

INSTALLATION AND USERS MANUAL

TELEMOTIVE

***telePilot*[™] SERIES**

TR12 AND TX12

RADIO

CONTROL

SYSTEM

telemotive[®]

Industrial Controls

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Section 1 – Service Information

1-1. Service Information.

For questions regarding service or technical information or ordering replacement parts, ask for Telemotive Customer Care. Telemotive's normal business hours are Monday through Friday 8:00 AM to 5:00 PM Central Standard Time. After hours emergency technical service is available.

For new product orders or quotations, ask for Telemotive Sales.

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Section 2 – Radio Controlled Safety

2-1. Warnings, Cautions and Notes.

Through out this document **WARNING**, **CAUTION** and **NOTE** statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.

WARNING – A warning highlights a essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in injury or death of personnel, or long term physical hazards. Warnings are highlighted as shown below:



CAUTION – A caution highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in damage to, or destruction of equipment, or loss of functional effectiveness. Cautions are highlighted as shown below:



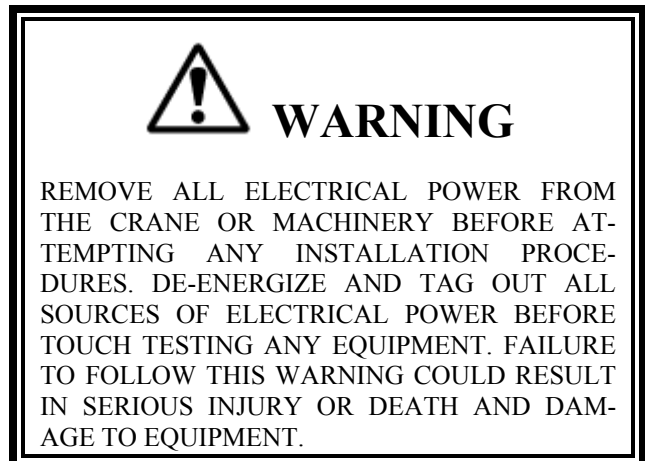
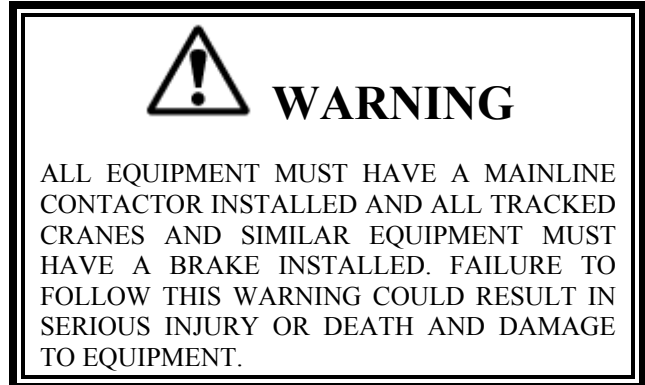
NOTE – A note highlights an essential operating or maintenance procedure, condition or statement. Notes are shown as below:

NOTE

WARNINGS, CAUTIONS AND NOTES SHOULD NEVER BE DISREGARDED.

The safety rules in this section are not intended to replace any rules or regulations of any applicable local, state, or federal governing organizations. The following information is intended to be used in conjunction with other rules or regulations already in existence. It is important to read all of the safety information contained in this section before installing or operating the Radio Control System.

2-2. Critical Installation Considerations.



Section 2 – Radio Controlled Safety (Continued)



WARNING

THE DIRECT OUTPUTS OF THIS PRODUCT ARE NOT DESIGNED TO INTERFACE DIRECTLY TO TWO STATE SAFETY CRITICAL MAINTAINED FUNCTIONS, I.E., MAGNETS, VACUUM LIFTS, PUMPS, EMERGENCY EQUIPMENT, ETC. A MECHANICALLY LOCKING INTERMEDIATE RELAY SYSTEM WITH SEPARATE POWER CONSIDERATIONS MUST BE PROVIDED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

2-3. General.

Radio controlled overhead cranes and other material handling equipment operate in several directions. They are large, bulky pieces of equipment that handle heavy loads efficiently at high speeds. Quite frequently, the equipment is operated in areas where people are working on the floor below. The crane operator must exercise extreme caution at all times. Workers must constantly be alert to avoid accidents. The following rules have been included to indicate how your careful and thoughtful actions may prevent injuries, damage to equipment, or even save a life. If radio controlled material-handling equipment is operated from the cab, special care must be taken to secure the transmitter. Refer to section titled Section 2-10. Boarding The Crane for specific safety rules.

2-4. Persons Authorized To Operate Radio Controlled Cranes.

Only properly trained persons designated by management should be permitted to operate radio-controlled cranes.

Radio controlled cranes should not be operated by any person who cannot read or understand signs, notices and operating instructions that pertain to the crane.

Radio controlled cranes should not be operated by any person with insufficient eyesight or hearing or by any person who may be suffering from a disorder or illness or is taking any medication that may cause loss of crane control.

2-5. Training Checklist For Crane Operators.

Anyone being trained to operate a radio-controlled crane should possess as a minimum the following knowledge and skills before operating the crane:

The operator should have knowledge of hazards peculiar to crane operation.

The operator should have knowledge of the safety rules for radio-controlled cranes.

The operator should have the ability to judge distance or moving objects.

The operator should have knowledge of the radio transmitter.

The operator should know the limit switch test procedure.

The operator should know, where authorized, instructions for plugging motions.

The operator should have knowledge of the use of crane warning lights and alarms.

The operator should have knowledge of observing crane signal lights.

The operator should be trained to avoid striking any obstructions.

The operator should have knowledge of the proper clearance of lifts or hooks before moving bridge or trolley.

The operator should have knowledge of the proper storage space for radio control box when not in use.

The operator should be trained in transferring radio control box to another person.

The operator should be trained how and when to report unsafe or unusual operating conditions.

The operator should be trained how to exhibit caution in approaching bridge or trolley bumpers.

The operator should know equipment capacity.

The operator should be trained in making lifts below floor level.

The operator should be trained in making side pulls.

The operator should know how to keep himself and other people clear of lifts and to avoid "pinch" points.

Section 2 – Radio Controlled Safety (Continued)

The operator should know cable and hook inspection procedures.

The operator should know procedures for testing hoist, trolley, and bridge brakes.

2-6. Operating Area.

Aisles between equipment, stock, etc., should be free of obstructions so the crane operator can move freely. These aisles should be a minimum of meter wide, or meet local regulations.

Crane operators should always position themselves for the best view of the crane they are controlling. The crane should never be operated blindly. The operator should stay as close to the crane load as possible. Operators should never position themselves in a "pinch" point.

2-7. Transmitter Unit.

Transmitter switches should never be mechanically blocked ON or OFF for any crane motion. When not in use turn the transmitter OFF. A secure storage space should be provided for the transmitter unit and the transmitter unit should always be placed there when not in use. This precaution will prevent unauthorized people from operating the crane.

Spare transmitters should be stored in a secure storage space and only removed from the storage space after the current transmitter in use has been turned OFF, taken out of the service area and secured.

2-8. Operating The Crane.

2-8.1. Pre-operation Test.

At the start of each work shift, or when a new operator takes control of the crane, operators shall do as a minimum the following steps before making lifts with any crane or hoist:

Test the upper-limit switch. Slowly raise the unloaded hook block until the limit switch trips. When checking limit switches the hoist should be centered over an area free of personnel and equipment.

Visually inspect the hook, load lines, trolley, and bridge as much as possible from the operator's station; in most instances, this will be the floor of the building.

The bridge and trolley brakes should be tested. On transmitter units equipped with two or more speeds, use the "lowest" speed when testing braking devices.

When lifting maximum loads, the crane operator should test the hoist brakes by raising the load a few inches from the floor. If the brakes do not hold, the load should immediately be lowered to the floor.

If provided, test the lower-limit switch.

Test all warning devices.

Test all direction and speed controls for both bridge and trolley travel.

Test all bridge and trolley limit switches, where provided, if operation will bring the equipment in close proximity to the limit switches.

Test the transmitter emergency stop.

Test the hoist brake to verify there is no drift without a load.

If any crane or hoist that fails any of the above tests notify the supervisor and lock out and tag for repair.

2-8.2. General rules for operation.

Consult the crane manufacturer, local and governmental regulations for complete rules of operation. In general the following rules apply to remotely controlled cranes:

The limit switches should never be used as a regular stopping device. They are intended to be protective devices.

Do not make lifts in excess of the equipment rated capacity.

The bridge and trolley should be centered directly over the load when the load is raised to prevent swinging when making lifts.

A crane designed for this purpose and only with supervisor permission should make side pulls. When a lift is being made, the crane operator should not be positioned in the line of travel. The crane or hoist should be operated from a position either to the side or opposite from the direction of travel.

When raising or lowering a load, proceed slowly and make certain the load is under control. Tag lines should be used for handling unusual lengths or bulky loads. Remove slack from chains or slings gradually.

Section 2 – Radio Controlled Safety (Continued)

Make certain all personnel are clear before making a lift.

The crane operator should keep all body parts away from the lift and should never be positioned under the lift.

Do not make a lift or move a load if anyone is in a location where they could be struck by the crane or the load.

If the crane operator is being helped, the crane should not be moved until the helper signals they are clear of the crane and its load.

When a load is hanging from the crane hook and the crane is being moved, the crane operator should sound all warning devices frequently.

Loads should not be carried over workers heads. If a worker is in the path of crane travel, the crane operator should stop the crane and clear the area before proceeding.

Runway stops or other cranes should never be bumped into.

When moving the crane, the crane operator should be sure that the hook block and attachments or cables would not catch on nearby equipment. Slings, chains, or cables should never be dragged along the floor.

Unless required for operator safety, gloves should not be worn when operating the transmitter unit.

All loose materials or parts should be removed from the load before starting the lift.

The crane operator should always hoist lifts high enough to clear all equipment and workers.

The crane operator should never permit anyone to ride on the load or hook except when authorized by the supervisor.

When another crane on the same runway is stationary with a load hanging, the crane operator should maintain a safe distance between the stationary crane and the one under their control.

Never leave suspended loads unattended. In an emergency, if the crane is inoperative and a load suspended, notify the supervisor immediately, barricade and post signs on the floor beneath crane and load.

If power to the crane is removed, the crane operator should turn the transmitter unit OFF and keep it OFF until power is restored.

If the crane fails to respond properly, the crane operator should stop operation, turn the transmitter unit OFF and immediately report the condition to their supervisor.

Outdoor cranes, which are subject to movement by wind, should be securely anchored when left unattended. If the crane is equipped with bridge brakes, the parking brake should be set immediately.

2-9. Boarding The Crane.

The crane should not be boarded without permission of the supervisor.

The crane operator should turn off the transmitter and take it with them when boarding the crane.

If more than one person is boarding the crane, one person should be made responsible for ensuring all personnel are off the crane before the system is returned to operation.

2-10. Crane Maintenance and Repair.

Qualified personnel must maintain a regularly, i.e., such as monthly, scheduled crane inspection. During this crane inspection the functionality and safety of the crane remote control must also be tested. The inspection shall include, but be not limited to items listed in Section 2-13. Condition Of The Radio Controlled Crane. Consult crane manufacturer, local and governmental regulations for recommended inspection intervals and proper inspection procedures. Problems noted during this inspection must be repaired before using the crane or the remote control.

Minor repairs include routine maintenance and repairs such as greasing, cleaning and control troubleshooting. All other repairs should be considered major. If the repair crew consists of more than one person, one person should be designated as the repair crew leader with the following responsibilities. If the repair crew consists of only one person, that person has the following responsibilities:

For minor repairs warning signs should be placed on the floor beneath the crane or suspended from the crane. For major repairs, the floor area below the crane should be roped off.

Section 2 – Radio Controlled Safety (Continued)

When major repairs are to take place, all persons operating other cranes on the same or adjacent runways, if any, must be notified prior to starting repairs. Notification should include the nature of the repair, safeguards provided, and movement limitations while repairs are in progress.

When practical, radio controlled cranes which cannot be moved during repairs must be protected against being bumped by other cranes on the runway. Bumpers should be installed on the exposed side or sides of the crane under repair. They should be placed as far away as possible. The location of these bumpers should be indicated by red lights placed so that they are clearly visible to other crane operators traveling on the same runway. When it is not possible to use bumpers, red lights must be placed so they are clearly visible to other crane operators traveling on the same runway to indicate the restricted travel zone. All crane operators on the same runway must be informed of the repair effort and thoroughly instructed to what their operations are limited to and informed they will be notified when repairs are completed.

If any hazard involving the repairmen exists when there is a runway adjacent to the crane under repair, the adjacent runway should be blocked off as described above. When it is necessary to continue crane operation on the adjacent runways warning lights must be installed and be visible to operators of cranes on those runways. All cranes should come to a complete stop prior to entering the restricted area and should proceed through this area only after receiving permission from a signal person designated for this purpose. Access of persons to and from the crane being repaired should be under control of the repair crew leader.

When boarding the crane, the transmitter should be turned OFF and the transmitter should remain with the repair crew leader. The leader should board the crane first, open and lock out the main switch, and then signal the other members of the crew it is safe to board the crane.

If work on the crane is to be done in areas not protected by standard handrails, the repair crew should wear approved safety belts.

All tools and equipment should be moved onto the crane by the use of hand lines. The tools and equipment should be adequately secured to the hand lines.

If it is necessary to have the crane control circuits energized, all power circuits for crane movement must be opened prior to energizing the control circuits.

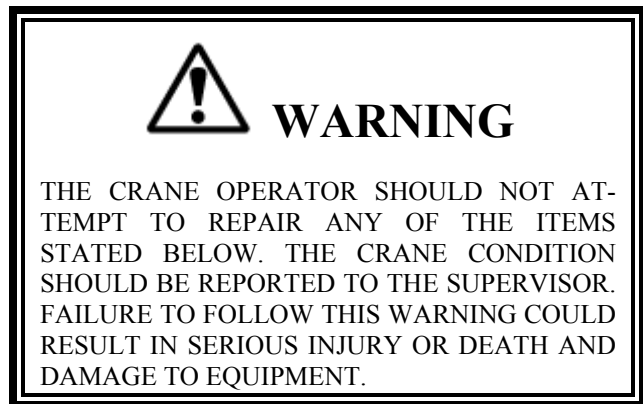
All personnel and tools should be moved to a safe spot before moving the crane during repairs.

Headroom is at a minimum in some crane cabs and on some crane walkways. Caution should be exercised when boarding or working on cranes. Hard hats should be worn whenever possible.

When repairs are finished, all personnel, tools and repair equipment should be removed before energizing the crane circuits.

2-11. Using The Crane As A Work Platform.

When the crane is to be used as a stationary work platform, follow all rules provided in Section 2-11. Crane Maintenance and Repair. When it is necessary for the crane to be moved from time to time, the crane operator should board the crane with the transmitter unit. The crane operator should ensure all personnel working on the crane are in a secure position before moving the crane to the next workstation. It should also be the crane operators responsibility to ensure the main switch is open and locked down before work is resumed.



2-12. Condition Of The Radio Controlled Crane.

If the crane fails to respond properly, the crane operator(s) should notify their supervisor. When serious conditions are noticed (conditions that make the crane unsafe to operate), the crane should be shut down immediately and the supervisor notified. The following is a list of some of the items that should be included in the report. (See the crane manufacturer for specifics and possible additional items):

Section 2 – Radio Controlled Safety (Continued)

Condition of hoisting cable and hook block (broken strands, clipped sheave wheels, etc.).

Condition of brakes (hoist, trolley, and bridge). (no bluing, rivets on shoes showing, glazing, etc.).

Condition of trolley and rail stops.

Condition of bridge structure.

Condition of festoon system.

Broken welds in any part of the crane structure.

Proper fluid levels and lubrication.

Condition of bridge and trolley stops.

Carbon dust or signs burning on the covers of motors.

Indication of fluid, oil or grease leaks.

Condition of rail sweeps.

Walkways required handrails and ladders are in place, sturdy and not loose.

Protective guards are in place for all moving parts.

Alignment of bridge (screeching or squealing wheels indicate bridge is out of line).

Broken, cracked, or chipped rails on trolley or runway.

Condition of limit switches.

Condition of electrical and mechanical control (electrical or mechanical defects which cause faulty operation such as un-commanded stopping or starting of any crane motions, warning devices, lights, or auxiliary functions).

Condition of gears (grinding or squealing may indicate foreign materials in gear teeth or a lack of lubrication).

All controls especially E-STOPS are in place and in working order.

Frequent relay tripping of power circuits.

Mechanical parts loosened by vibration (loose rivets, covers, bolts, etc.).

Uneven riding (worn or damaged wheels).

Condition of collector shoes or bars.

Condition of warning or signal lights and horns. (burned out or broken).

2-13. Batteries



WARNING

KNOW AND FOLLOW PROPER BATTERY HANDLING, CHARGING AND DISPOSAL PROCEDURES. IMPROPER BATTERY PROCEDURES CAN CAUSE BATTERIES TO EXPLODE OR DO OTHER SERIOUS DAMAGE. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

2-13.1. Battery Handling.

Use only batteries approved by Telemotive for the specific product.

Do not dispose of a battery pack in fire; it may explode.

Do not attempt to open the battery pack.

Do not short circuit battery.

For intrinsically safe environments only used specified Telemotive intrinsically safe batteries.

Keep the battery pack environment cool during charging operation and storage, (i.e., not in direct sunlight or close to a heating source).

2-13.2. Battery Charging.

Please familiarize all users with the instructions of the charger before attempting to use.

Use only Telemotive approved chargers for the appropriate battery pack.

Do not attempt to charge non-rechargeable battery packs.

Avoid charging the battery pack for more than 24 hours.

Do not charge batteries in a hazardous environment.

Do not short charger.

Section 2 – Radio Controlled Safety (Continued)

Do not attempt to charge a damaged battery.

Do not attempt to use a battery that is leaking, swollen or corroded.

Charger units are not intended for outdoor use. Use only indoors.

2-13.3. Battery Disposal.

Before disposing of batteries consult local and governmental regulatory requirements for proper disposal procedures.

Section 3 – General System Information

3-1. General System Information.

The Telemotive Radio Control System (system) provides remote control of overhead cranes using radio signals. The system consists of a hand held portable battery operated transmitter unit and a fixed station receiver unit.

A unique 16-bit code (Access Code) for each system is preset in every transmitter and receiver. The receiver considers any received signal, which does not match the receiver access code setting, invalid. The Access Code is made up of 16-bits (65,000 combinations) and no two similar codes are assigned to any two Telemotive systems.

Up to four systems may be used with the same frequency in a 600-foot area (220 meters). Each transmitter operating on the same frequency may be operated in close proximity, not less than six feet (1.9 meters), to each other.

3-2. TMS Low Power Signaling.

TMS (Time Multiplexed Signaling) is a Telemotive propriety high-speed packet data system. The system software is structured to minimize "on the air" transmission time of any transmitter. This allows for multiple transmitters to share a common frequency. The TMS system is designed so that a transmitter will send a signal for a predetermined ON time, and then will turn OFF. The length of transmitter ON time is referred to as data burst or packet. The packet length is a function of the quantity of data to be sent, and the data rate (baud). Once the packet is sent, the transmitter will turn OFF. This allows for other transmitters to time-share the same frequency when a transmitter has turned OFF. The TMS system software determines the OFF period and repetition rate of the ON period. Since each system has its own access code, up to 4 transmitters can share and have equal access to the same frequency. TMS also allows for reduced battery consumption and extended battery life.

These systems have low power pulsed signaling, FCC certified under Part 15 Telecommunications Code of Regulations, no license is required. The transmitter unit is frequency modulated, low power and is certified under the appropriate regulations. A license is not required for the transmitter or operator. Modifications to the RF section of this system are not permitted and could void FCC certification.

3-3. System Specifications.

Channel Designations:

AK01 - 439.8 MHz	AK06 - 438.8 MHz
AK02 - 439.6 MHz	AK07 - 438.6 MHz
AK03 - 439.4 MHz	AK08 - 438.4 MHz
AK04 - 439.2 MHz	AK09 - 438.2 MHz
AK05 - 439.0 MHz	AK10 - 438.0 MHz
AK11 - 437.8 MHz	AK16 - 436.8 MHz
AK12 - 437.6 MHz	AK17 - 436.6 MHz
AK13 - 437.4 MHz	AK18 - 436.4 MHz
AK14 - 437.2 MHz	AK19 - 436.2 MHz
AK15 - 437.0 MHz	AK20 - 436.0 MHz

For special applications only:

AKA00 433.100 MHz

Operating Temperature: -22° F to +158° F (-30° C to +70° C) ambient.

Humidity: up to 95 % (non-condensing).

Typical Operating Range: 200 feet (70 meters).

Rating of output relays (including Master Relay): 16 Amp 277 VAC/24 VDC, 1 HP 240 VAC.

3-4. Transmitter Unit.

The transmitter is battery operated has an ON and OFF switch, E-STOP, motor controls and auxiliary controls used for such item warning indicators.

LED's mounted on the front panel provide indication of battery voltage, ON/OFF, Modes and data transmission status.

A power down feature allows the transmitter and the receiver unit to turn OFF if no keys are pressed for predetermined number of minutes. The transmitter unit must again be turned ON. The unit uses pulsed operation for extremely long battery life. A configuration of the system is available without automatic timeout.

Housings are designed of high impact, chemical resistant, materials. The antenna for the unit is internal. A strap or belt is provided for carrying the transmitter.

Section 3 – General System Information (Continued)

3-5. Receiver Unit.

The receiver unit consists of a synthesized RF module, built in antenna, integral power supply, microprocessor controlled output motor control and auxiliary function relays and mainline contactor relay. The receiver unit contains circuitry, which matches the frequency and access code of the transmitter.

Section 4 – Installation Procedure

4-1. Pre-Installation Considerations.

To ensure reliable and safe operation of the system, the following items must be considered before installing the receiver unit.

If the receiver is mounted outdoors or in a corrosive environment, the receiver unit cabinet must be housed in a protective enclosure.

The receiver unit should not be subjected to moisture.



WARNING

THE RECEIVER UNIT OR RELAYS ARE NOT RATED AS EXPLOSION PROOF. THE RECEIVER UNIT MUST NOT BE INSTALLED IN EXPLOSIVE ENVIRONMENTS UNLESS APPROPRIATE SECONDARY ENCLOSURE MEASURES ARE TAKEN. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

4-2. Receiver Unit Mounting Location Considerations.

Ensure the mounting location is as far as possible from exposed trolley wires and sources of electromagnetic or radiated noise

The receiver unit requires a mounting area approximately 8" (20 cm) wide by 11" (28 cm) high. A depth of at least 6" (15 cm) must be provided to allow the cabinet door to open.

The mounting surface must be smooth and continuous. Mounting the cabinet on uneven surfaces could cause warpage or stress internal components.

The receiver unit may be mounted in any position. Greatest radio control range is obtained when the receiver unit is mounted with the antenna pointed straight up.

If possible, avoid installing receiver unit to a surface where high vibration or shock is present. If this cannot be avoided, use appropriate shock mounts.

4-3. Antenna Mounting Considerations.

The antenna is internal and requires no additional mounting. The antenna is at the top of the receiver cabinet and should not be placed near large metal objects that could be close to or cover the top of the box. Allow at least six inches above the top of the box for clearance.

4-4. Line Input Considerations.



WARNING

THE UNIT MUST BE WIRED TO THE CORRECT VOLTAGE, AND BE CONNECTED TO THE CORRECT TERMINAL AS REQUIRED BY THE ACTUAL LINE VOLTAGE, FAILURE FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

The receiver unit has direct connect provisions for operation from 120 (nominal), 50-60 Hz power.

For applications where line voltage deviation exceeds 20% of nominal values if line voltage is not between

95-130 VAC or 190-260 VAC or if 440 VAC power is used, a step up or step down transformer must be used.

NOTE

THE RECEIVER UNIT SHOULD NOT BE CONNECTED TO LINES CONTAINING EXCESSIVE POWER UP TRANSIENTS OR CONTINUOUS COMMUTATOR NOISE. A LINE CONDITIONER MAY BE NECESSARY IN SOME INSTALLATIONS.

4-5. Wiring Considerations.

1. Read this manual before installation.
2. Please observe appropriate local and National Electrical Codes when wiring electrical devices.
3. Do not connect or disconnect wiring, or perform circuit checks while the power is turned on.

Section 4 – Installation Procedure (Continued)

4. The motor wiring should be in a separate metal conduit from the power wiring, which should also be in metal conduit.
5. Low voltage wires shall be wired with proper low voltage class wiring procedures.
6. Control wiring as well as antenna wiring shall be in separate conduit and shall be kept as short as possible.
7. All terminals shall be tightened to specified terminal torque 4.4 IN-LBS (.5 N·m). unless otherwise specified.
8. Remove excess metal screws, metal filings and wire clippings from inside of unit.
9. Inspect to make sure no exposed wire has contact with any other wiring or terminals.
10. Suppressors are strongly recommended on all contactors.

4-6. Receiver/Equipment Interface Considerations.

All output relay contacts are rated at 16 amps 250 VAC, however the system rating for the contacts is 5A. Connection to equipment or contactors with higher voltage or current requirements will require intermediate relays.

All relay outputs are normally open, momentary contact. Since a relay closure is only active while the transmitter unit key is pressed and held, devices such as lights or lifting magnet must use a mechanical auxiliary latching relay.

NOTE

FOR INFORMATION ON INTERFACING WITH SYSTEMS WITH HIGH IMPEDANCE INPUTS SEE SECTION 6-4. CONNECTING OUTPUTS TO DRIVES OR CONTACT TELEMOTIVE.

4-7. Receiver Unit Cabinet Mounting.

Mounting hardware is provided. See next page Figure 4-1A. Installation Hardware. The door is not attached when the unit is shipped to make it easier to install the mounting screws. After the unit is mounted the door should be attached.

Mount receiver unit cabinet securely to mounting surface. Actual cabinet mounting dimensions and

a mounting template are shown on page 29 Figure 4-2.

4-8. Receiver Installation.

1. Set the Access code per the instructions on pages xxxx 24-25 Section 7. Servicing and Programming
2. Position the receiver. Locate as far as possible from exposed trolley wire and sources of electromagnetic or radiated noise. Cabinet mounting dimensions and mounting template is on page 29 Figure 4-2. Antenna at top of unit should be kept as clear as possible of any metal object.
3. Mount the receiver. Through the four deep mounting holes in corners of the receiver housing use quantity four #10-24 slotted round head screws 1" in length, four #10 lock washers and four #10-24 hex nuts. Lock washers should be used in front of hex nuts. (Five sets of mounting hardware are provided; one set is a spare). See Figure 4-1A. Installation Hardware.
4. Attach door. Put two door screws in door. (Included in your unit are two pairs of door screws. One pair slotted and one pair wing head.) Pick the screws that are preferred, line up the slots in the door holes with the tapered part of the screw tip and firmly press the screws through the holes in the door until they snap through. (Lightly tapping them with a hard object will help to snap them in). Use the special door hinge screwdriver provided to screw in the door hinges to the main box. See Figure 4-1A. Installation Hardware.
5. Wire the unit using the appropriate electrical drawings for the specific transmitter and crane orientation selected on pages 17-19 Section 6. – Wiring Diagrams. For crane orientation determine if the direction pair Forward or Reverse better describes the equipment movement. Use this pair to wire the motor directionals respectively. Make sure to replace connectors in the correct locations).
6. Wire the power to J1 input power connector. The connections are Ground (GND), Neutral (N) and 120 VAC 50-60 Hz (120V). See Figure 4-1B. Input Power Connections.

Section 4 – Installation Procedure (Continued)

7. Wiring of the system should now be complete.
8. Stand clear of the crane and apply AC power to receiver unit. Turn switch SW2 OFF (MR relay control) and SW1 ON (main power switch). Check to see if three green LEDs are lit (DS22, DS23 and DS24). If none are lit check AC power, power switch SW1 and fuse.
9. Turn transmitter ON. Check to see if the yellow LED is now lit (DSMR1). At this point the MR relay is disabled, the functions of the transmitter can be checked by noting the turning ON of the appropriate red LEDs next to the control relays (DS7 to DS11). After checking out the functions, turn switch SW2 ON to enable the MR relay, check function and direction by jogging each motion. Now Installation should now be complete.
10. If there are any problems see pages 20-23 Section 7. – Servicing and Programming.

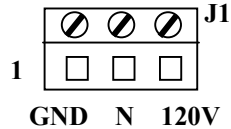


Figure 4-1. Input Power Connections.

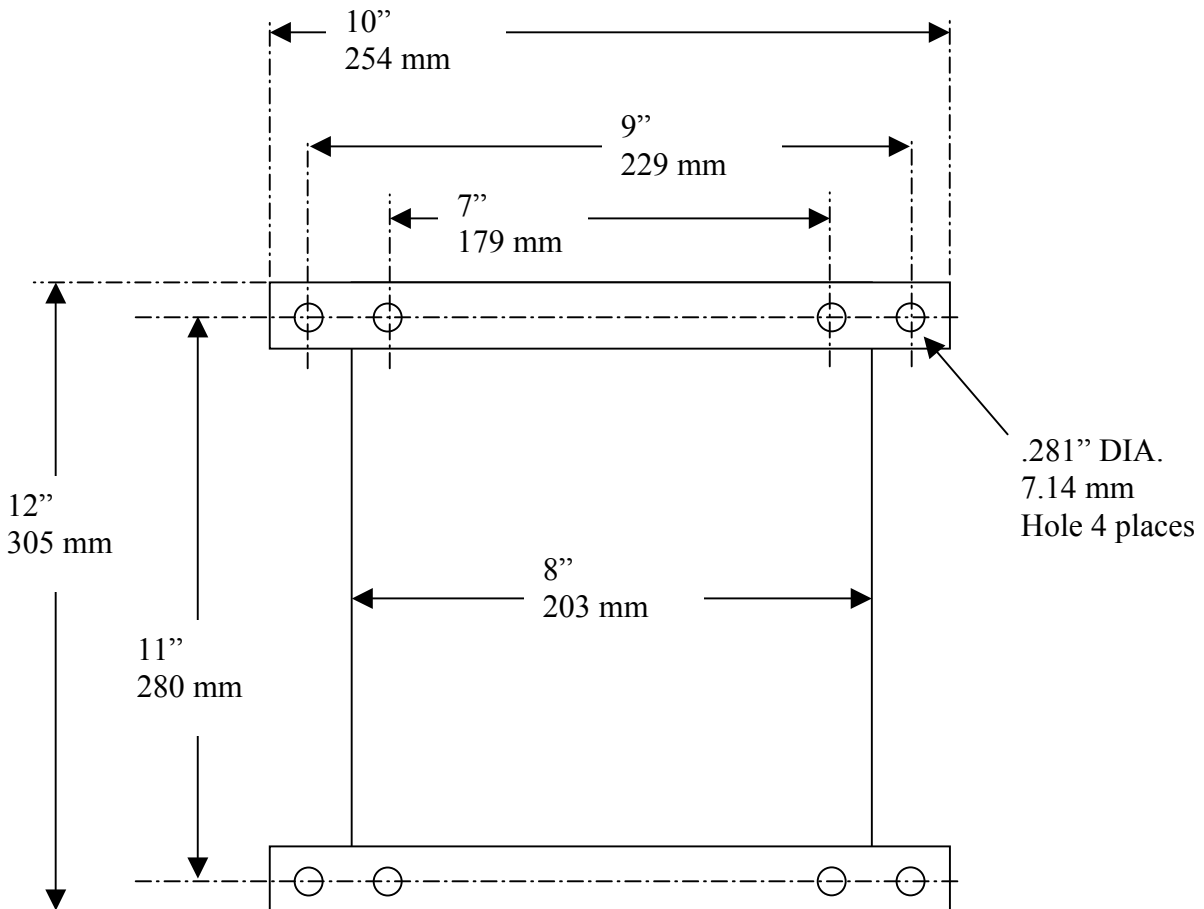


Figure 4-2. Receiver Mounting Details

Section 5– Operation

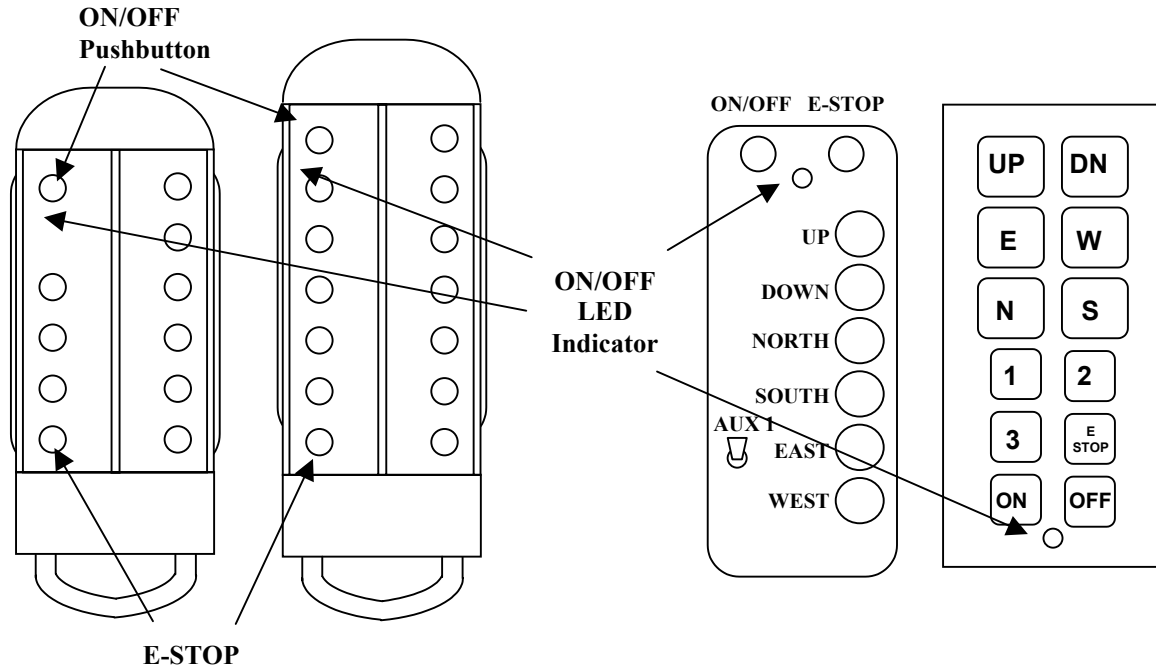


Figure 5-1. telePilot Pendant and Membrane Transmitters.

5-1. Transmitter Functions.

ON – (ON/OFF) Turns the transmitter ON and then sends the ON command to the receiver. (On Slider ON and OFF button is activated by the lanyard key. On the Pendant Transmitter ON and OFF is the same button. On the Pendant the ON/OFF button turns the unit ON.

OFF – (ON/OFF) Sends the OFF command to the receiver and then turns the transmitter OFF. On the Pendant the ON/OFF button turns the unit OFF.

E-STOP (EMS) – Stops all equipment movement and disables all functions. Reset the system for normal operation by turning the transmitter “OFF” then “ON”. Use for emergencies only. (NOT FOR NORMAL SHUT DOWN).

UP (HST UP) – Selects hoist movement in the UP direction speed one (first switch position) or speed two (second switch position). For the Slider the HST UP is pressed and the finger is slid to the center (2SP) for 2nd speed. The first direction is maintained while the second speed key is held.

DN (HST DN and DOWN) – Selects hoist movement in the DOWN direction speed one (first switch position) or speed two (second switch position). For the Slider the HST DN is pressed and the finger is slid to the center (2SP) for 2nd speed. The first direction is maintained while the second speed key is held.

E (FWD, BRIDGE E and EAST) – Selects the appropriate direction of the bridge or trolley (depending how unit is wired at installation) speed one (first switch position) or speed two (second switch position). For the Slider the BRIDGE E is pressed and the finger is slid to the center (2SP). The first direction is maintained while the second speed key is held for 2nd speed.

W (REV, BRIDGE W and WEST) – Selects the appropriate direction of the bridge or trolley (depending how unit is wired at installation) speed one (first switch position) or speed two (second switch position). For the Slider the BRIDGE W is pressed and the finger is slid to the center (2SP) for 2nd speed. The first direction is maintained while the second speed key is held.

N (TROLL N and NORTH) – Selects the appropriate direction of the bridge or trolley (depending how unit is wired at installation) speed one (first switch position) or speed two (second switch position). For the Slider the

Section 5 – Operation (Continued)

TROLL N is pressed and the finger is slid to the center (2SP) for 2nd speed. The first direction is maintained while the second speed key is held.

S (TROLL S and SOUTH) – Selects the appropriate direction of the bridge or trolley (depending how unit is wired at installation) speed one (first switch position) or speed two (second switch position). For the Slider the **TROLL S** is pressed and the finger is slid to the center (2SP) for 2nd speed. The first direction is maintained while the second speed key is held.


1, 2 and 3 (AUX 1, AUX 2, and AUX 3) – Selects the Auxiliary relay(s), which may be used for a warning device as a horn or other function.

5-2. Transmitter LED Indicator.

When the transmitter is ON the red LED flashes slowly. When the unit transmits, the red LED flashes rapidly.


If there is no LED indicator at all after turning ON the transmitter or while operating crane with the transmitter, replace the batteries, they are weak. See [Section 5-4. Battery Replacement](#) on this page for battery replacement.

5-3. Operation.



WARNING

BEFORE TURNING ON OR OPERATING THE CRANE, MAKE SURE ALL PERSONNEL ARE CLEAR OF THE OPERATING AREA AND NO ONE IS STANDING UNDER THE LOAD. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.



WARNING

WHEN OPERATING THE CRANE FOLLOW LOCAL AND GOVERNMENTAL RULES ON THE USE OF HORNS AND ALARMS.

FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

Make sure that all personnel are clear of the crane movement and no one is under the crane or load.

Turn unit ON by pressing the ON (ON/OFF) button. The red LED should flash rapidly for a few seconds indicating the ON command is being sent to the receiver. After the receiver is turned ON the red LED should flash slowly indicating the transmitter is now ready to send commands.


Perform whatever safety checks are required. See [Section 2. Radio Controlled Safety](#). Operate any horns or alarms as required by local and governmental regulations.

To operate the crane, press and hold the desired function button to maintain operation. Press the directional buttons harder to second position to engage second speed for those cranes having two-speed motors.

Always turn system OFF by pressing the OFF (ON/OFF) button on the transmitter when done with crane operation.

In an emergency always hit E-STOP (EMS) immediately. To clear the emergency condition, turn the transmitter OFF and ON again to resume normal operation.

The receiver will time-out after approximately 15 minutes if there is no activity. The transmitter is programmed to time-out if not used for 15 minutes also.



WARNING

IN AN EMERGENCY HIT “E-STOP” TO STOP ALL CRANE MOVEMENT. WHEN EMERGENCY HAS CLEARED TURN THE TRANSMITTER OFF THEN ON AGAIN TO RESUME NORMAL OPERATION. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

5-4. Battery Replacement.

Section 5 – Operation (Continued)

To replace the batteries, turn transmitter over to access back cover. Twist half moon shaped battery latch to remove cover. Take out old batteries; replace ALL batteries with new cells. For the Membrane Transmitter note battery orientation, batteries in backwards will blow fuse. Replace cover and turn transmitter ON to use. See [Section 9. Spare Parts](#) for battery and fuse part numbers.

Section 6 – Wiring

6-1. Wiring Diagrams.

The following pages in this section have individual wiring diagrams for different crane configurations. Find the appropriate wiring diagram and set the Configuration Switch (SW3 in the receiver) in the appropriate receiver(s) to match the SW3 Receiver Configuration Switch settings shown in the diagram. The location of the Configuration Switch is shown in [Figure 8-1. Receiver Layout](#). Terminal designators are marked on the wiring diagram corresponding to designators found on the Receiver Board. For terminal locations see [Figure 8-1. Receiver Layout](#). The proper connections to use for the bridge and for the trolley are best determined by that pair of directional designators (North/South or East/West) best describes the crane's movement. Does the bridge travel East/West or North/South? The trolley would use the other directional pair as the bridge. Care should be taken after a directional pair is selected to make sure the specific motor directional inputs match the desired direction of the bridge or trolley, i.e., if North/South is picked for the bridge make sure the South traveling bridge motor directional is wired to the South terminal of the unit.

Typically in the following wiring diagrams, the bridge is shown as E/W (East/West) and Trolley as N/S (North/South). Since the labeling cannot be easily moved on the Membrane Transmitter keypad, the two directional pairs can be easily exchanged by turning the dipswitch SW3 position 1 in the Membrane Transmitter to "ON". See [Section 8-2.6. Repositioning of Membrane Transmitter Motion Switch Functions](#) for more details.

6-2. Installation.

Follow [Section 4. Installation Information](#) for instructions on how to install the receiver.

6-3. Alarms and Horns.

Make sure that the installation includes the proper alarms, horns, indicator lights and their associated controls as required by local and governmental regulations.

6-4. Membrane Transmitter Wiring.

The wiring diagrams output connections shown in the following pages match the nomenclature

on the single and Two-Speed Membrane per their respective diagrams.

6-5. Single-Speed Pendant Transmitter Wiring.

For the Single-Speed Pendant Transmitter the only wiring configuration is the diagram in [Figure 6-9. 10K6 Single Receiver with Single-Speed Pendant, Single-Speed Bridge, Trolley and Hoist](#).

6-6. Two-Speed Pendant Transmitter Wiring.

For the Two-Speed 10K12 Pendant Transmitter the functional labeling is different than the Two-Speed Membrane. E/W and N/S are exchanged. By setting dipswitch SW3 position 1 in the "ON" position the pushbuttons of the Pendant Transmitter match the directional notations on the two-speed wiring diagrams in [Section 6. Wiring](#). Failure to turn switch SW3 position 1 to "ON" will cause EAST/WEST and NORTH/SOUTH to be exchanged respectively. All other functions will remain the same.

6-7. Relay Sequencing

When the second speed position is activated the appropriate directional relay is still engaged.

6-8. Connecting Outputs to Drives.

MOV's (transient protectors) are on all the output relays to protect the relays from power surges. MOV's allow a small leakage current that can affect some high impedance circuits. When connecting output relays to drives, it may be required to remove the MOV to prevent the leakage current through the MOV from holding in the drive. See [Figure 8-1. Receiver Layout](#) for the location of the MOV's. The MOV's are numbered correspondingly to the relays they protect. The MOV's can be cut out of the circuit with a wire cutter. Remember to do this with ALL power OFF on the crane and all associated controls.

Section 6 – Wiring (Continued)

Legend

The following is the legend for the wiring diagrams below:

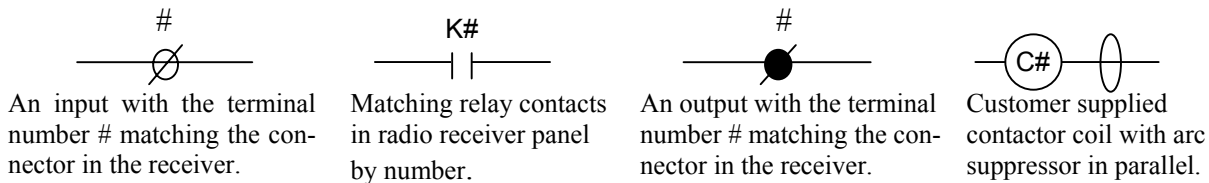


Figure 6-1. Legend.

6-9. Optional Transfer Switch Wiring Configuration.

If a transfer switch is desired, the additional connectors on the board facilitate the wiring of a transfer switch. The schematic of the transfer switch interface is shown for reference.

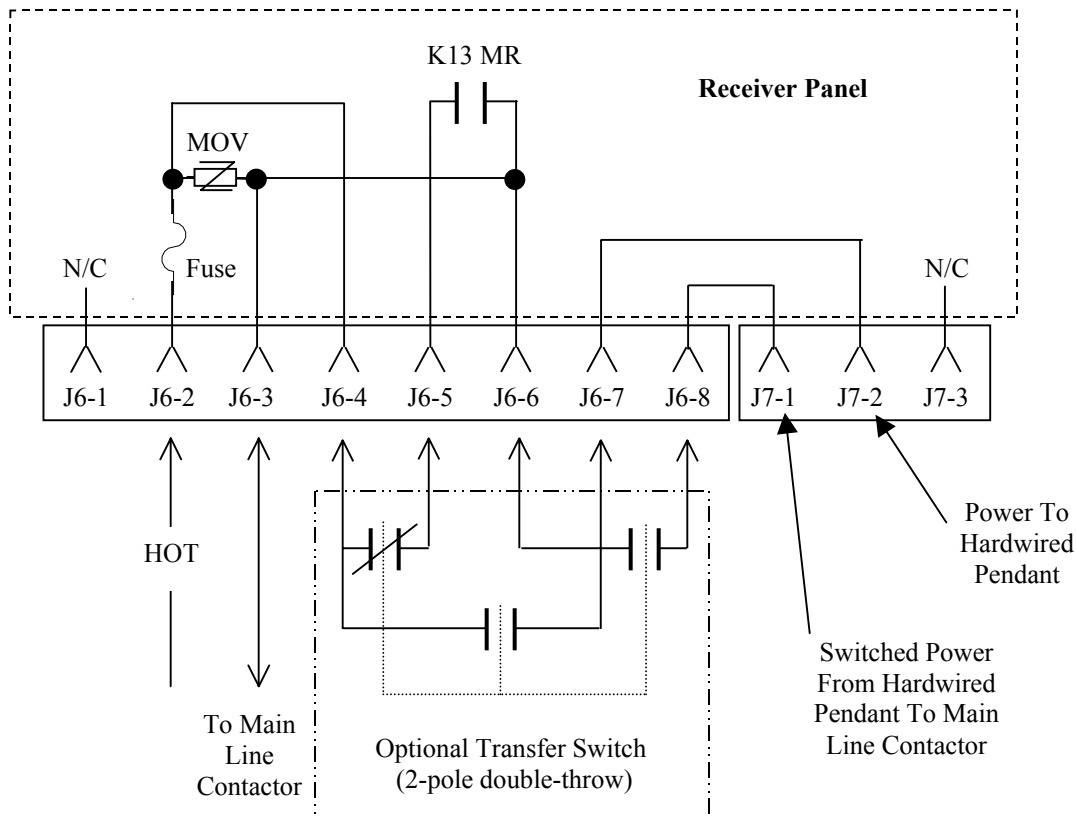
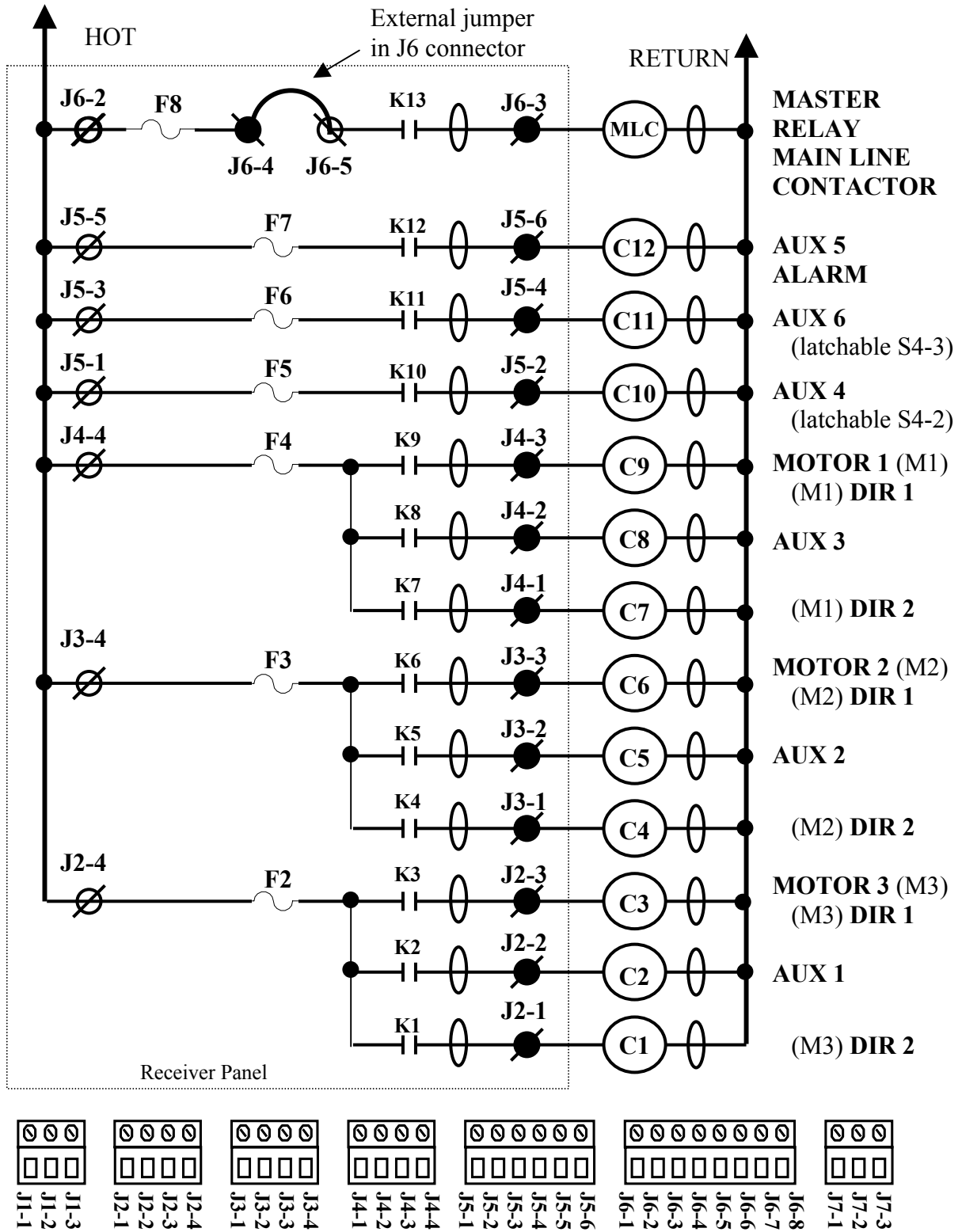


Figure 6-2. Optional Transfer Switch Wiring

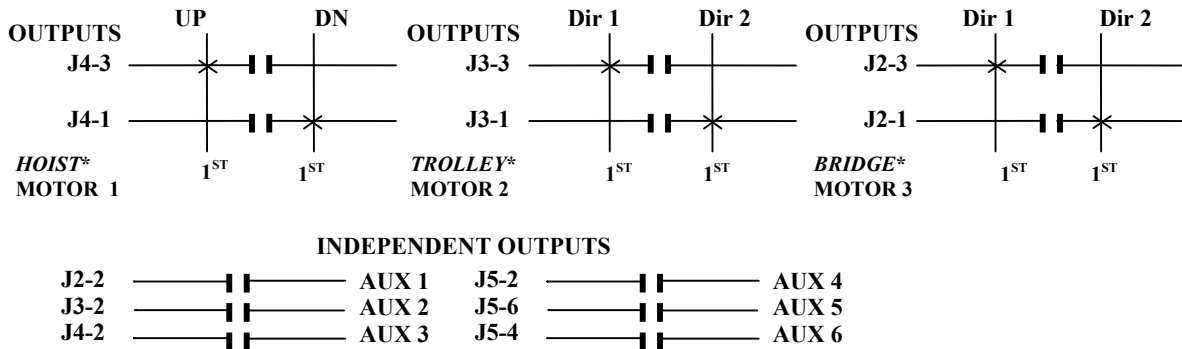
Section 6 - Wiring (Continued)

**TABLE 1 TR12 SINGLE SPEED WIRING DIAGRAM.
STANDARD CONFIGURATION HOIST, TROLLEY AND BRIDGE**



Section 6 - Wiring (Continued)

**TABLE 1 TR12 SINGLE SPEED PROGRAMMING DIAGRAM.
STANDARD CONFIGURATION HOIST, TROLLEY AND BRIDGE**



MOTOR 1 CONNECTIONS

J4-3 *HOIST* UP
 J4-2 AUX 3
 J4-1 *HOIST* DOWN
 J4-4 HOT (J4-1, 2 & 3)

MOTOR 2 CONNECTIONS

J3-3 *TROLLEY* DIR 1
 J3-2 AUX 2
 J3-1 *TROLLEY* DIR 2
 J3-4 HOT (J3-1, 2 & 3)

MOTOR 3 CONNECTIONS

J2-3 *BRIDGE* DIR 1
 J2-2 AUX 1
 J2-1 *BRIDGE* DIR 2
 J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

J5-2 AUX 4 (LATCHABLE S4-2) J5-1 HOT AUX 4
 J5-4 AUX 6 (LATCHABLE S4-3) J5-3 HOT AUX 6
 J5-6 AUX 5 ALARM J5-5 HOT AUX 5

TRANSMITTER SWITCH SETTINGS

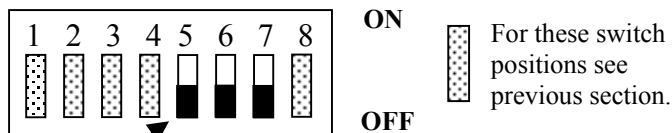
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 "C"

PENDANT, JLTX AND SLTX USE SW4 "D"

TRANSMITTER SWITCH SETTINGS:

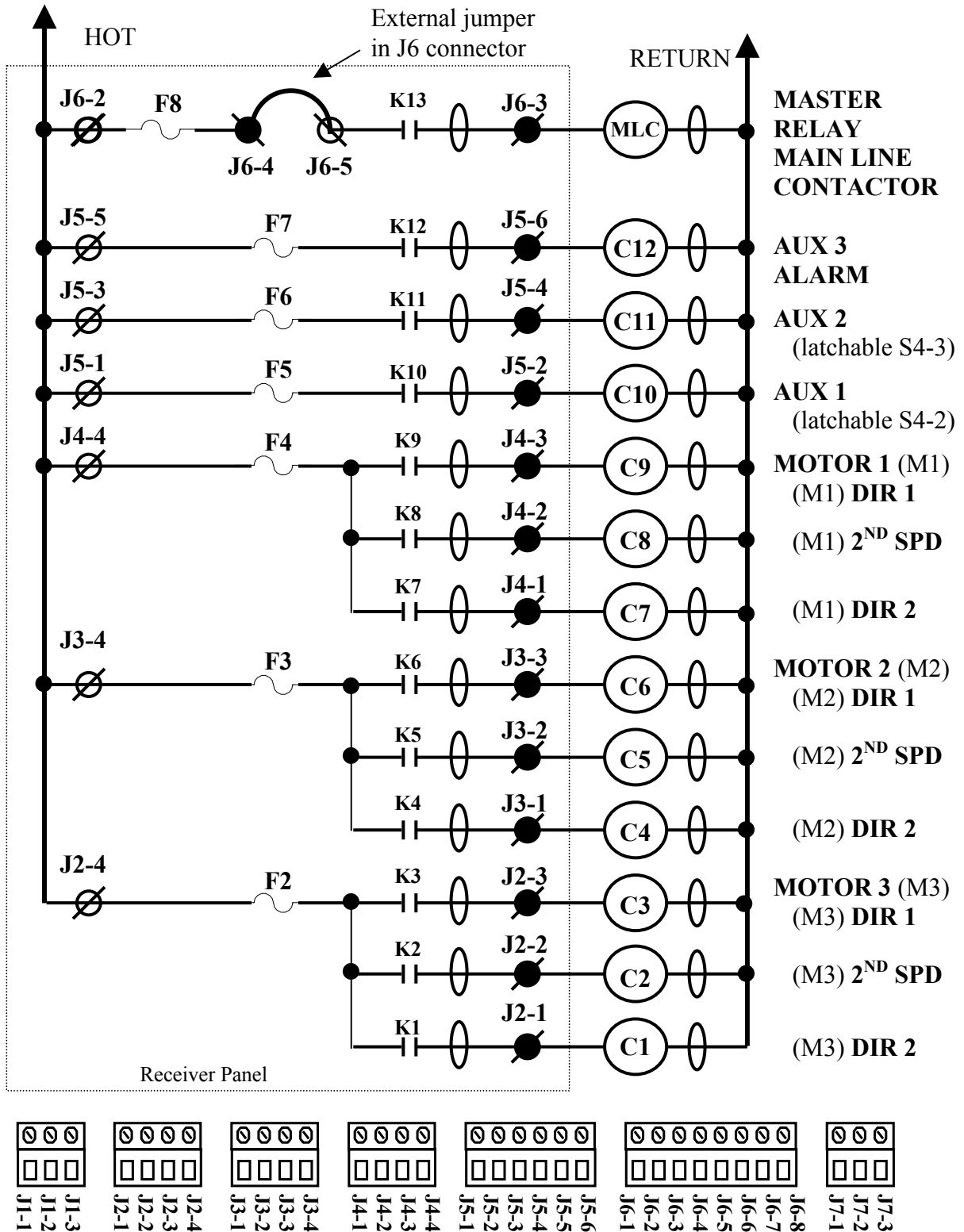
Position-5 Position -6 Position -7
OFF OFF OFF



*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

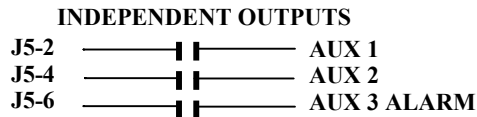
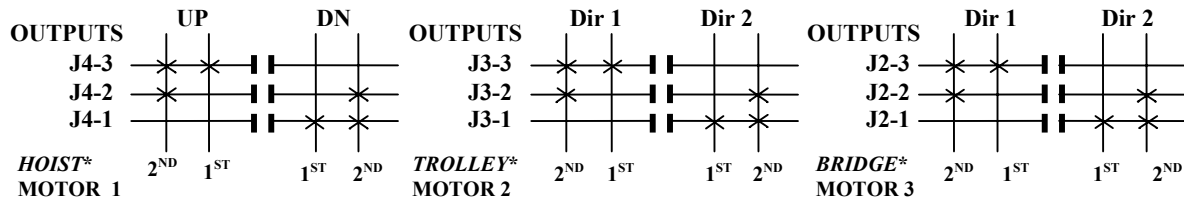
Section 6 - Wiring (Continued)

**TABLE 2(A) TR12 2-SPEED WIRING DIAGRAM.
STANDARD CONFIGURATION HOIST, TROLLEY AND BRIDGE**



Section 6 - Wiring (Continued)

**TABLE 2(A) TR12 2-SPEED PROGRAMMING DIAGRAM.
STANDARD CONFIGURATION HOIST, TROLLEY AND BRIDGE**



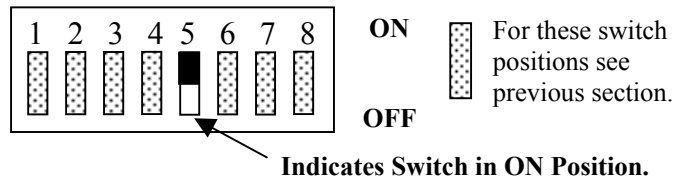
MOTOR 1 CONNECTIONS	MOTOR 2 CONNECTIONS	MOTOR 3 CONNECTIONS
J4-3 HOIST UP	J3-3 TROLLEY DIR 1	J2-3 BRIDGE DIR 1
J4-2 HOIST 2 ND SPEED	J3-2 TROLLEY 2 ND SPEED	J2-2 BRIDGE 2 ND SPEED
J4-1 HOIST DOWN	J3-1 TROLLEY DIR 2	J2-1 BRIDGE DIR 2
J4-4 HOT (J4-1, 2 & 3)	J3-4 HOT (J3-1, 2 & 3)	J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

J5-2 AUX 1 (LATCHABLE S4-2)	J5-1 HOT AUX 1
J5-4 AUX 2 (LATCHABLE S4-3)	J5-3 HOT AUX 2
J5-6 AUX 3 ALARM	J5-5 HOT AUX 3 ALARM

RECEIVER SWITCH SETTINGS SW3: SW3 Position-5

ON

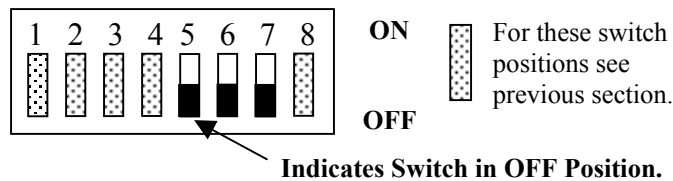


SINGLE SPEED ONLY TRANSMITTERS SWITCH SETTINGS

SINGLE SPEED *telePilot* USE PDA SCREEN (select single speed transmitter style).

SINGLE SPEED MEMBRANE USE SW3 "C", SINGLE SPEED PENDANT USE SW "D"

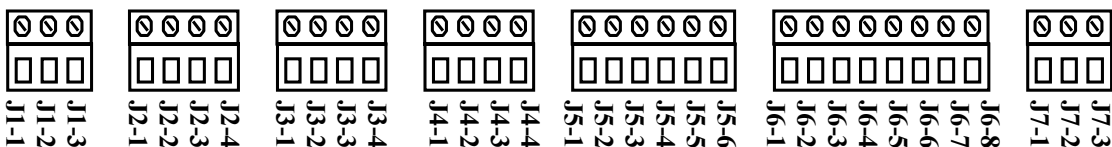
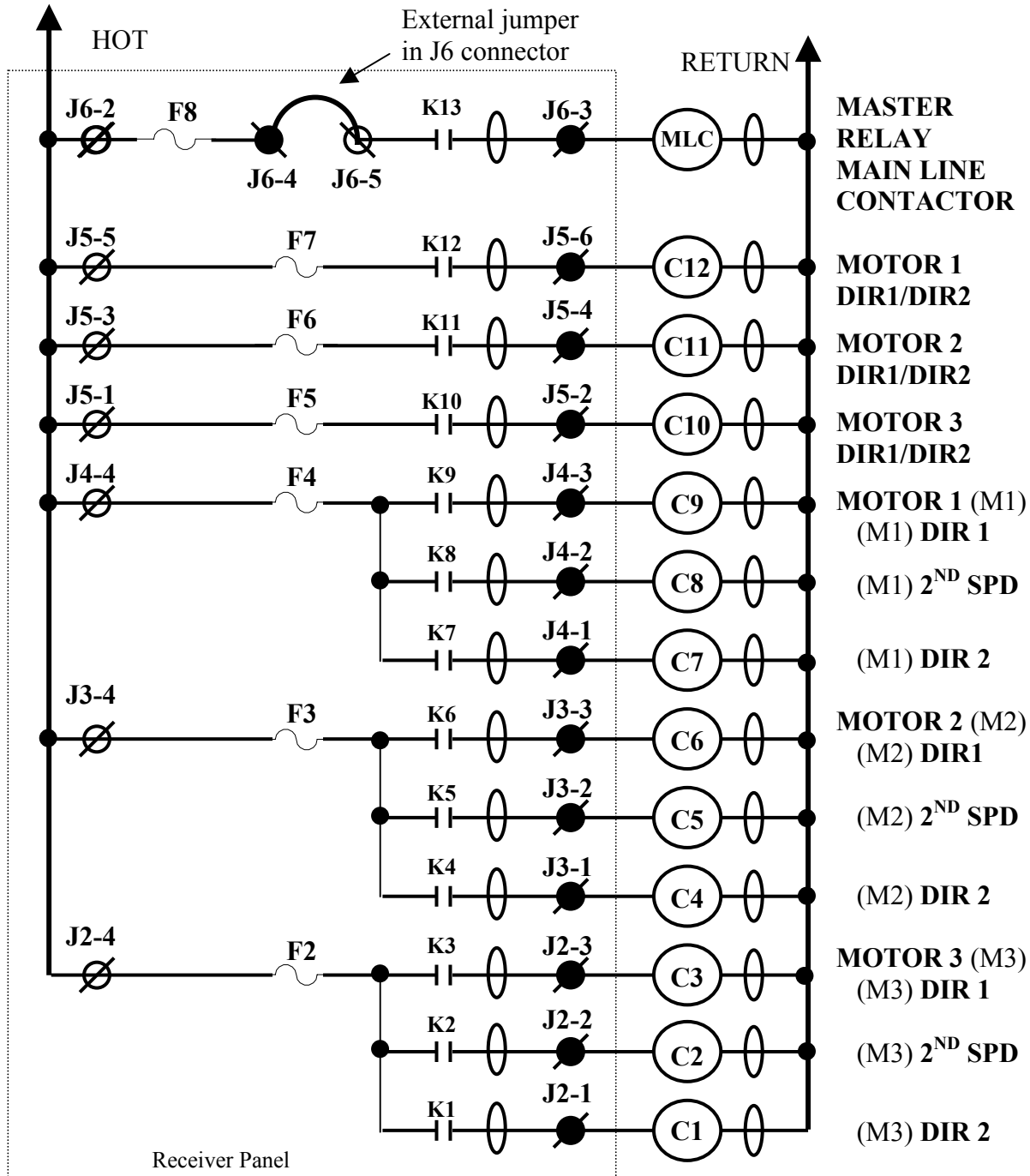
TRANSMITTER SWITCH SETTINGS: Position-5 OFF Position -6 OFF Position -7 OFF



*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

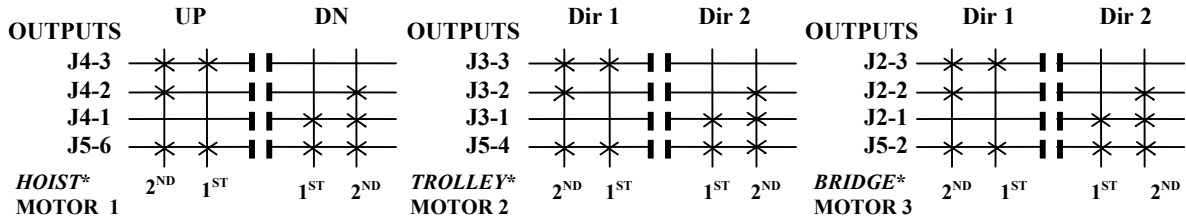
Section 6 - Wiring (Continued)

TABLE 2(B) TR12 2-SPEED WIRING DIAGRAM.
2-SPEED with DIRECTIONAL CONTROLS: ALL MOTIONS



Section 6 - Wiring (Continued)

**TABLE 2(B) TR12 2-SPEED PROGRAMMING DIAGRAM.
2-SPEED with DIRECTIONAL CONTROLS: ALL MOTIONS**



MOTOR 1 CONNECTIONS

J4-3 *HOIST* UP
 J4-2 *HOIST* 2ND SPEED
 J4-1 *HOIST* DOWN
 J4-4 HOT (J4-1, 2 & 3)
 J5-6 *HOIST* DIR1/DIR2
 J5-5 HOT *HOIST* DIR1/DIR2

MOTOR 2 CONNECTIONS

J3-3 *TROLLEY* DIR 1
 J3-2 *TROLLEY* 2ND SPEED
 J3-1 *TROLLEY* DIR 2
 J3-4 HOT (J3-1, 2 & 3)
 J5-4 *TROLLEY* DIR1/DIR2
 J5-3 HOT *TROLLEY* DIR1/DIR2

MOTOR 3 CONNECTIONS

J2-3 *BRIDGE* DIR 1
 J2-2 *BRIDGE* 2ND SPEED
 J2-1 *BRIDGE* DIR 2
 J2-4 HOT (J2-1, 2 & 3)
 J5-2 *BRIDGE* DIR1/DIR2
 J5-1 HOT *BRIDGE* DIR1/DIR2

NOTE

CHECK GOVERNMENTAL AND LOCAL REGULATIONS ON THE REQUIREMENTS OF HORNS OR ALARMS BEFORE USING THIS CONFIGURATION, AS THERE IS NOT A SEPARATE ALARM CONTROL.

TRANSMITTER SWITCH SETTINGS

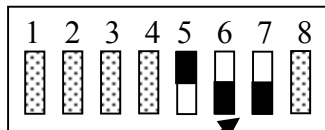
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 "C"

PENDANT, JLTX AND SLTX USE SW4 "D"

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
ON	OFF	OFF



ON For these switch positions see previous section.

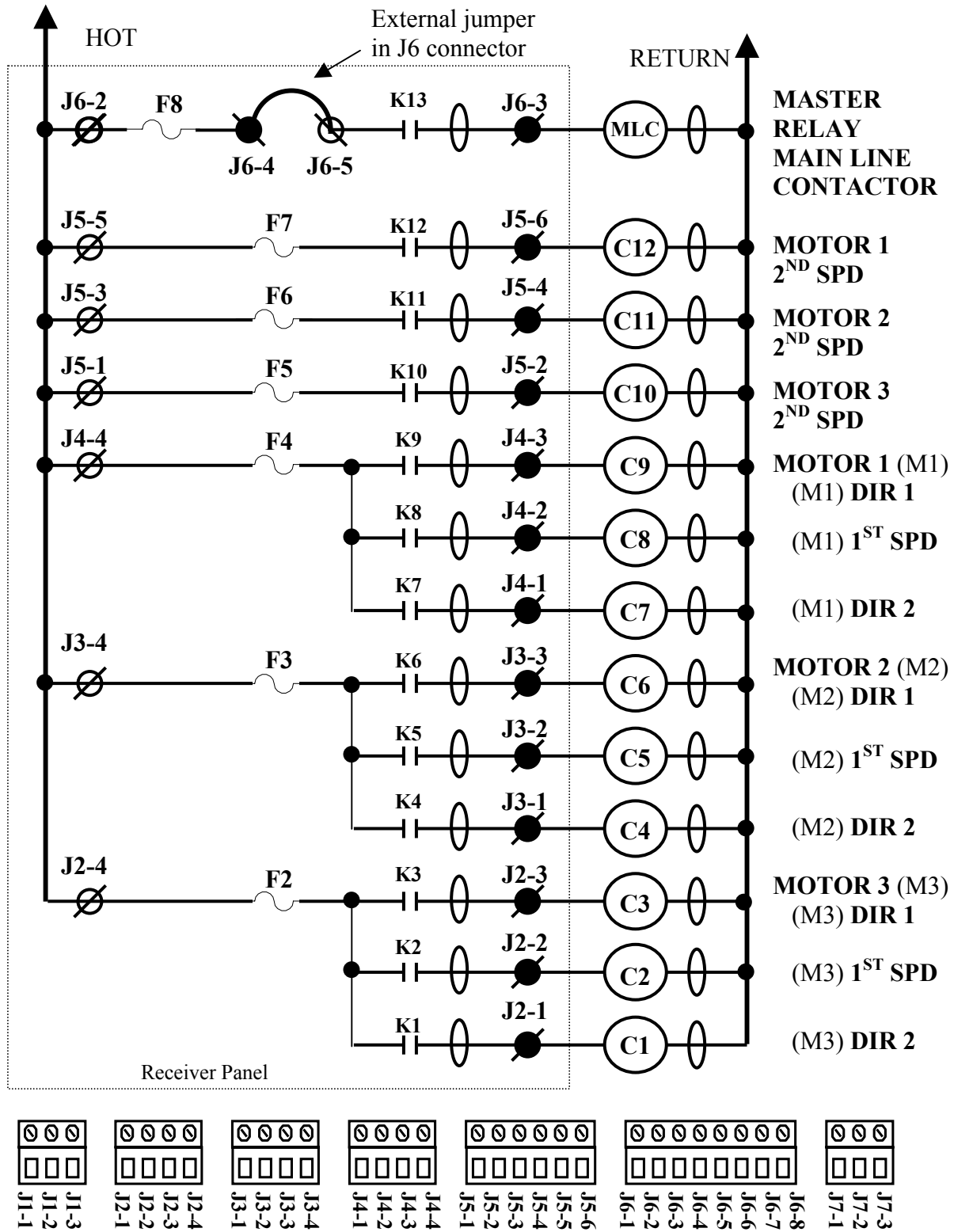
OFF

Indicates Switch in OFF Position.

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

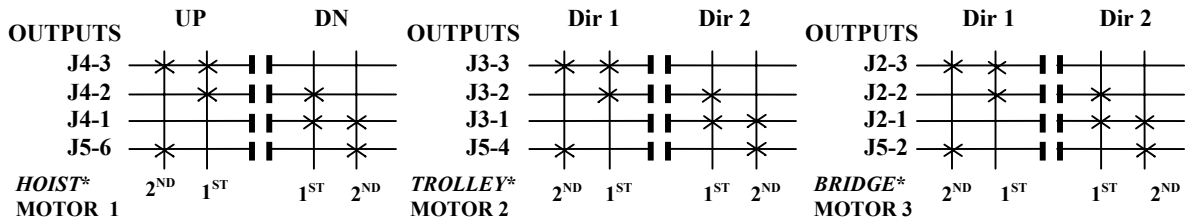
Section 6 - Wiring (Continued)

**TABLE 1(C) TR12 WIRING DIAGRAM.
2-SPEED, 2-WINDINGS: ALL MOTIONS**



Section 6 - Wiring (Continued)

**TABLE 2(C) TR12 2-SPEED PROGRAMMING DIAGRAM.
2-SPEED, 2-WINDINGS: ALL MOTIONS**



MOTOR 1 CONNECTIONS

- J4-3 *HOIST* UP
- J4-2 *HOIST* 1ST SPEED
- J4-1 *HOIST* DOWN
- J4-4 HOT (J4-1, 2 & 3)
- J5-6 *HOIST* 2ND SPEED
- J5-5 HOT *HOIST* 2ND SPEED

MOTOR 2 CONNECTIONS

- J3-3 *TROLLEY* DIR 1
- J3-2 *TROLLEY* 1ST SPEED
- J3-1 *TROLLEY* DIR 2
- J3-4 HOT (J3-1, 2 & 3)
- J5-4 *TROLLEY* 2ND SPEED
- J5-3 HOT *TROLLEY* 2ND SPEED

MOTOR 3 CONNECTIONS

- J2-3 *BRIDGE* DIR 1
- J2-2 *BRIDGE* 1ST SPEED
- J2-1 *BRIDGE* DIR 2
- J2-4 HOT (J2-1, 2 & 3)
- J5-2 *BRIDGE* 2ND SPEED
- J5-1 HOT *BRIDGE* 2ND SPEED

NOTE

CHECK GOVERNMENTAL AND LOCAL REGULATIONS ON THE REQUIREMENTS OF HORNS OR ALARMS BEFORE USING THIS CONFIGURATION, AS THERE IS NOT A SEPARATE ALARM CONTROL.

TRANSMITTER SWITCH SETTINGS

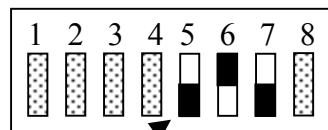
telePilot USE PDA SCREEN (Program the configuration switches to match the pattern and position shown).

MEMBRANE USE SW3 "C"

PENDANT, JLTX AND SLTX USE SW4 "D"

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
OFF	ON	OFF



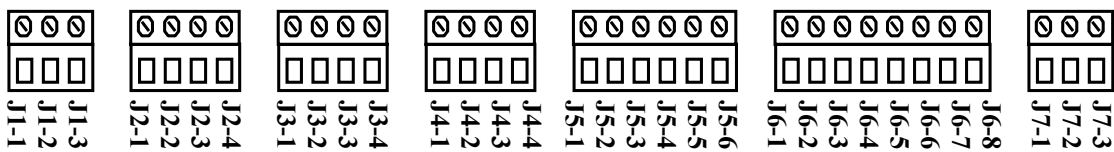
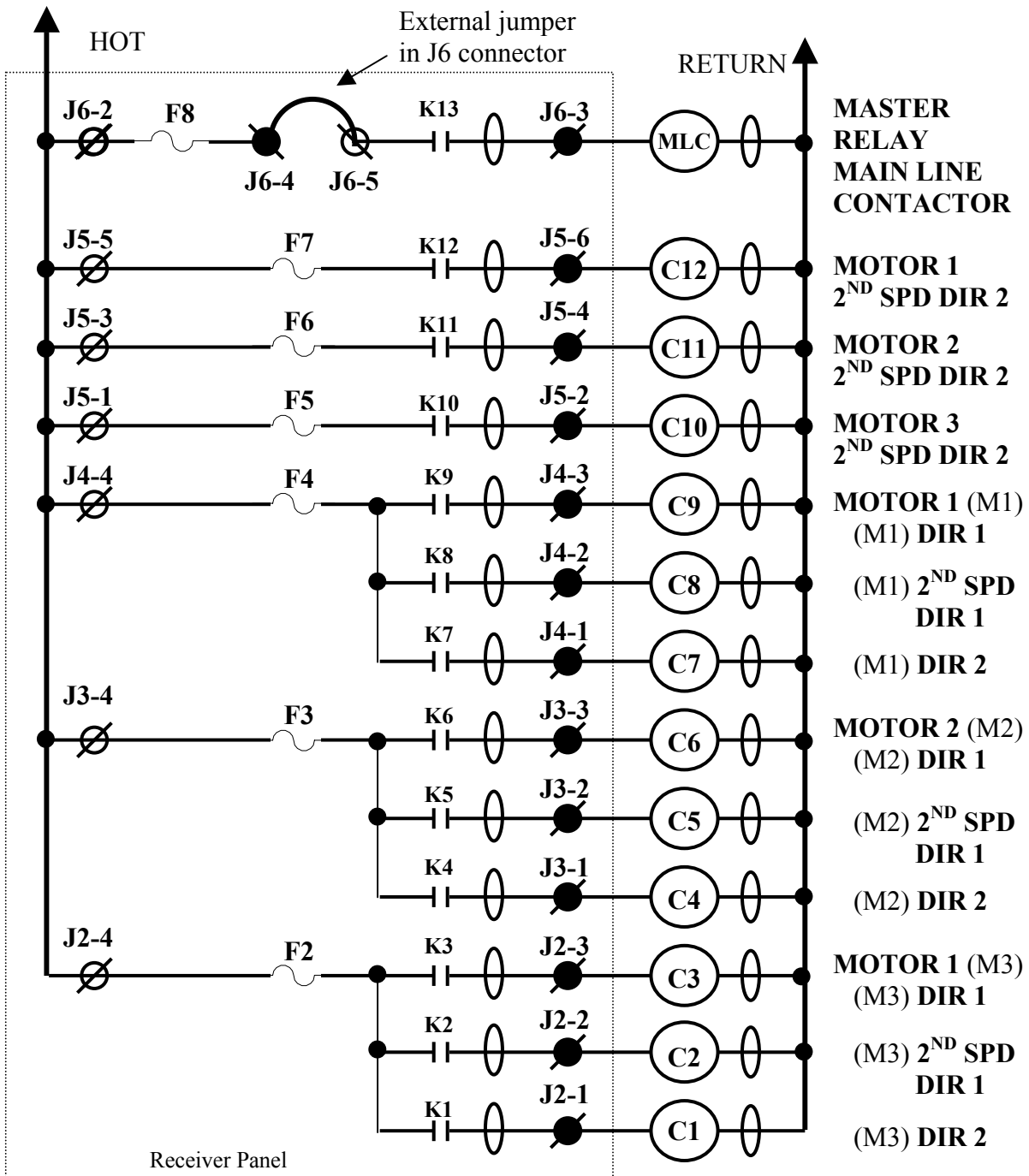
ON For these switch positions see previous section.

OFF

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

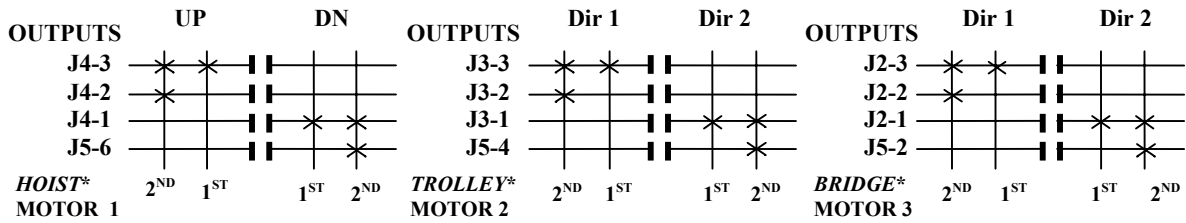
Section 6 - Wiring (Continued)

TABLE 1(D) TR12 WIRING DIAGRAM.
ACCO CONTROLS: ALL MOTIONS



Section 6 - Wiring (Continued)

**TABLE 2(D) TR12 2-SPEED PROGRAMMING DIAGRAM.
ACCO CONTROLS: ALL MOTIONS**



MOTOR 1 CONNECTIONS

- J4-3 *HOIST* UP
- J4-2 *HOIST* 2ND SPEED DIR 1
- J4-1 *HOIST* DOWN
- J4-4 HOT (J4-1, 2 & 3)
- J5-6 *HOIST* 2ND SPEED DIR 2
- J5-5 HOT *HOIST* 2ND SPD DIR 2

MOTOR 2 CONNECTIONS

- J3-3 *TROLLEY* DIR 1
- J3-2 *TROLLEY* 2ND SPEED DIR 1
- J3-1 *TROLLEY* DIR 2
- J3-4 HOT (J3-1, 2 & 3)
- J5-4 *TROLLEY* 2ND SPEED DIR 2
- J5-3 HOT *TROLLEY* 2ND SPD DIR 2

MOTOR 3 CONNECTIONS

- J2-3 *BRIDGE* DIR 1
- J2-2 *BRIDGE* 2ND SPEED DIR 1
- J2-1 *BRIDGE* DIR 2
- J2-4 HOT (J2-1, 2 & 3)
- J5-2 *BRIDGE* 2ND SPEED DIR 2
- J5-1 HOT *BRIDGE* 2ND SPD DIR 2

NOTE

CHECK GOVERNMENTAL AND LOCAL REGULATIONS ON THE REQUIREMENTS OF HORNS OR ALARMS BEFORE USING THIS CONFIGURATION, AS THERE IS NOT A SEPARATE ALARM CONTROL.

TRANSMITTER SWITCH SETTINGS

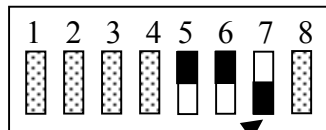
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 "C"

PENDANT, JLTX AND SLTX USE SW4 "D"

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
ON	ON	OFF



ON

OFF

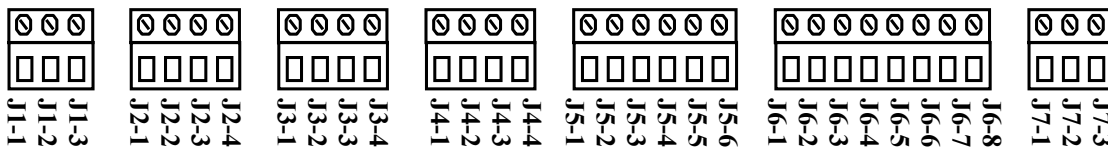
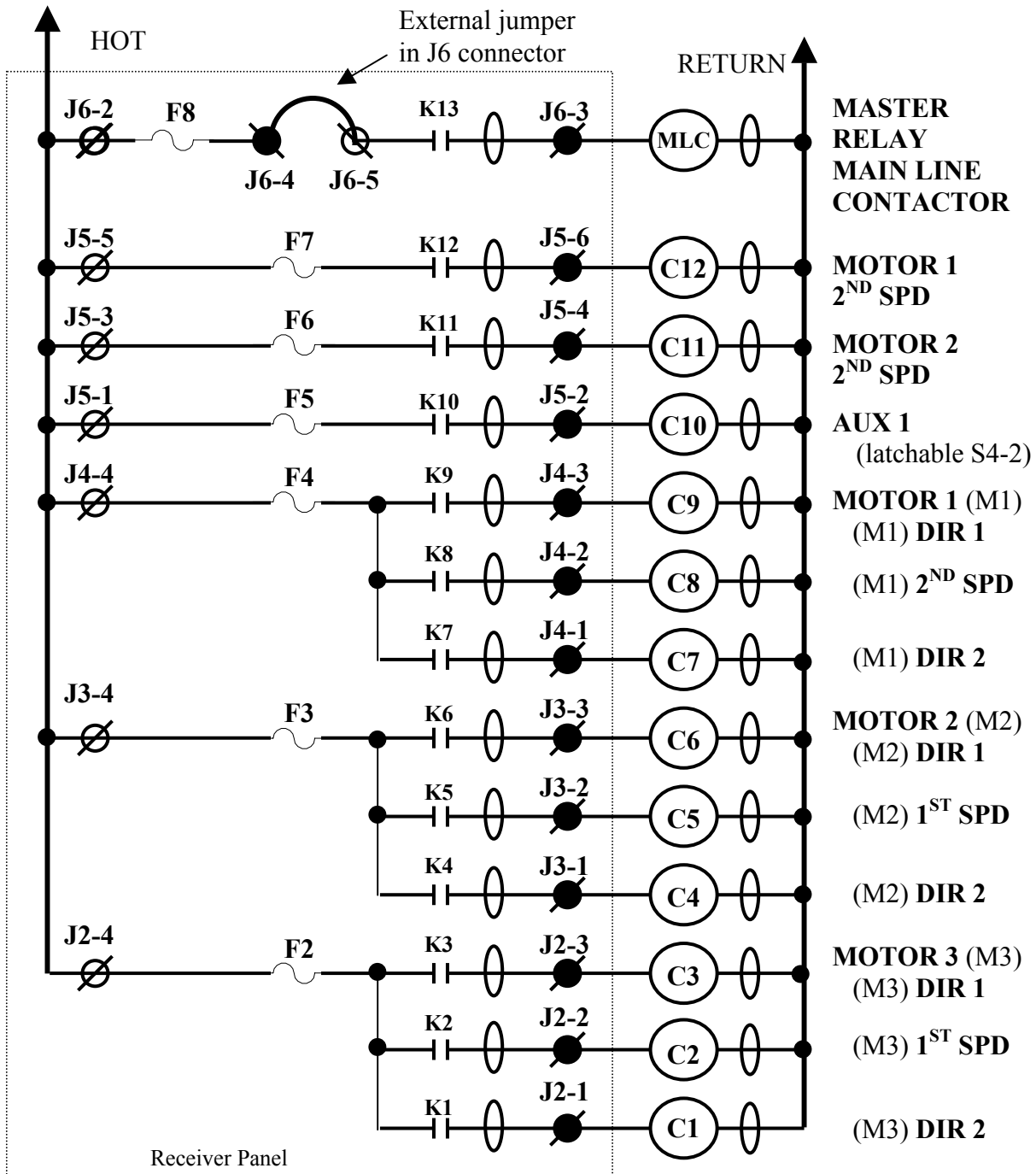
For these switch positions see previous section.

Indicates Switch in OFF Position.

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

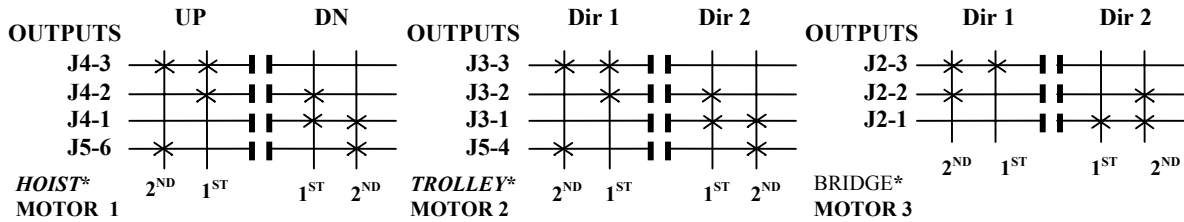
Section 6 - Wiring (Continued)

TABLE 1(E) TR12 WIRING DIAGRAM.
P&H: 2-SPEED, 2-WINDINGS for HOIST and TROLLEY;
STANDARD BRIDGE



Section 6 - Wiring (Continued)

**TABLE 2(E) TR12 2-SPEED PROGRAMMING DIAGRAM.
P&H: 2-SPEED, 2-WINDINGS for HOIST and TROLLEY;
STANDARD BRIDGE**



MOTOR 1 CONNECTIONS

- J4-3 *HOIST* UP
- J4-2 *HOIST* 1ST SPEED
- J4-1 *HOIST* DOWN
- J4-4 HOT (J4-1, 2 & 3)
- J5-6 *HOIST* 2ND SPEED
- J5-5 HOT *HOIST* 2ND SPEED

MOTOR 2 CONNECTIONS

- J3-3 *TROLLEY* DIR 1
- J3-2 *TROLLEY* 1ST SPEED
- J3-1 *TROLLEY* DIR 2
- J3-4 HOT (J3-1, 2 & 3)
- J5-4 *TROLLEY* 2ND SPEED
- J5-3 HOT *TROLLEY* 2ND SPEED

MOTOR 3 CONNECTIONS

- J2-3 *BRIDGE* DIR 1
- J2-2 *BRIDGE* 2ND SPEED
- J2-1 *BRIDGE* DIR 2
- J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

- J5-2 AUX 1 (LATCHABLE S4-2) J5-1 HOT AUX 1

TRANSMITTER SWITCH SETTINGS

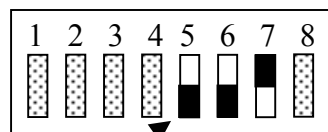
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 “C”

PENDANT, JLTX AND SLTX USE SW4 “D”

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
OFF	OFF	ON



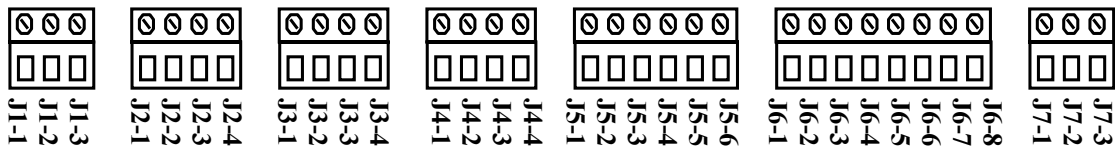
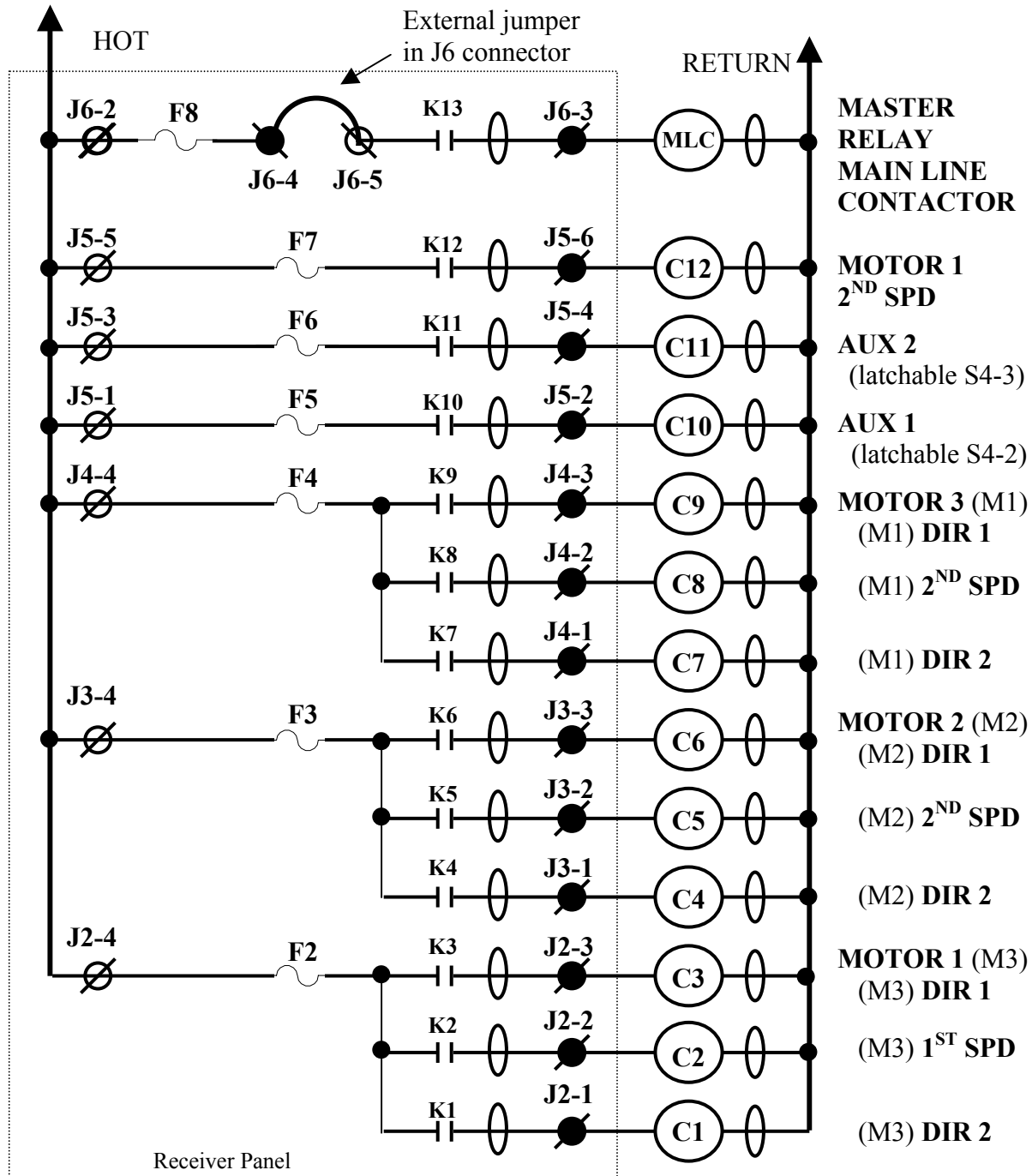
ON For these switch positions see previous section.

OFF

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

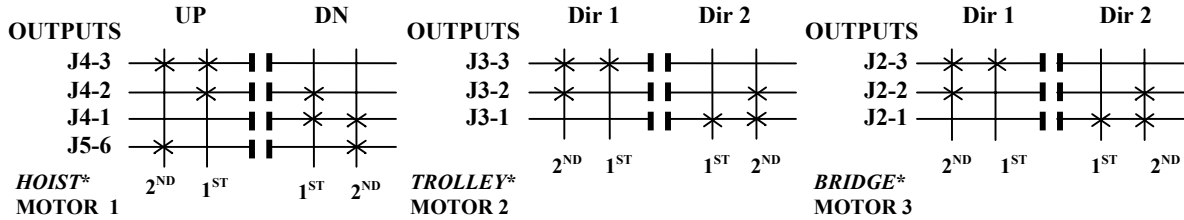
Section 6 - Wiring (Continued)

TABLE 1(F) TR12 WIRING DIAGRAM.
P&H: 2-SPEED, 2-WINDINGS for HOIST;
STANDARD TROLLEY and BRIDGE

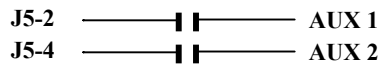


Section 6 - Wiring (Continued)

**TABLE 2(F) TR12 2-SPEED PROGRAMMING DIAGRAM.
P&H: 2-SPEED, 2-WINDINGS for HOIST;
STANDARD TROLLEY and BRIDGE**



INDEPENDENT OUTPUTS



MOTOR 1 CONNECTIONS

- J4-3 *HOIST* UP
- J4-2 *HOIST* 1ST SPEED
- J4-1 *HOIST* DOWN
- J4-4 HOT (J4-1, 2 & 3)
- J5-6 *HOIST* 2ND SPD
- J5-5 HOT *HOIST* 2ND SPEED

MOTOR 2 CONNECTIONS

- J3-3 *TROLLEY* DIR 1
- J3-2 *TROLLEY* 2ND SPEED
- J3-1 *TROLLEY* DIR 2
- J3-4 HOT (J3-1, 2 & 3)

MOTOR 3 CONNECTIONS

- J2-3 *BRIDGE* DIR 1
- J2-2 *BRIDGE* 2ND SPEED
- J2-1 *BRIDGE* DIR 2
- J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

- | | |
|-----------------------------|----------------|
| J5-2 AUX 1 (LATCHABLE S4-2) | J5-1 HOT AUX 1 |
| J5-4 AUX 2 (LATCHABLE S4-3) | J5-3 HOT AUX 2 |

TRANSMITTER SWITCH SETTINGS

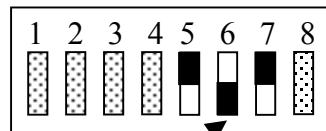
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 “C”

PENDANT, JLTx AND SLTx USE SW4 “D”

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
ON	OFF	ON



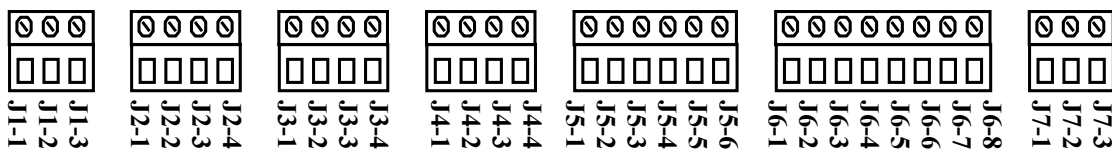
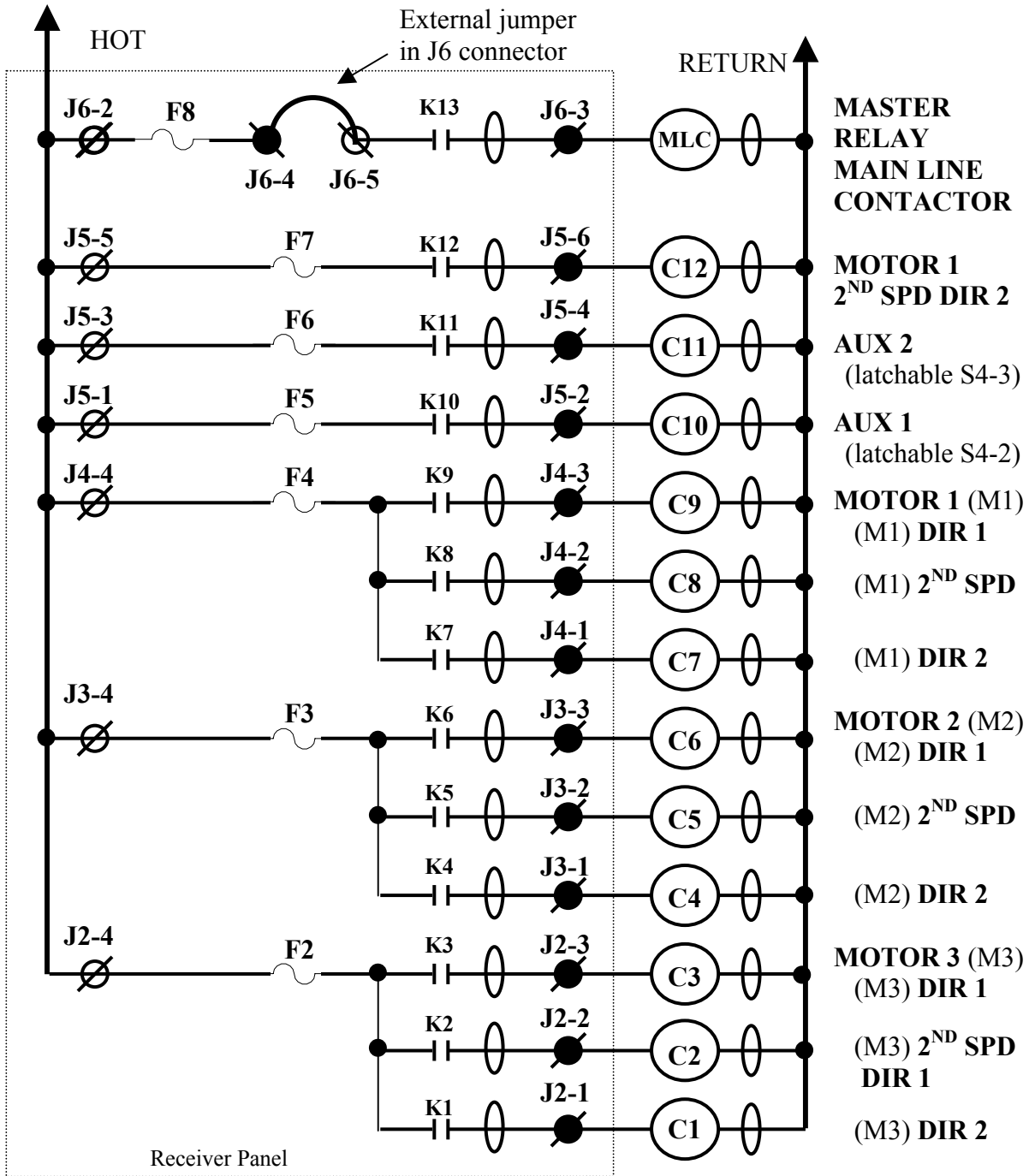
ON For these switch positions see previous section.

OFF

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

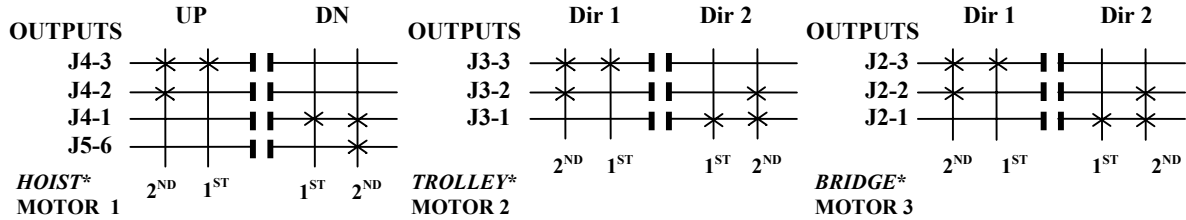
Section 6 - Wiring (Continued)

TABLE 1(G) TR12 WIRING DIAGRAM.
DEMAG: 2-SPEED, 2-WINDINGS for HOIST;
STANDARD TROLLEY and BRIDGE

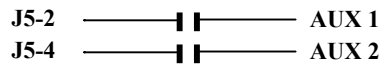


Section 6 - Wiring (Continued)

**TABLE 2(G) TR12 2-SPEED PROGRAMMING DIAGRAM.
DEMAG: 2-SPEED, 2-WINDINGS for HOIST;
STANDARD TROLLEY and BRIDGE**



INDEPENDENT OUTPUTS



MOTOR 1 CONNECTIONS

- J4-3 *HOIST* UP
- J4-2 *HOIST* 2ND SPEED DIR 1
- J4-1 *HOIST* DOWN
- J4-4 HOT (J4-1, 2 & 3)
- J5-6 *HOIST* 2ND SPEED DIR 2
- J5-5 HOT *HOIST* 2ND SPEED DIR 2

MOTOR 2 CONNECTIONS

- J3-3 *TROLLEY* DIR 1
- J3-2 *TROLLEY* 2ND SPEED
- J3-1 *TROLLEY* DIR 2
- J3-4 HOT (J3-1, 2 & 3)

MOTOR 3 CONNECTIONS

- J2-3 *BRIDGE* DIR 1
- J2-2 *BRIDGE* 2ND SPEED
- J2-1 *BRIDGE* DIR 2
- J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

- | | |
|-----------------------------|----------------|
| J5-2 AUX 1 (LATCHABLE S4-2) | J5-1 HOT AUX 1 |
| J5-4 AUX 2 (LATCHABLE S4-3) | J5-3 HOT AUX 2 |

TRANSMITTER SWITCH SETTINGS

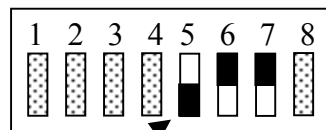
telePilot USE PDA SCREEN (Program the configuration switches 5, 6 & 7 to match the settings shown below).

MEMBRANE USE SW3 "C"

PENDANT, JLTX AND SLTX USE SW4 "D"

TRANSMITTER SWITCH SETTINGS:

Position-5	Position -6	Position -7
OFF	ON	ON



ON For these switch positions see previous section.

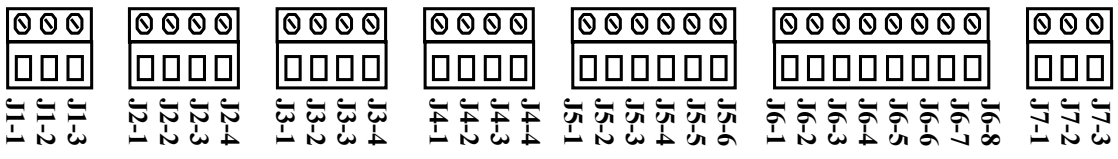
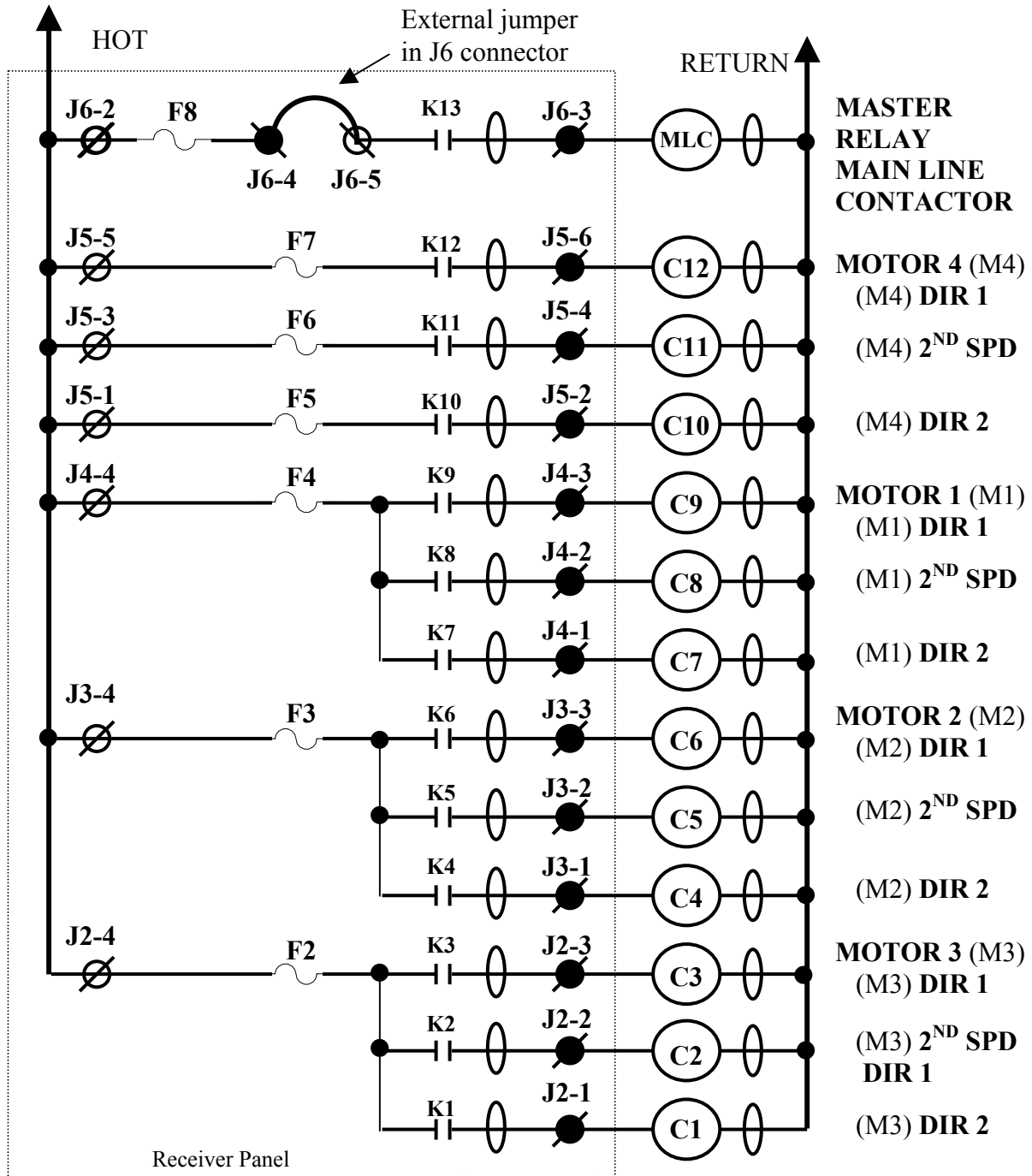
OFF

Indicates Switch in OFF Position.

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

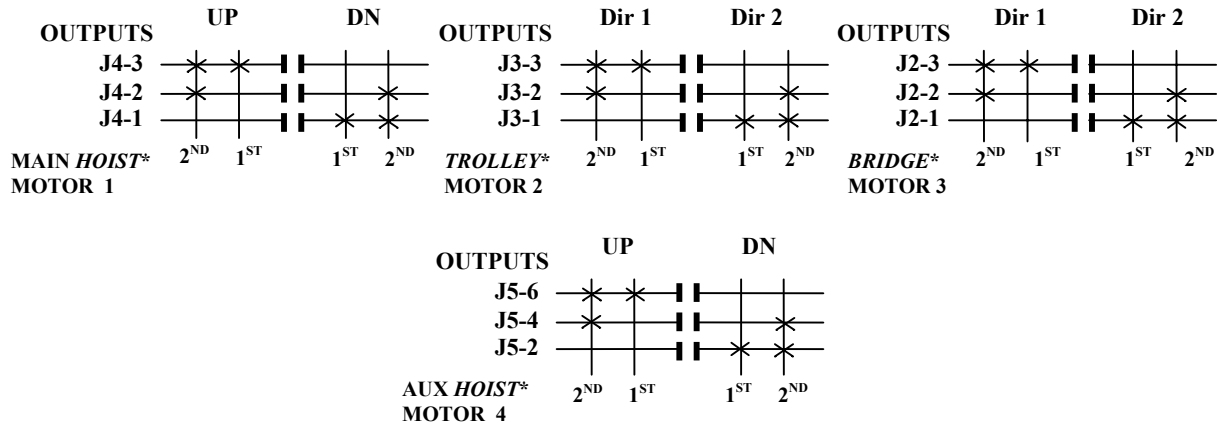
Section 6 - Wiring (Continued)

**TABLE 1(H) TR12 WIRING DIAGRAM.
STANDARD 2-SPEED 4 MOTOR SYSTEM**



Section 6 - Wiring (Continued)

**TABLE 2(H) TR12 2-SPEED PROGRAMMING DIAGRAM.
STANDARD 2-SPEED 4 MOTOR SYSTEM**



MOTOR 1 CONNECTIONS

J4-3 MAIN HOIST UP
 J4-2 MAIN HOIST 2ND SPEED
 J4-1 MAIN HOIST DOWN
 J4-4 HOT (J4-1, 2 & 3)

MOTOR 2 CONNECTIONS

J3-3 TROLLEY DIR 1
 J3-2 TROLLEY 2ND SPEED
 J3-1 TROLLEY DIR 2
 J3-4 HOT (J3-1, 2 & 3)

MOTOR 3 CONNECTIONS

J2-3 BRIDGE DIR 1
 J2-2 BRIDGE 2ND SPEED
 J2-1 BRIDGE DIR 2
 J2-4 HOT (J2-1, 2 & 3)

MOTOR 4 CONNECTIONS

J5-6 AUX HOIST UP
 J5-4 AUX HOIST 2ND SPEED
 J5-2 AUX HOIST DOWN
 J5-5 HOT AUX HOIST UP
 J5-3 HOT AUX HOIST 2ND SPEED
 J5-1 HOT AUX HOIST DOWN

NOTE

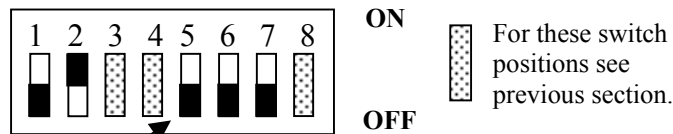
CHECK GOVERNMENTAL AND LOCAL REGULATIONS ON THE REQUIREMENTS OF HORNS OR ALARMS BEFORE USING THIS CONFIGURATION, AS THERE IS NOT A SEPARATE ALARM CONTROL.

TRANSMITTER SWITCH SETTINGS (This configuration does not apply to the Membrane transmitter).

telePilot USE PDA SCREEN (Program the configuration switches 5, 6 and 7 to OFF. Under MAIN/AUX select the motor desired to be the AUX ; MOT 1, MOT 2 or MOT 3. For a Main and Aux Hoist select MOT 1).

PENDANT, JLTX AND SLTX TRANSMITTER SWITCH SW4 “D” SETTINGS:

Position-1	Position-2	Position-5	Position -6	Position -7
OFF	ON	OFF	OFF	OFF

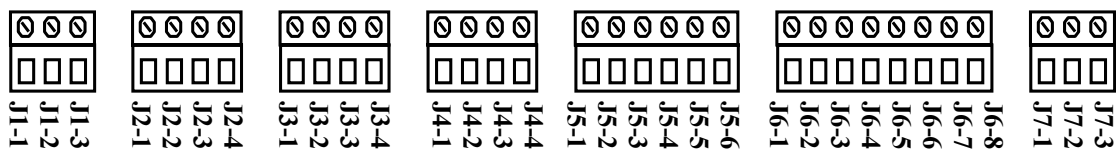
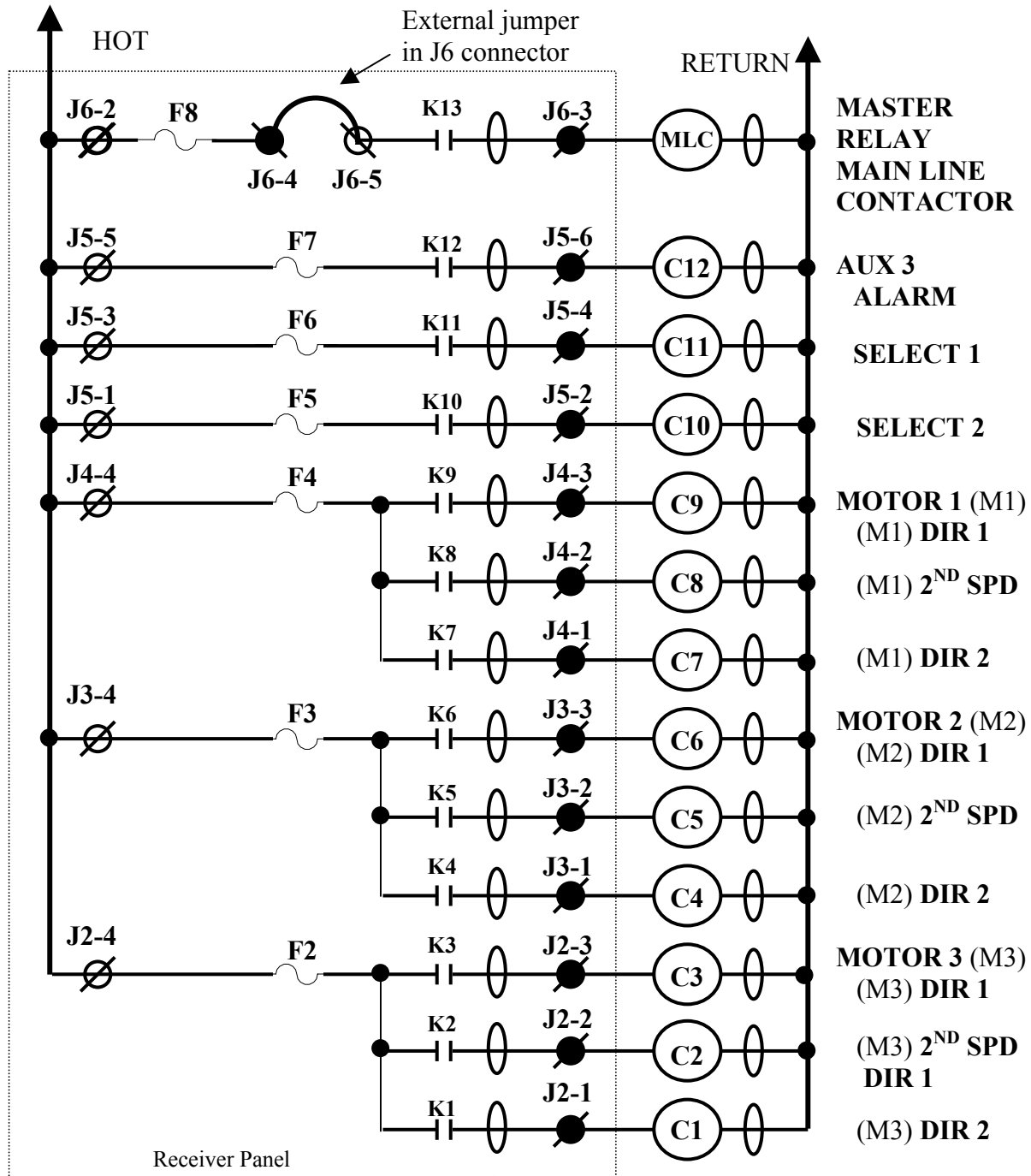


Indicates Switch in OFF Position.

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

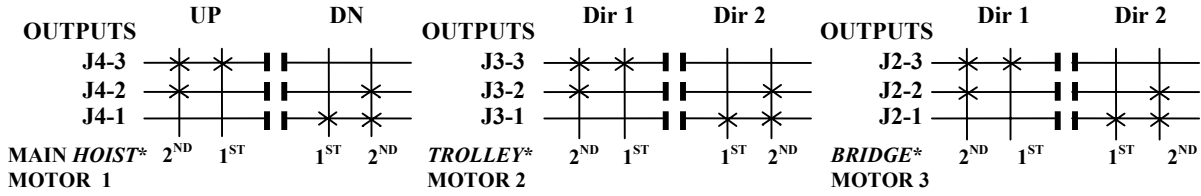
Section 6 - Wiring (Continued)

TABLE 1(I) TR12 WIRING DIAGRAM.
STANDARD 2-SPEED 3, 4 & 5 MOTOR SYSTEM using SELECT



Section 6 - Wiring (Continued)

**TABLE 2(I) TR12 2-SPEED PROGRAMMING DIAGRAM.
STANDARD 2-SPEED 3, 4 & 5 MOTOR SYSTEM using SELECT**



INDEPENDENT OUTPUTS



MOTOR 1 CONNECTIONS

J4-3 MAIN HOIST UP
 J4-2 MAIN HOIST 2ND SPEED
 J4-1 MAIN HOIST DOWN
 J4-4 HOT (J4-1, 2 & 3)

MOTOR 2 CONNECTIONS

J3-3 TROLLEY DIR 1
 J3-2 TROLLEY 2ND SPEED
 J3-1 TROLLEY DIR 2
 J3-4 HOT (J3-1, 2 & 3)

MOTOR 3 CONNECTIONS

J2-3 BRIDGE DIR 1
 J2-2 BRIDGE 2ND SPEED
 J2-1 BRIDGE DIR 2
 J2-4 HOT (J2-1, 2 & 3)

INDEPENDENT CONNECTIONS

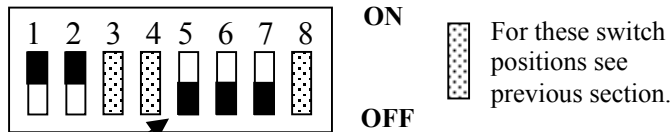
J5-2 SELECT 2	J5-1 HOT SELECT 2
J5-4 SELECT 1	J5-3 HOT SELECT 1
J5-6 AUX 3 ALARM	J5-5 HOT AUX 3 ALARM

TRANSMITTER SWITCH SETTINGS (This configuration does not apply to the Membrane transmitter).

telePilot USE PDA SCREEN (Program the configuration switches 5, 6 and 7 to OFF. Under MAIN/AUX select the word "SELECT").

PENDANT, JLTX AND SLTX TRANSMITTER SWITCH SW4 "D" SETTINGS:

Position-1	Position-2	Position-5	Position -6	Position -7
ON	ON	OFF	OFF	OFF



↑
Indicates Switch in OFF Position.

*NOTE: Hoist, Trolley and Bridge are listed here as traditional configurations, the installer may choose to define the motors differently.

Additional programming available:

The select function can be inverted by turning switch position 4 to ON (the Configuration Switch on the telePilot or SW4 "D" for the Pendant, JLTX and SLTX).

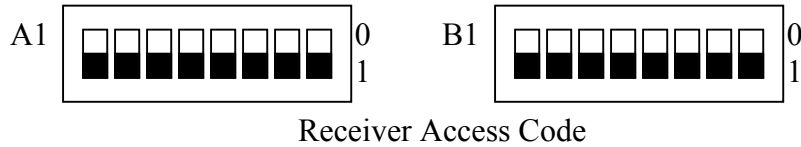
Tandem select operation, both select 1 and 2 on at the same time, can be disabled by turning switch position 3 to ON (the Configuration Switch on the telePilot or SW 4 "D" for the Pendant, JLTX and SLTX).

Section 7 – Programming

7-1. Programming Access Codes.

System ▼ “10K”

Frequency ▼



Multibox Tx # ▼ 1

Auto Turn Off Auto Alarm



Switch Conf. H, T, B

Timer ▼

Main/Aux ▼ “Aux”

The access code is set at the factory and should not be changed unless absolutely necessary. If you are reprogramming a spare or “Minuteman” transmitter make sure the other transmitter is securely taken out of service.

WARNING

TWO OPERATIONAL TRANSMITTERS WITH THE SAME ACCESS CODES OPERATING AT THE SAME TIME IS A DEFINITE SAFETY HAZARD.

TeleMotion receivers are shipped with the access code settings for the transmitter marked on the receiver door for both styles of transmitters.

Also a label on the transmitter lists the access code settings inside. The positions on the transmitter label match the switch settings. The “1” by A1 means the switch position A1 should be ”ON” and “0” means A1 should be “OFF”.

7-2. Changing Transmitter Access Codes.

Section 7 - Programming (Continued)

WARNING

AFTER CHANGING THE ACCESS CODES ON THE TRANSMITTER, TEST THE UNIT BY TURNING IT ON AND OFF NEAR THE APPROPRIATE RECEIVER. IF THE RECEIVER DOES NOT RESPOND, DO NOT ACTIVATE A FUNCTION BUTTON! THE TRANSMITTER MAY HAVE THE WRONG ACCESS CODE, WHICH COULD MOVE ANOTHER CRANE. RE-CHECK THE ACCESS CODE IN THE TRANSMITTER AND RETEST.

7-2.1. Transmitter.

Open the back battery door and take out the batteries as a safety precaution.

Remove the 6 screws on the front cover. Lift out switch-pad, logic board and turn logic board over.

Locate the dipswitches marked "A" and "B". With a pen or pointed object toggle the switches to match the Membrane Transmitter Code Diagram on the door of the receiver. A dot on the switch diagram means that switch position is ON.

CAUTION

DO NOT USE A PENCIL TO TOGGLE THE SWITCHES. THE LOOSE GRAPHITE FROM THE PENCIL CAN DAMAGE THE SWITCH.

Reassemble unit; replace the batteries and test.

7-3. Transmitter.

Open the back battery door and take out the batteries as a safety precaution.

Remove the 8 screws on the front cover. Turn transmitter over and remove back cover.

Locate the dipswitches marked "A" and "B". With a pen or pointed object toggle the switches to match the Pendant Transmitter Code Diagram on the door of the receiver. A dot on the switch diagram means that switch position is ON.

Reassemble unit; replace the batteries and test.**Receiver Unit Access Code Setting.**

The access code is preset at the factory and should not be changed unless absolutely necessary. There are two separate microprocessors in the TeleMotion unit. Each microprocessor has its own pair of access code switches

for additional reliability. The two pairs of access code switches are labeled "A1, B1" and "A2, B2". A1 must match the settings of A2 and B1 must match the settings of B2 or the unit will not work. See Figure 7-2. Access Code Setting.

The programming in the receiver must match the transmitter. If looking at the label on the outside of the transmitter, take note that positions "A" and "B" number from the left 1 through 8. In the receiver 8 is closer to the bottom of the unit and 1 is closer to the top.

NOTE

IN EVENT PROGRAMMING OF ACCESS CODES IS REQUIRED, TAKE SPECIAL CARE TO CORRECTLY LOCATE ACCESS CODE SWITCHES A AND B. LOOK FOR THE LABELS A AND B ON THE PRINTED CIRCUIT BOARD NEAR THE RESPECTIVE SWITCHES. DETERMINE THEIR ORIENTATION. THE SWITCHES MAY NUMBER FROM LEFT TO RIGHT OR RIGHT TO LEFT. LOOK FOR THE NUMBERING ON THE SWITCHES. MATCH ACCESS CODES A1, A2, --- B1, B2 ETC.

After changing the access code test the receiver with a matching transmitter. (If only one of the two red LEDs DS12 and DS20 come on, then check the access code settings on the receiver. (Check A1-B1 if DS20 is lit or A2-B2 if DS12 is lit). If both LEDs are lit, both sets of access codes do not match the transmitter.

7-5. Transmitter Programming (Other).

This applies to Membrane and Pendant transmitter dipswitches SW3 and SW4. These are transmitter-programming switches (not the access code switches) in both types of transmitters these should always all be in the "OFF" position for use with a TeleMotion unit. These switches are used for other Telemotive receivers.

If replacing a Membrane transmitter with a Pendant transmitter on an existing installation or making them interchangeable and keeping the existing receiver wiring, open the Pendant transmitter, find dip switch SW3 and move position 1 (SW3) to "ON". The Pendant transmitters labeling and functions North and South, East and West will match the Membrane transmitter.

If replacing a Pendant transmitter with a Membrane transmitter on an existing installation or to making them interchangeable and keeping the existing receiver wiring, open the Membrane transmitter, find dip switch SW3 and move position 1 (SW3) to "ON". The Membrane transmitters labeling and functions North and South, East and West will match the Pendant transmitter.

Section 7 - Programming (Continued)

Section 7 - Programming (Continued)

Section 8 – Servicing

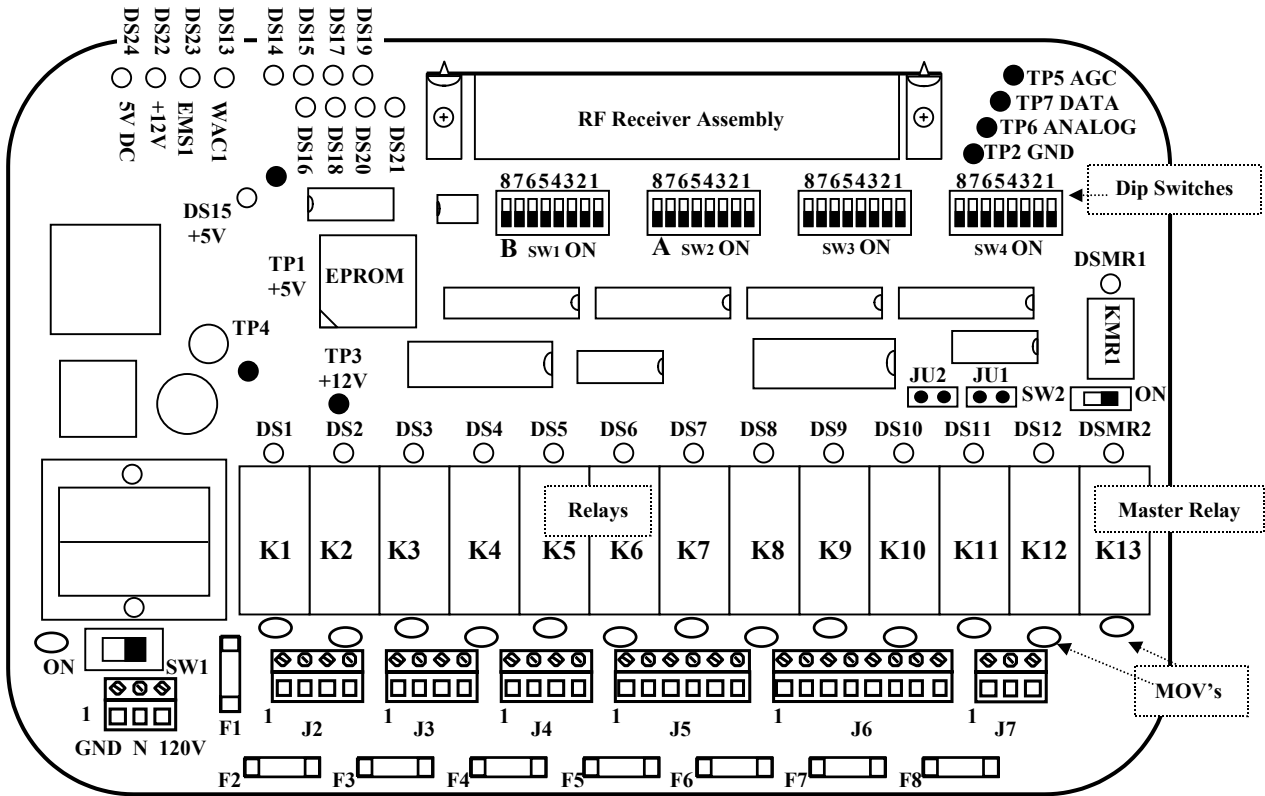


Figure 8-1. Receiver Layout

NOTE

IF THE SYSTEM STOPS WORKING CHECK THE RED INDICATOR ON THE TRANSMITTER. IF IT DOES NOT COME ON WITH PUSHING THE ON BUTTON OR THE RED WEAK BATTERY LIGHT IS ON (FOR THE *telePilot* TRANSMITTER) REPLACE THE TRANSMITTER BATTERIES.

Table 8-1. Receiver Diagnostic LED Functions. (See Figure 8-1. Receiver Layout for LED locations).

LED	COLOR	FUNCTION
DSMR1	Yellow	Monitors closure of the Security Relay output (KMR1). The LED will be illuminated when the Security Relay has been enabled by an ON command received from the Transmitter Unit. LED will extinguish when an OFF command is transmitted, or an EMS condition is present. The Security Relay controls the 12 VDC power to the MCR relay (K13) and the power to the coils of the control relays (K1 through K12) on the Relay Output Modules.
DSMR2	Red	Monitors closure of the Master Control Relay (MCR) relay (K13). LED will be illuminated when the MCR relay has been enabled by an ON command received from the Transmitter Unit. LED will extinguish, when an OFF command has been transmitted, an EMS condition is present, or SW2 is set to OFF. The MCR controls the 12 VDC power to the Master Relay on the Power Supply Board.

Section 8 – Servicing (Continued)

DS1-DS12	Red	<p>Monitors closure of the output relays (K1-K12).</p> <p>Normally ON for a function when that specific function is enabled.</p> <p>The LED will be illuminated when a specific relay has been enabled by the respective command received from the Transmitter Unit. The LED will extinguish, when the command is no longer detected.</p>
DS13	Red	<p>Monitors the watchdog timer.</p> <p>Normally OFF.</p> <p>The LED will illuminate momentarily when power is applied to or removed from the system. If the LED is continuously flashing or on, the computer is not working properly. If LED is illuminated constantly (no flashing), the +5 VDC is probably too low. This could be caused by shorts on the board or by a defective voltage regulator. If the LED flashes at a constant rate, the microcomputer chip or EPROM may be defective.</p>
DS14	Yellow	<p>Monitors data synchronization. (Flashes when a properly formatted data signal is received from the transmitter).</p> <p>This LED will flash rapidly when data is transmitted. The LED can be used with DS16 to analyze incoming data. If DS16 is illuminated or flashing when DS14 also is flashing, another Transmitter Unit on the same frequency may be present. This is normal. As more Transmitter Units operated on the same frequency, LED will flash brighter and more often.</p>
DS15	Yellow	<p>Monitors continuity between receiver RF module and CPU module.</p> <p>Normally ON.</p> <p>Off indicates a malfunctioning receiver.</p>
DS16	Red	<p>Monitors received data errors.</p> <p>Normally OFF.</p> <p>A flashing LED during data transmission may indicate interference of the received data. If LED is illuminated continuously when data is transmitted and the system will not respond the Access Code of the Receiver and Transmitter Units may not match. If LED is illuminated when data is not transmitted, another Transmitter Unit may be present on the same frequency with a different Access Code. The presence of activity on this LED does not necessarily indicate a problem. It should be used with other indicators in analyzing system status.</p>
DS17	Yellow	<p>Monitors system activity.</p> <p>Normally FLASHING.</p> <p>If not flashing the microprocessor is dead.</p>
DS18	Red	<p>Monitors the ON command from the Transmitter.</p> <p>LED will flash when an ON command is being received from the Transmitter.</p> <p>While pushing the ON button on the Transmitter this should light.</p>
DS19	Red	<p>Monitors EMS condition.</p> <p>Normally OFF.</p> <p>LED will flash when an EMS command is transmitted and illuminate continuously when the EMS</p>

Section 8 – Servicing (Continued)

		condition is in effect. An EMS condition may be created when an EMS command is transmitted or when a failure mode is detected by the slave microcomputer. If both DS18 and DS19 are illuminated, a contact monitoring error has been detected. If both DS16 and DS19 are illuminated, the incoming data on the ICC bus has been corrupted.
DS20	Red	Monitors the OFF command from the Transmitter. LED will flash when an OFF command is being received from the Transmitter Unit. While pushing the OFF button on the Transmitter this should light.
DS21	Yellow	Monitors the activity for the Security Relay (KMR1). Normally ON when the receiver is enabled. If the system is ON and the light is not lit there is a serious microprocessor error.
DS22	Green	Monitors the unregulated DC power to the 12 volt regulator Normally ON when AC line is present. If AC Power is present and the AC to DC converter is working then the LED is illuminated. The LED is off if DC power is not present. Check power supply, fuses and if power is applied to the receiver.
DS23	Green	Monitors the regulated 12 VDC power to the Board (receiver board). Normally ON when AC line is present. If 12 VDC power is present then the LED is illuminated. The LED is off if 12 VDC power is not present. Check the 12 VDC regulator and for shorts on the Board.
DS24	Green	Monitors regulated 5 VDC power to the Board. Normally ON when AC line is present. If 5 VDC power is present then the LED is illuminated. The LED is off if 5 VDC power is not present. Check the 5 VDC regulator and for shorts on the Board.

8-1. Receiver Test Points.

Test points are shown as stars on Figure 8-1. Receiver Layout.

TP1 – Monitors regulated 5 VDC

TP2 – Ground for monitoring other test points.

TP3 – Monitors regulated 12VDC.

TP4 – Not used.

TP5 – Monitors AGC (Automatic Gain Control) from RF Receiver module.

TP6 – Monitors analog signal from RF Receiver module.

TP7 – Monitors received data from RF Receiver module.

Section 8 – Servicing (Continued)

8-2. Typical Wave Forms on an Oscilloscope.

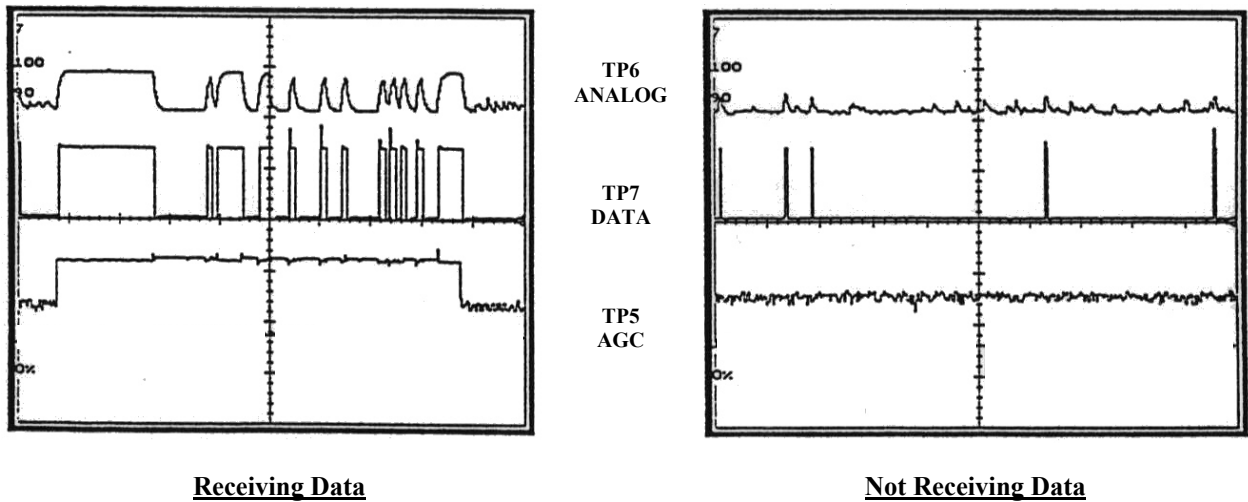


Figure 8-2. Receiver Scope Wave Forms.

Scope Settings:

- Sweep – 1 millisecond per division.
- Sensitivity – TP6 1 volt per division 10X probe.
TP7 2 volts per division 10X probe.
TP5 1 volt per division 10X probe.

Section 9 – Spare Parts

PART NUMBER	DESCRIPTION
RECEIVER	
FW2911-0	EPROM
E13151-3.2-01	RF RECEIVER MODULE ASSEMBLY
H310-0	RF RECEIVER MODULE ASSEMBLY MOUNTING SCREWS (4)
MP18005-0	RF RECEIVER MODULE MOUNTING BRACKET TOP SIDE (LEFT)
MP18005-1	RF RECEIVER MODULE MOUNTING BRACKET TOP SIDE (RIGHT)
H906-0	RF RECEIVER MODULE MOUNTING BRACKET BOLT (2)
H934-0	RF RECEIVER MODULE MOUNTING BRACKET NUT (2)
E10100-1	MAIN BOARD
H1224-1	MAIN BOARD MOUNTING SCREWS (5)
E10197-0	ANTENNA ASSEMBLY (INTERNAL)
	CONNECTOR PLUG IN:
TS1060-3	3 POSITION (2)
J4655-0	6 POSITION
TS1060-8	8 POSITION
CR260-0	MOV
K1304-0	RELAY (OUTPUT) (7)
S2721-8	DIP SWITCH (ACCESS CODE) (4)
MP10267-0	HOUSING ASSEMBLY, CASE DOORS, SCREWS
E10196-0	FILTER ASSEMBLY
H1223-0	SCREW ROUND HEAD #10-24 X 1"
H1226-0	HEX NUT #10-24
H2079-0	LOCK WASHER #10 SPLIT
TC10K-TR6	INSTRUCTION MANUAL
F2711-2	FUSE ½ AMP, SLO BLO 250V
F2711-0	FUSE 10 AMP SLO BLO 250V
MEMBRANE TRANSMITTER	
F2712-1.5	FUSE 1.5 AMP, 250V FAST ACTING 2 AG
FW2836-0	TWO SPEED TACTILE MEMBRANE EPROM FOR TRANSMITTER M/C MODULE E10635
A9654-0	STRAP ASSEMBLY
A10662-1	TRANSMITTER CASE ASSEMBLY
E9654-0	BATTERY HOLDER ASSEMBLY
A10664-2	BATTERY DOOR ASSEMBLY
E10640-2	BEZEL ASSEMBLY (TWO-SPEED TRANSMITTER)
S22803-0	MEMBRANE SWITCH PAD (TACTILE)
MP9656-0	VINYL POUCH
A9665-0	RUBBER BOOT ASSEMBLY
AA CELL 1.5 VOLTS	BATTERY (5)
PENDANT TRANSMITTER	
E10668-11	CASE, TOP PENDANT TRANSMITTER, COMPLETE WITH SWITCHES, DECALS, BOOTS
MP10668-1	CASE ONLY, TOP PENDANT TRANSMITTER
H634-0	BOOT, GRAY (PUSHBUTTON)
H635-0	BOOT, RED (PUSHBUTTON)
H2055-3	LENS/MOUNT, LED W/SPACER, RED
S1058-0	SWITCH, PUSHBUTTON, TWO-SPEED SBRU-SD
S1026-0	SWITCH, PUSHBUTTON, MOM N/O
S1041-0	SWITCH, TOGGLE, SPDT, CTR OFF
MP10666-0	KNOB, ROTARY 1/2" DIA., BLACK

Section 9 – Spare Parts (Continued)

MP10661-0	BOOT, TOGGLE SW., BLACK
A10667-5	BOTTOM CASE W/O BATTERY DOOR
A10669-1	BATTERY DOOR W/FOAM, W/O SCREWS AND LATCH
MP10676-0	FOAM, BATTERY DOOR

PART NUMBER	DESCRIPTION
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PENDANT TRANSMITTER (CONTINUED)

MP10677-0	GASKET FOR BOTTOM CASE
H1047-0	COVER SCREWS (8)
MP1049-0	SWITCH GUARD WITH SCREWS
E10668-11LT	SAME AS E1066-11 BUT WITH SWITCH GUARD AND LARGE TOGGLES
MP10668-3	CASE TOP ONLY, LARGE TOGGLES
S605-0	SWITCH, TOGGLE SPDT CENTER OFF, LARGE
A1011-X	BOOTS (6) (SEE *NOTE 1 BELOW FOR THE PROPER SUFFIX)
MP10650-1	LATCH FOR BATTERY DOOR
S605-0	SWITCH, TOGGLE SPDT CENTER OFF, LARGE
A1011-X	BOOTS (6) (SEE *NOTE 1 BELOW FOR THE PROPER SUFFIX)
H251-0	SCREW FOR BATTERY DOOR LATCH
H252-0	WAVE WASHER FOR BATTERY DOOR LATCH
H2034-0	FLAT WASHER FOR BATTERY DOOR LATCH
N13653-2	FCC LABEL
E10688-0	BATTERY HOLDER ASSEMBLY, W/CABLE
MP10680-0	O'RING
MP10678-0	SHOULDER STRAP
BT10KP-0	BATTERY, ALKALINE
BT10KP-1	BATTERY, NICAD
E10670-1	BATTERY CHARGER
A10669-1	BATTERY DOOR

*NOTE 1	<u>UP</u>	<u>DOWN</u>	<u>EAST</u>	<u>WEST</u>	<u>NORTH</u>	<u>SOUTH</u>
YELLOW	23	24	31	32	29	30
BLACK	3	4	11	12	9	10