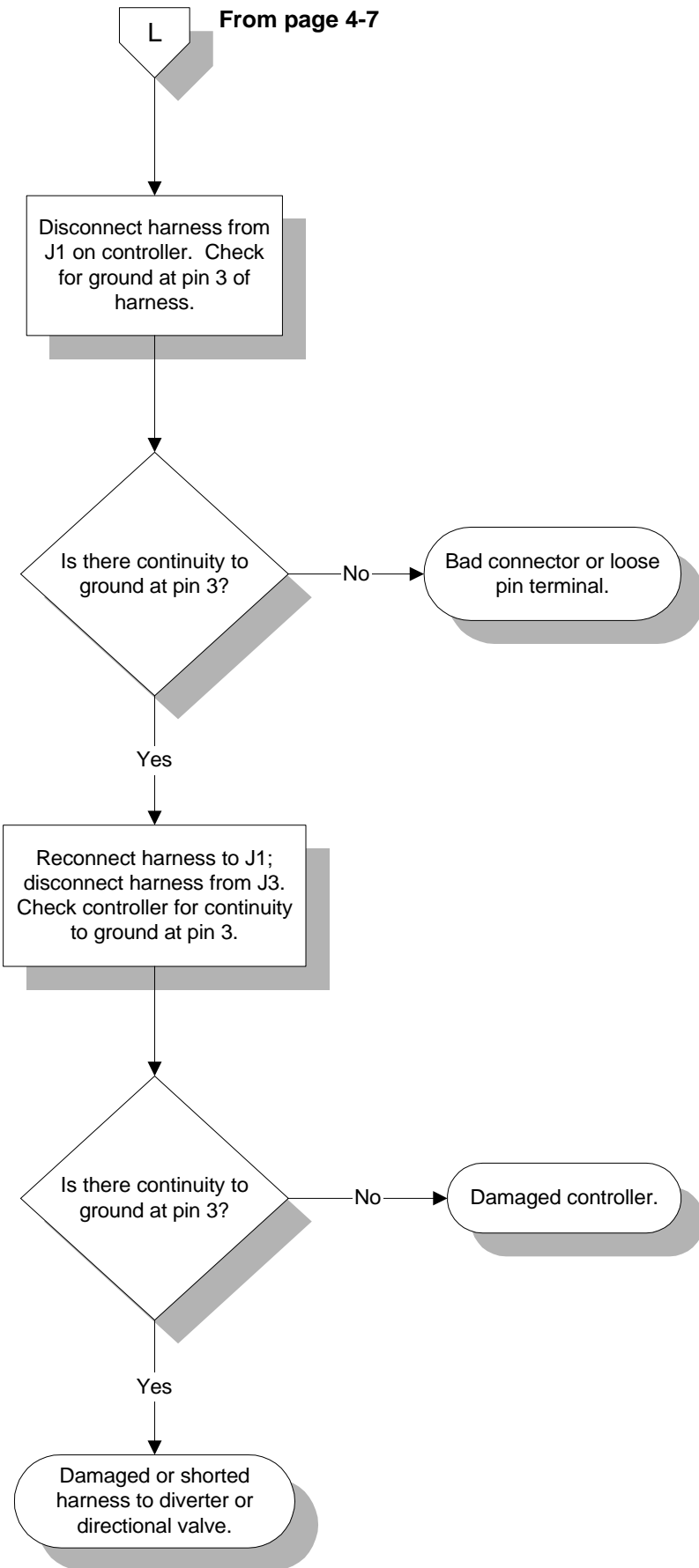




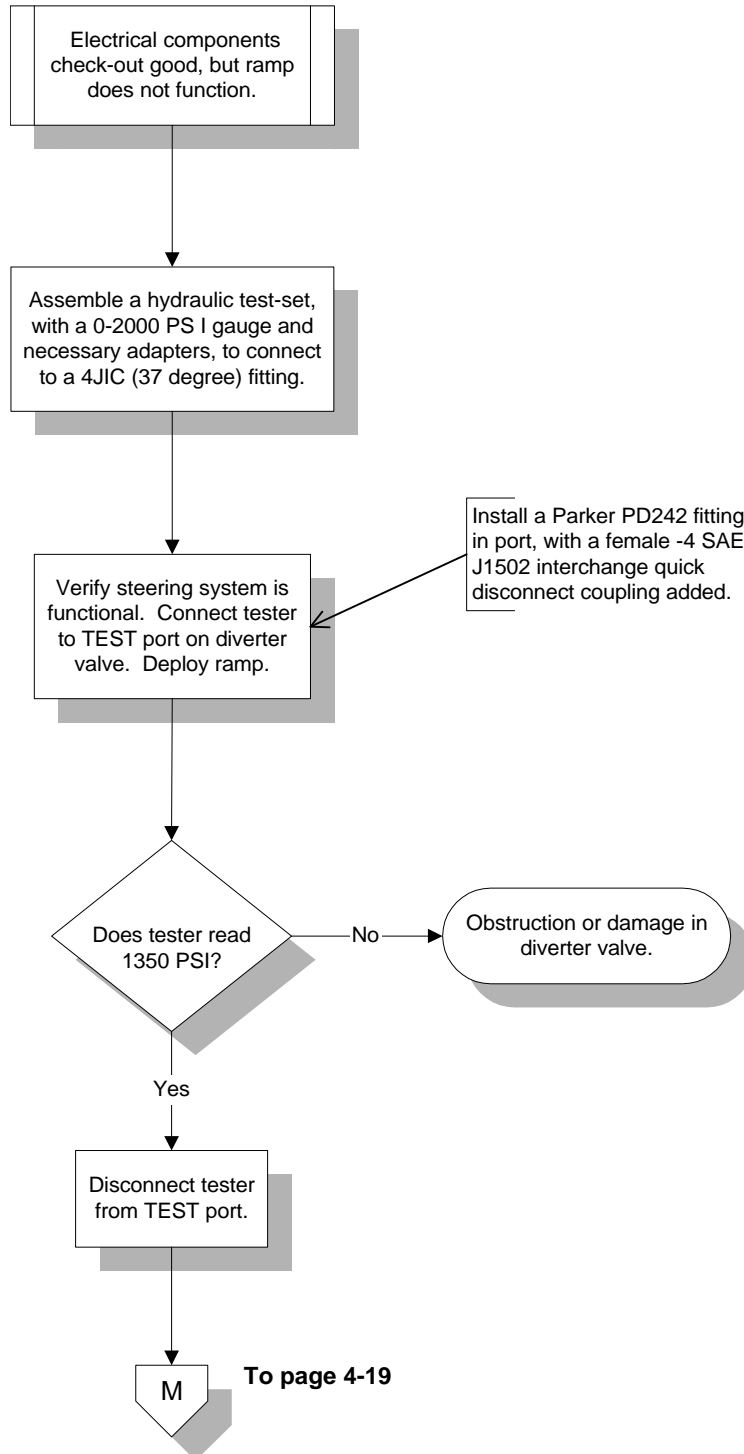


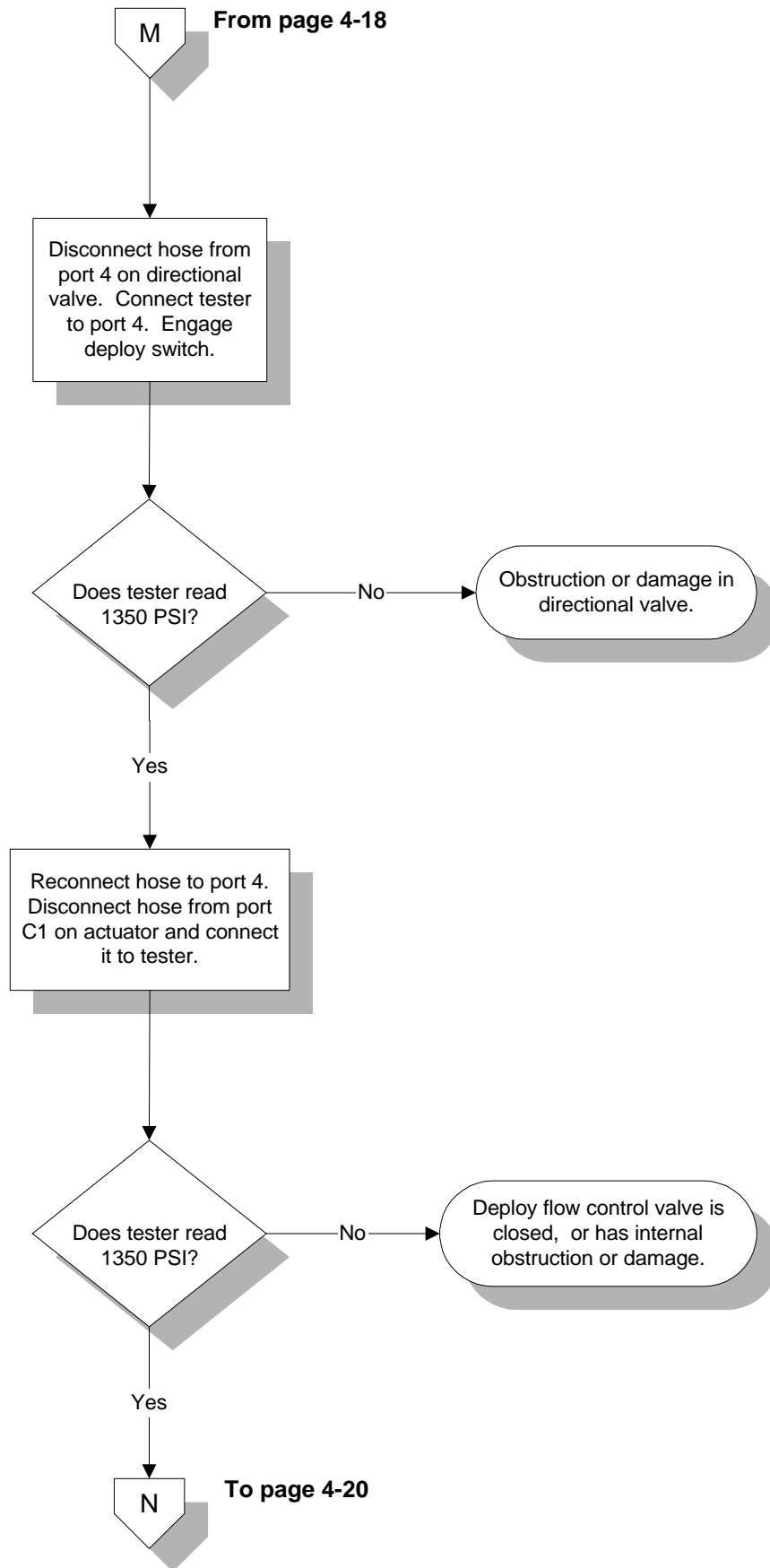


L From page 4-7



2. ELECTRICAL COMPONENTS CHECK-OUT GOOD, BUT RAMP DOES NOT FUNCTION.





N

From page 4-19

Air in hydraulic system.
Bleed air from system.
Refer to Section C.5
**"Hydraulic System
Purging"**.

Have ramp
operations
improved?

Yes

Verify correct fluid level in
steering reservoir. Finish
bleeding ramp system.

No

(Verify that pressure remains at 1350 PSI)
Seals in actuator are damaged. Rebuild/
replace actuator.

END OF CHART

C. INSTALLATION GUIDELINE

Careful installation of the Ricon FoldOver ramp contributes to safe and reliable operation. Following these notes will also expedite installation.

1. POSITIONING MOUNTING BRACKETS

Use a welding fixture (that substitutes for ramp assembly) to position ramp mounting brackets on bus frame before welding them. If the ramp assembly is used as a fixture, be certain it is correctly located relative to the vehicle floor, etc. Correct positioning of brackets prevents twisting or warping of ramp structure when installing and tightening mounting hardware. Distortion of ramp structure causes the deploy and stow actions to be erratic. Set height of ramp non-skid flooring surface flush to surrounding floor structure.

2. INSTALLING RAMP

Trim sufficient floor material to allow ramp assembly to drop into floor structure. The ramp perimeter trim overlaps floor surface. The nominal gap between the ramp mounting faces and the bus structure is 1/8 inch; use shims to fill excess gap. Mount ramp with six grade-5 bolts. Use flat washers and locking-type nuts. Cover ramp pockets to protect ramp until bus assembly is complete.

3. INSTALLING HYDRAULIC LINES

"V" port: Use –8 AN hose with a –8 JIC female hose end to connect "V" port on diverter valve to output of OEM power steering pump.

"S" port: Use –8 AN hose with a –8 JIC female hose end to connect "S" port on diverter valve to input of power steering box.

"T" port: Use –4 An hose with a –4 JIC hose end to connect "T" port on diverter valve to hydraulic catch tank (reservoir) line.

4. INSTALLING WIRING HARNESS

Route wiring harness from ramp controls in vehicle to ramp controller located inside ramp. Install a six-pin female receptacle that mates with the J1 ramp controller connector (refer to section C in chapter three). See **Table 4-2** for pin layout and description.

| TABLE 4-2: J1 PIN LAYOUT AND DESCRIPTION | | | |
|--|------------|---|--------------------------------|
| Pin | Wire Color | Description | Volts/amps |
| 1 | White | Output signal to counter | 24 volt positive pulse, 5A max |
| 2 | Red | Stow signal from ramp control switch | 24 volts, 5ma max draw |
| 3 | Green | Ground | |
| 4 | Orange | Output signal to interlock, ramp not stowed | 24 volts, 5A max |
| 5 | Black | Deploy signal from ramp control switch | 24 volts, 5ma max draw |
| 6 | Blue | Input power | 24 volt, 7A max |
| END OF TABLE | | | |

5. PURGING HYDRAULIC SYSTEM

Fill power steering system reservoir, if necessary. **Check level periodically while purging.** Running the reservoir dry will require restarting this procedure (after filling steering system reservoir). This procedure is similar to automotive hydraulic brake bleeding.

- Manually stow ramp.
- Purge steering system of air; this is important because the steering system and ramp are using the same hydraulic lines for supply and return. Start the bus engine, turn steering wheel completely left and then completely right (do not hold wheel in far right or left positions). Repeat this procedure approximately 10 times. Leave engine running.

- c. Close ramp needle valves; turn completely clockwise after loosening set screw. Disconnect Synflex lines at actuator ports C1 and C2, and submerge ends in a tank of steering fluid. Open needle valves completely by turning knobs counter clockwise. Have a second operator turn the steering wheel while you watch for air bubbles in fluid. A nominal amount of fluid will be released into tank. Check fluid level in power steering reservoir. Close both needle valves when system is free of air.
- d. Reconnect Synflex lines to actuator ports. Disconnect actuator line from stow needle-valve; this line connects actuator port C2 to needle-valve. Submerge end of line in tank of fluid.
- e. Open deploy needle valve, and deploy ramp with control panel. (The actuator rotor range of movement begins near the internal divider. Therefore, minimal air is in deploy chamber, and the majority of air is forced out of stow chamber.)
- f. Close deploy needle valve.
- g. Reconnect Synflex line to stow needle valve.
- h. Disconnect actuator line from deploy needle valve; this line connects actuator port C1 to needle-valve. Submerge line in tank.
- i. Stow ramp with control panel. Air is purged into tank.
- j. Reconnect deploy line to needle valve.
- k. Repeat steps d. through j. twice.

6. ADJUSTING RAMP HYDRAULIC PRESSURE

- a. Completely close needle valves by rotating knobs CW.
- b. Connect pressure test gauge to diverter "TEST" port.
- c. Locate pressure bypass valve on diverter valve assembly.
- d. Loosen bypass valve lock nut with a 3/4" wrench, then insert a 1/4" hex key wrench into adjustment screw.
- e. Attempt to deploy ramp; ramp does not move because needle valves are closed.
- f. Rotate adjustment screw **CW to increase** pressure, or **CCW to decrease** pressure. Adjust pressure to 1350 PSI. Retighten lock nut

7. ADJUSTING RAMP SPEED/TORQUE

NOTE: It is important to adjust both needle valves **identically** during this procedure.

- a. Loosen hex screws that lock knobs.
- b. Turn both valves fully CW. This completely closes the valves, stopping ramp operation.
- c. Open both valves 1/2 turn from fully closed. Make sure each needle valve is adjusted identically.
- d. Operate ramp to determine if more adjustment is necessary. Rotating needle valves **CCW increases** flow to the ramp actuator and increases speed/torque; rotating the valves **CW decreases** flow to the actuator and decreases speed/torque.
- e. Use a 5/64" hex key wrench to tighten the adjustment knob setscrews once valves are adjusted.

8. ADJUSTING SENSOR TARGET

- a. Refer to **Figure 4-1**. Ensure that the ramp is completely stowed. This establishes a reference position for ramp during target adjustment.



FIGURE 4-1: REFERENCE POSITION FOR RAMP

- b. Refer to **Figure 4-2** to verify that target is correctly installed on driveshaft; the small stow segment faces the actuator. The target must be laterally positioned on driveshaft so that it is aligned with sensors; each target segment is directly in front of a sensor.

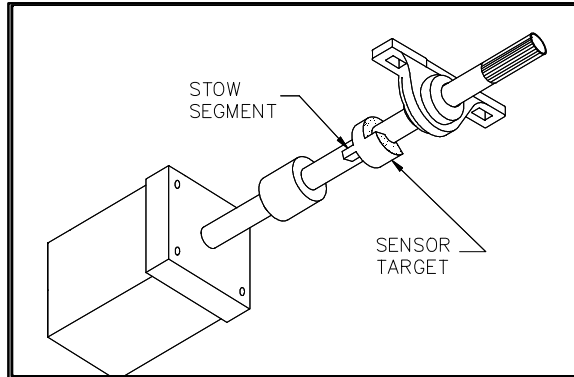


FIGURE 4-2: ORIENTATION OF SENSOR TARGET

- c. Refer to **Figure 4-3**. Adjust the gap between each sensor and the outside diameter of the target to $0.060" \pm 0.030"$. **Do not allow sensors to contact target.** Tighten sensors jam nuts.

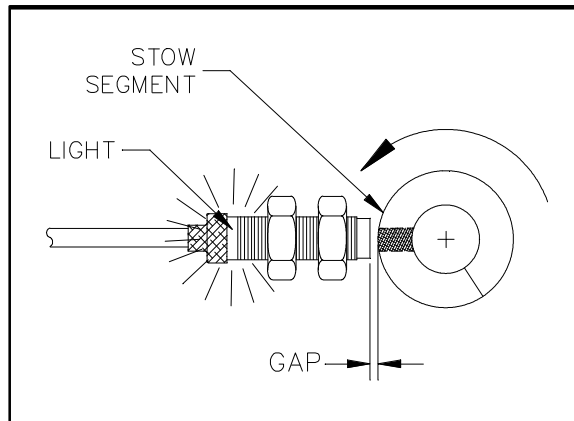


FIGURE 4-3: TARGET ADJUSTMENT

- d. Verify that sensor target is aligned with sensors.
- e. When the ramp is approximately 10 inches from being fully stowed, the sensor should engage the target and illuminate the LED on the sensor. **Figure 4-3** shows position of target when the ramp is fully stowed.

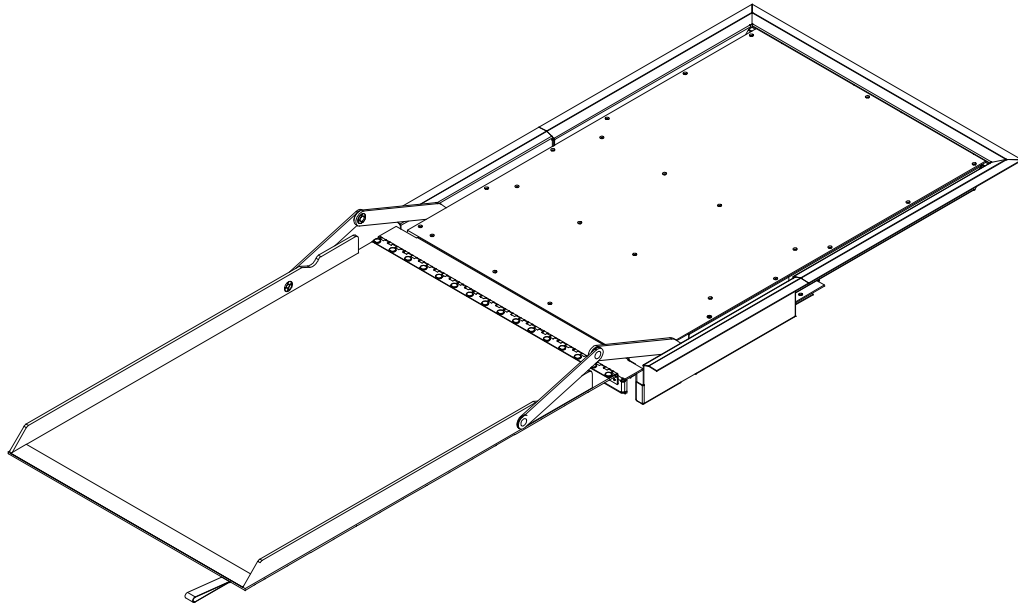
9. FINAL INSPECTION

- a. Visually inspect ramp for loose or missing hardware and fittings, and confirm that both pockets are free of debris.
- b. Verify that bottom cover is installed on ramp.
- c. Verify that non-skid flooring is clean, functional and securely fastened.
- d. Verify that manual operation strap is undamaged.

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V. FOLDOVER RAMP SPARE PARTS

The parts layouts and lists in this chapter apply to the Ricon FoldOver Low-Floor Vehicle Access ramps when installed in transit vehicles. Replaceable ramp parts are illustrated in exploded views of major lift assemblies, which show smaller assemblies and components with reference numbers. Each associated parts lists contains reference numbers, parts descriptions, and Ricon part numbers. To order, locate the part in an exploded view, note its reference number, find this number on the associated parts list, and order the part number in the far right column.



PARTS DIAGRAMS

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| FIGURE 5-2: | FR2-3048 RAMP AND SUPPORT ASSEMBLY – TOP VIEW | 5-4 |
| FIGURE 5-3: | FR2-3248 RAMP AND SUPPORT ASSEMBLY – TOP VIEW | 5-6 |
| FIGURE 5-4: | FR2-3050 RAMP AND SUPPORT ASSEMBLY – TOP VIEW | 5-8 |
| FIGURE 5-5: | RAMP AND SUPPORT ASSEMBLY – BOTTOM VIEW | 5-10 |
| FIGURE 5-6: | ELECTRICAL HARNESSSES, HYDRAULIC HOSES AND FITTINGS..... | 5-12 |

RAMP DECALS

Refer to **Figure 5-1**. Inspect decals at mileage interval listed in **Table 3-1** of Chapter Three. Inspect for chipping, peeling, fading, and illegibility. Replace a decal by ordering part number shown in **Figure 5-1**, and applying it where shown.

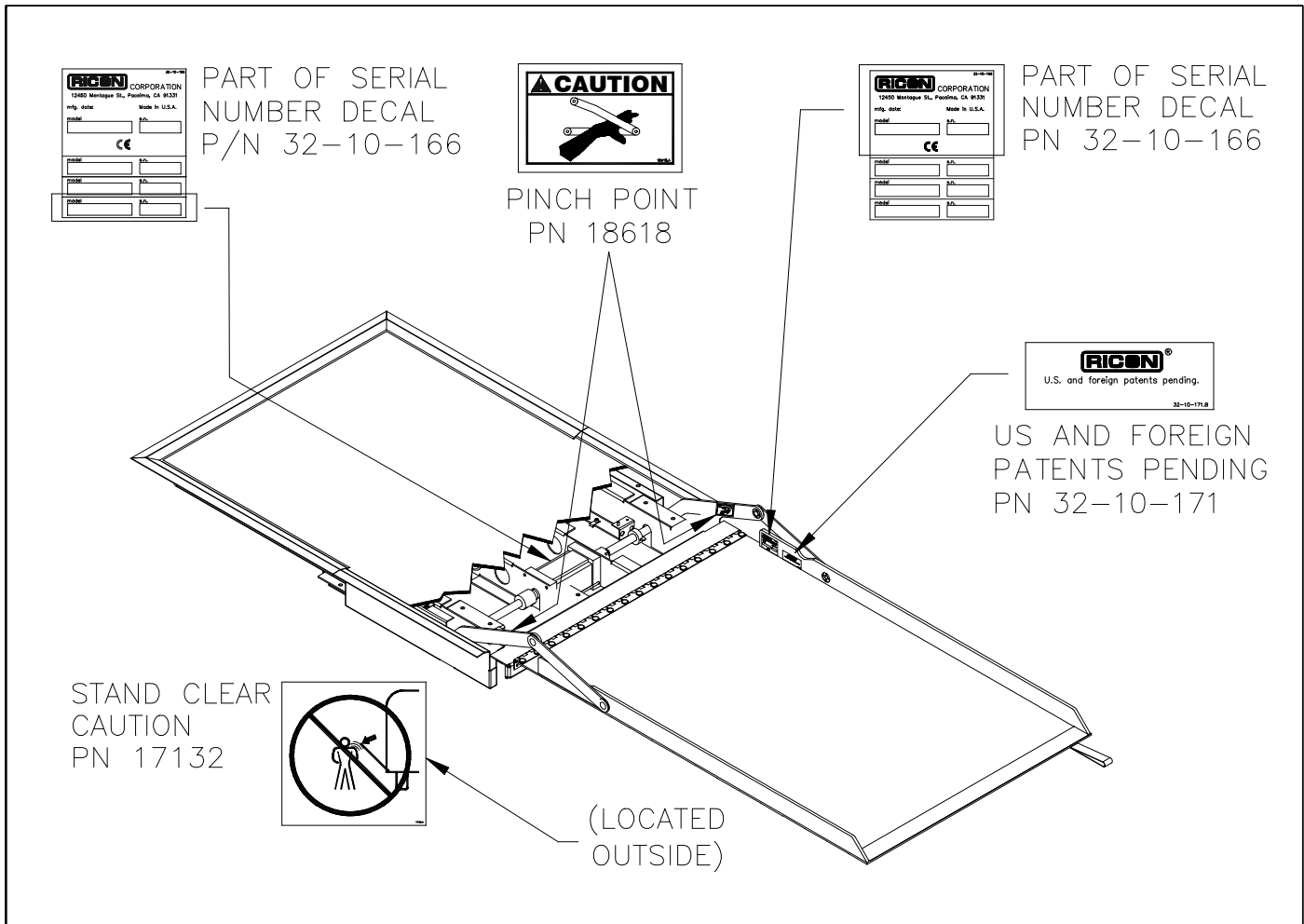


FIGURE 5-1: DECAL PART NUMBERS AND LOCATIONS

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FR2-3048 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

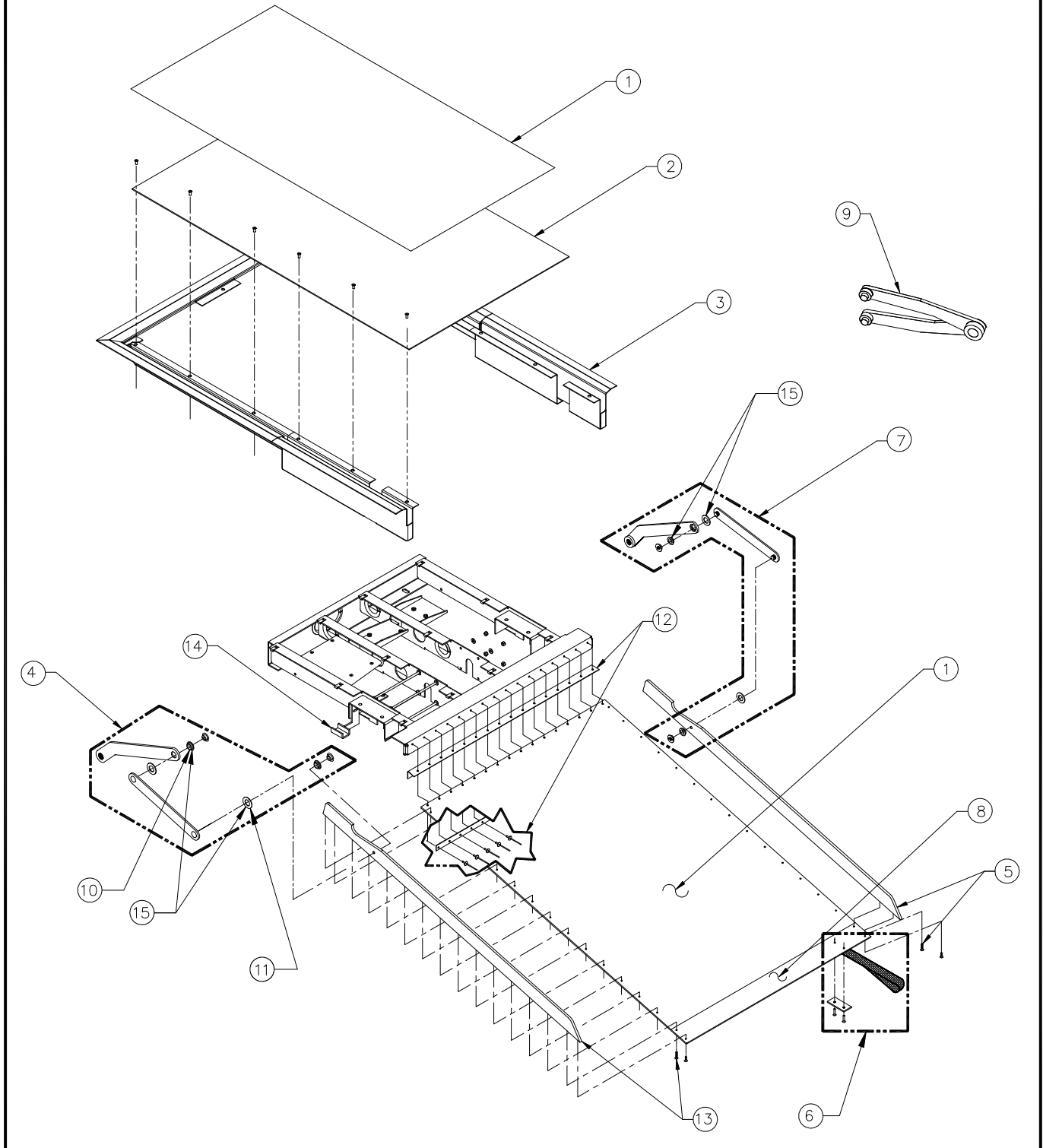


FIGURE 5-2: FR2-3048 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

FR2-3048 RAMP AND SUPPORT ASSEMBLY

| ITEM | DESCRIPTION | PART NO |
|-------------|--|----------------|
| 1 | SAFETREAD, BLACK, 48" X 60ft ROLL | 17792 |
| 2 | KIT, FLOORPLATE, W/HDWR..... | 18693 |
| 3 | TRIM BRACKET | 18228 |
| 4 * | KIT, ARM ASSY, LH, W/HDWR..... | 18662 |
| 5 | KIT, SIDE BARRIER, R.H. | 19543 |
| 6 | KIT, LIFTING STRAP | 18625 |
| 7 * | KIT, ARM ASSY, RH, W/HDWR..... | 18666 |
| 8 | SAFETREAD, YELLOW, 2" X 60FT ROLL | 17250 |
| 9 | SPANNER WRENCH..... | 18756 |
| 10 | BUSHING, FLANGED (BAG OF 10) | 18691 |
| 11 | WASHER, THRUST (BAG OF 10)..... | 18692 |
| 12 | KIT, HINGE, W/HDWR..... | 18699 |
| 13 | KIT, SIDE BARRIER, L.H..... | 19542 |
| 14 | BRACKET, FRAME CHANNEL..... | 21629 |
| 15 | KIT, RAMP BUSHING REBUILD, 4ea + 4ea, w/ 3/8-16 SCREWS | 19975 |

* Spanner wrench is required for assembly.

FR2-3248 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

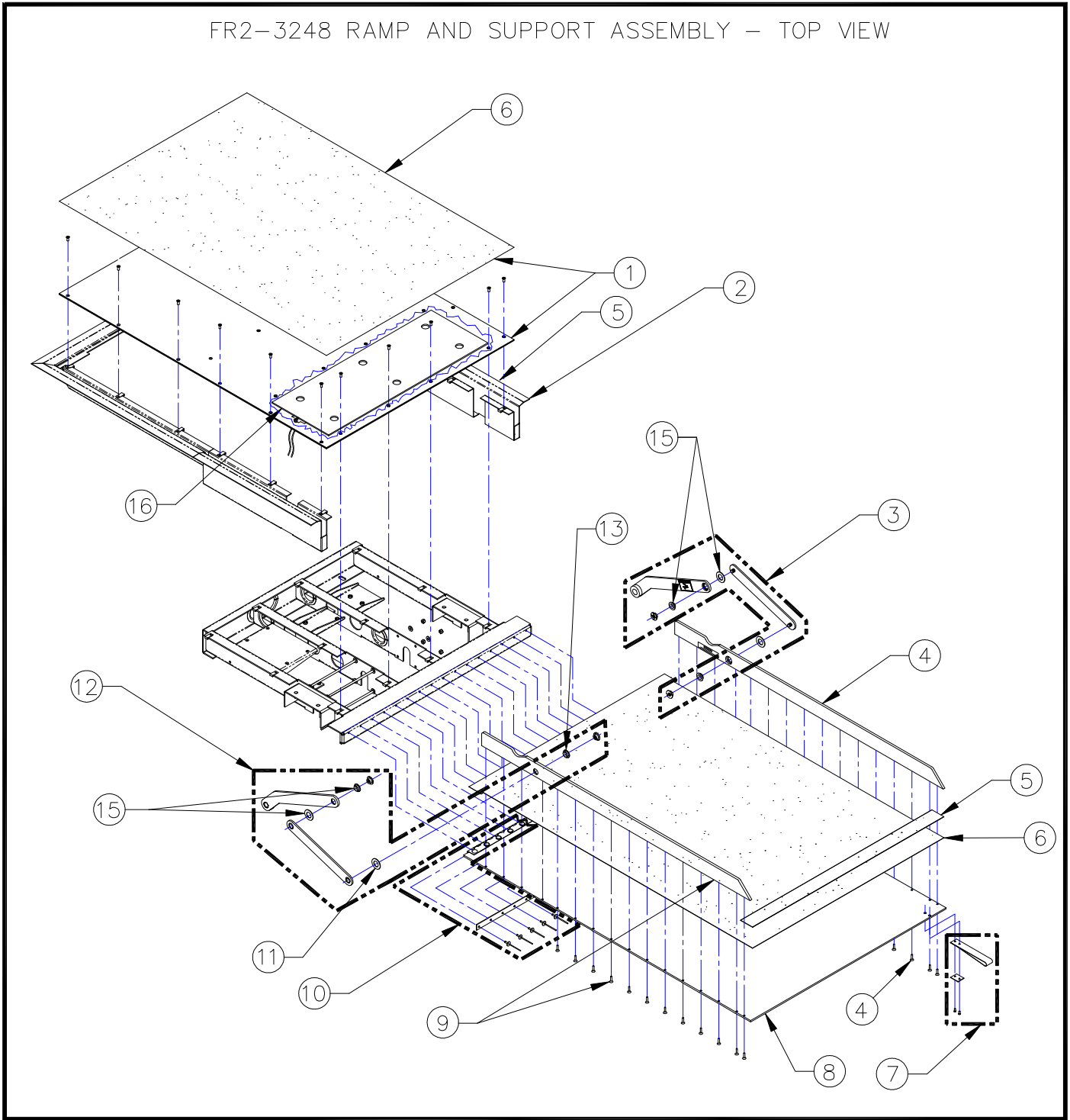


FIGURE 5-3: FR2-3248 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

FR2-3248 RAMP AND SUPPORT ASSEMBLY

| ITEM | DESCRIPTION | PART NO |
|-------------|---|----------------|
| 1 | KIT, FLOOR PLATE, W/SAFETREAD AND HDWR | 19544 |
| 2 | TRIM, POCKET, 32" WIDE | 18773 |
| 3 * | KIT, ARM ASSY, RAMP, RH, W/HDWR | 18666 |
| 4 | KIT, SIDE BARRIER, R.H. | 19543 |
| 5 | SAFETREAD, 2"X60FT, ROLL, YELLOW | 17250 |
| 6 | SAFETREAD, 4FTX60FT, BLK..... | 17792 |
| 7 | KIT, LIFTING STRAP | 18625 |
| 8 | KIT, RAMP PLATE, 32" W X 48" L | 19541 |
| 9 | KIT, SIDE BARRIER, LH..... | 19542 |
| 10 | KIT, HINGE, W/HDWR..... | 19545 |
| 11 | WASHER, THRUST (BAG OF 10)..... | 18692 |
| 12 * | KIT, ARM ASSY, RAMP, LH, W/HDWR..... | 18662 |
| 13 | BUSHING, FLANGED, (BAG OF 10)..... | 18691 |
| 14 | SPANNER WRENCH (NOT SHOWN)..... | 18756 |
| 15 | KIT, RAMP BUSHING REBUILD, 4ea + 4ea w/ 3/8-16 SCREWS | 19975 |
| 16 | HEATER MAT | 17192 |

* Spanner wrench is required for assembly.

FR2-3050 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

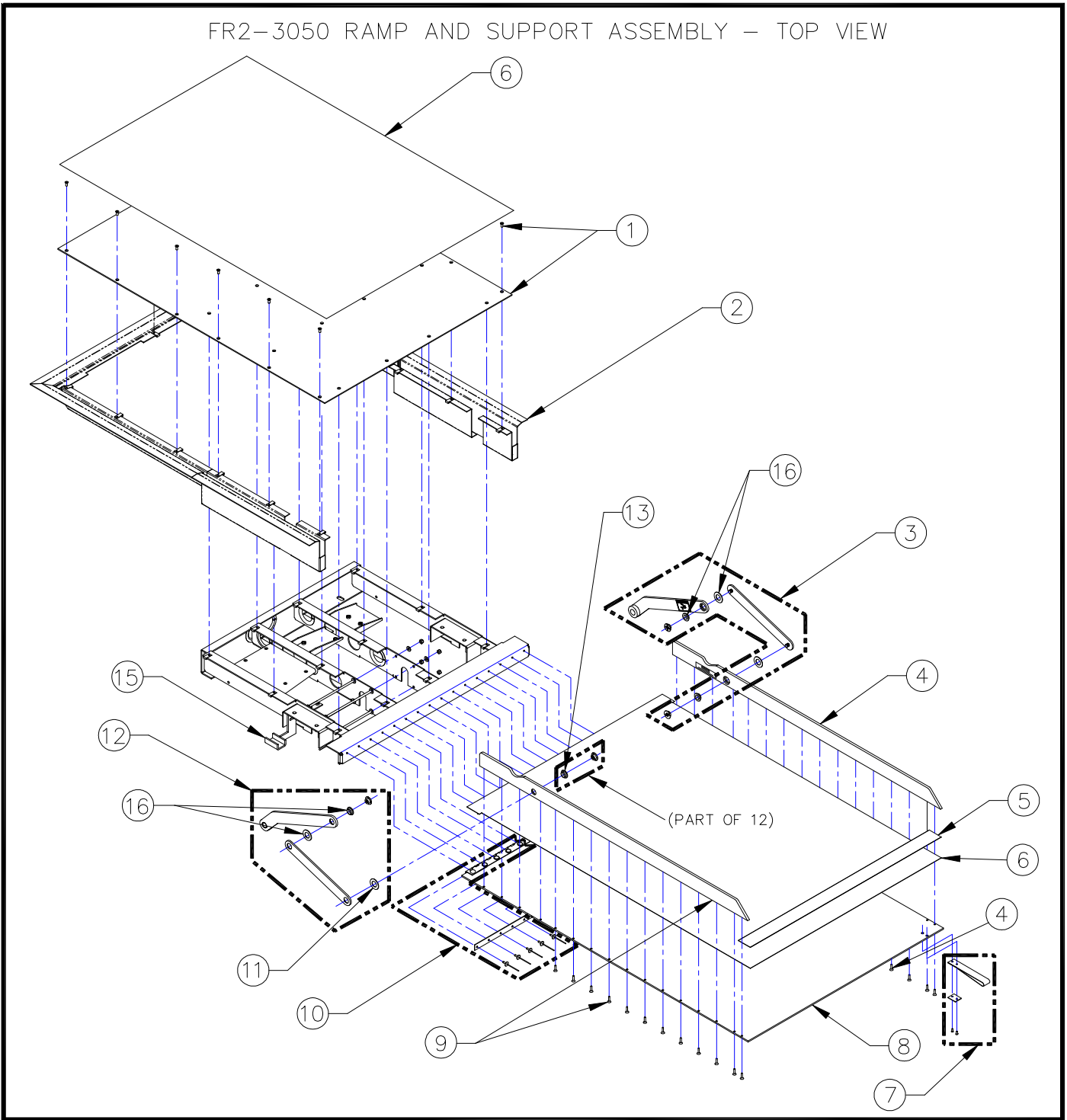


FIGURE 5-4: FR2-3050 RAMP AND SUPPORT ASSEMBLY – TOP VIEW

FR2-3050 RAMP AND SUPPORT ASSEMBLY

| ITEM | DESCRIPTION | PART NO |
|-------------|---|----------------|
| 1 | KIT, FLOOR PLATE, W/HDWR..... | 19546 |
| 2 | WLDT, TRIM, POCKET..... | 19449 |
| 3 * | KIT, ASSY, ARM, RAMP, RH W/HDWR | 18666 |
| 4 | KIT, SIDE BARRIER, RH. | 19547 |
| 5 | SAFETREAD, 2"X60FT, ROLL, YELLOW | 17250 |
| 6 | SAFETREAD, 4FTX60FT, BLK, 3M #310..... | 17792 |
| | SAFETREAD, 48" WX60FT. 3M 610, BLACK (OCTA) | 22263 |
| 7 | KIT, LIFTING STRAP | 18625 |
| 8 | KIT, RAMP PLATE | 19549 |
| 9 | KIT, SIDE BARRIER, LH..... | 19548 |
| 10 | KIT, HINGE, W/HDWR..... | 18699 |
| 11 | WASHER, THRUST (BAG OF 10)..... | 18692 |
| 12 * | KIT, ARM ASSY, RAMP, LH, W/HDWR..... | 18662 |
| 13 | BUSHING, FLANGED, (BAG OF 10)..... | 18691 |
| 14 | SPANNER WRENCH (NOT SHOWN)..... | 18756 |
| 15 | BRACKET, FRAME CHANNEL..... | 21629 |
| 16 | KIT, RAMP BUSHING REBUILD, 4ea + 4ea w/ 3/8-16 SCREWS | 19975 |

* Spanner wrench is required for assembly.

RAMP AND SUPPORT ASSEMBLY – BOTTOM VIEW

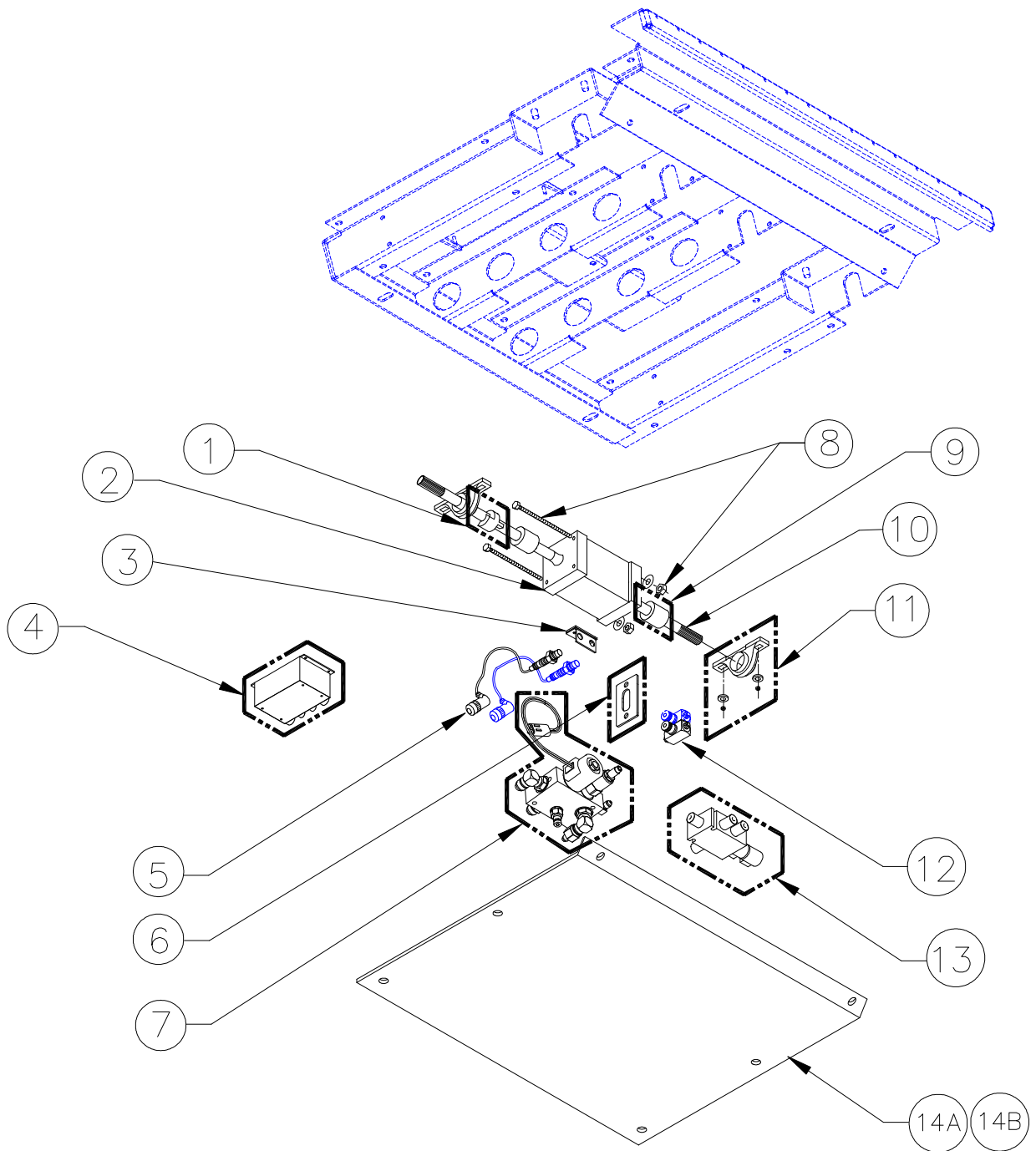


FIGURE 5-5: RAMP AND SUPPORT ASSEMBLY – BOTTOM VIEW

RAMP AND SUPPORT ASSEMBLY – BOTTOM VIEW

| ITEM | DESCRIPTION | PART NO |
|-------------|--|----------------|
| 1 | TARGET, SENSOR, W/HDWR | 98049 |
| 2 | KIT, ACTUATOR ASSY, W/FITTINGS..... | 18619 |
| 3 | MOUNTING BRACKET, SENSORS | 98052 |
| 4 | KIT, CONTROLLER REPLACEMENT, W/COUNTER | 20707 |
| 5 | SENSOR ASSY, (ONE EA), W/MOLDED CABLE | 98071 |
| 6 | KIT, MOUNTING BRKT, NEEDLE VALVES, W/HDWR | 18624 |
| 7 | KIT, DIVERTER VALVE ASSY, W/ADAPTERS..... | 18668 |
| 8 | KIT, HDWR, ACTUATOR MTG | 18622 |
| 9 | KIT, COUPLER, DRIVESHAFT, W/HDWR | 18614 |
| 10 | DRIVE SHAFT (FR2-3048 & FR2-3050 ONLY)..... | 17300 |
| " | DRIVE SHAFT (FR2-3248 ONLY) | 98063 |
| 11 | KIT, PILLOW BLOCK (ONE EA), W/MTG HDWR | 18611 |
| 12 | NEEDLE VALVE ASSY (2EA), W/FITTINGS | 17211 |
| 13 | KIT, DIRECTIONAL VALVE ASSY, W/FITTINGS (4ea) | 18628 |
| 14A | BOTTOM COVER, FRAME | 17754 |
| 14B | BOTTOM COVER, SLOTTED FRAME (FR2-3048 & FR2-3050 only) | 19837 |

ELECTRICAL HARNESSES, HYDRAULIC HOSES, AND FITTINGS

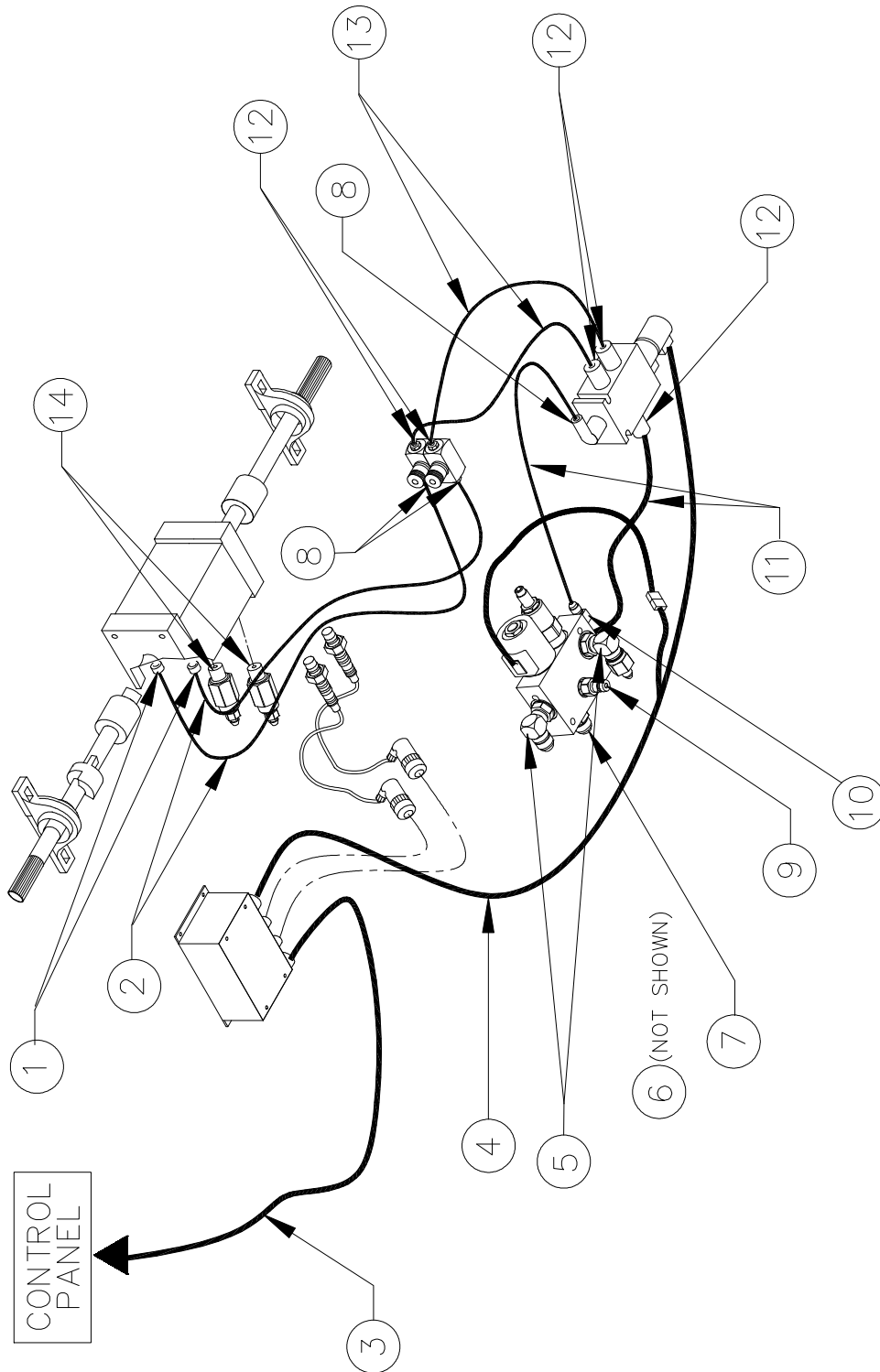


FIGURE 5-6: ELECTRICAL HARNESSES, HYDRAULIC HOSES AND FITTINGS

ELECTRICAL HARNESES, HYDRAULIC HOSES AND FITTINGS

| ITEM | DESCRIPTION | PART NO |
|-------------|--|----------------|
| 1 | ADAPTER, ORB, 4 X JIC, 4 STL..... | 17208 |
| 2 | HYDRAULIC HOSE ASSY, 25"..... | 98065 |
| 3 | HARNESS ASSY, J1..... | 18231 |
| 4 | HARNESS ASSY, J4..... | 18226 |
| 5 | FITTING, ELBOW, #8 STD, THD, #8 JIC..... | 18236 |
| 6 | CAP, #8JIC, HYD FITTING, (10 PER KIT)..... | 18686 |
| 7 | ADAPTER, #8 STR, 37° FLR..... | 17203 |
| 8 | FITTING, STE, ¼ J/9/16-18 STL..... | V2-SH-14 |
| 9 | FITTING, #4, QUICK DISCONNECT..... | 18232 |
| 10 | FITTING, ELBOW, #4 STD, THD, #4 JIC..... | 18235 |
| 11 | HYDRAULIC HOSE ASSY, 13.5"..... | 16752 |
| 12 | ADAPTER, ORB, 6 X JIC, STR, 4 STL..... | 26591 |
| 13 | HYDRAULIC HOSE ASSY, 17"..... | VS-SH-09 |
| 14 | FITTING, -4 SAE, BLEEDER..... | 19963 |

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