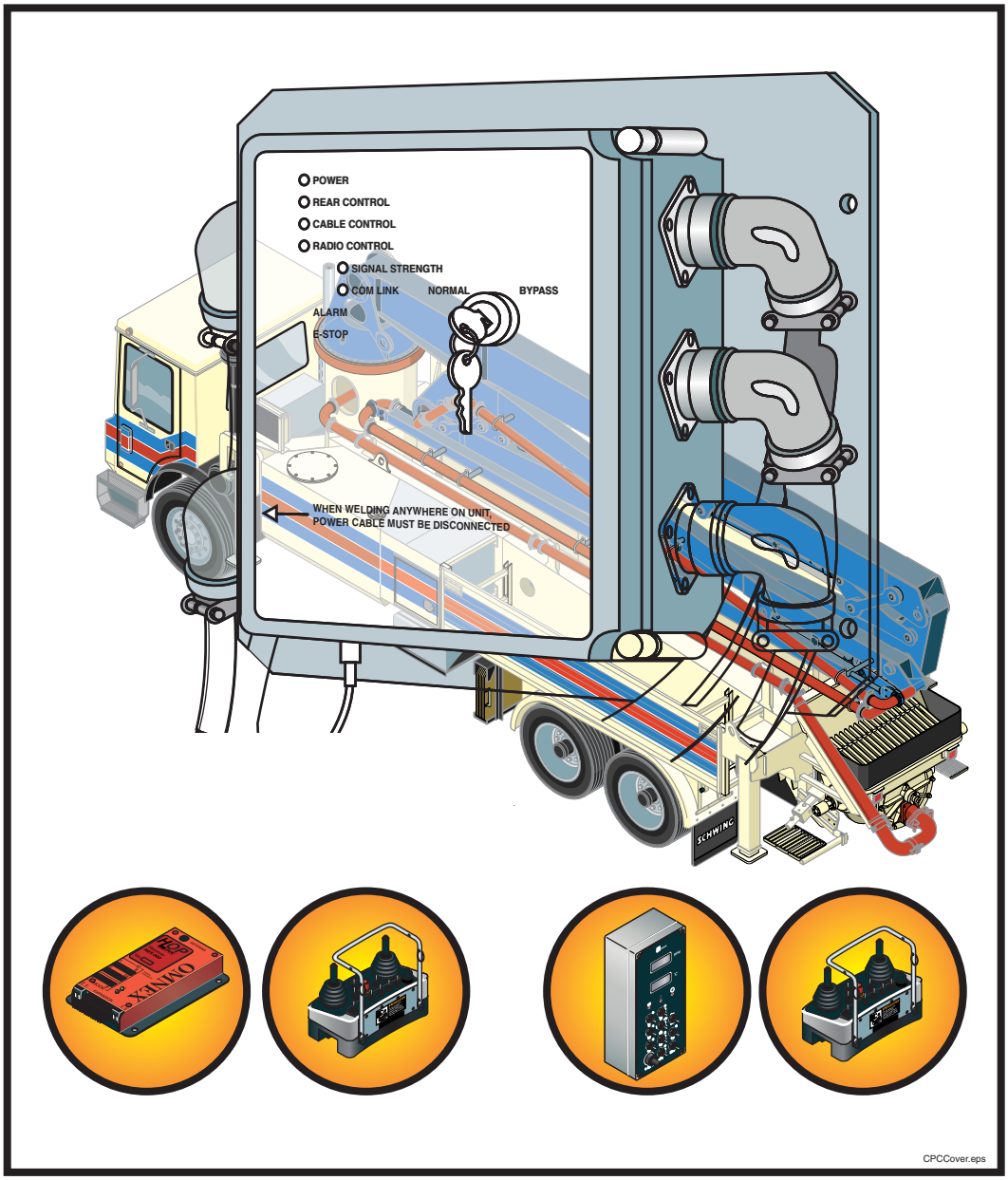
SCHWING AMERICA INC.

Concrete Pump Controller

Operation Manual




HOME

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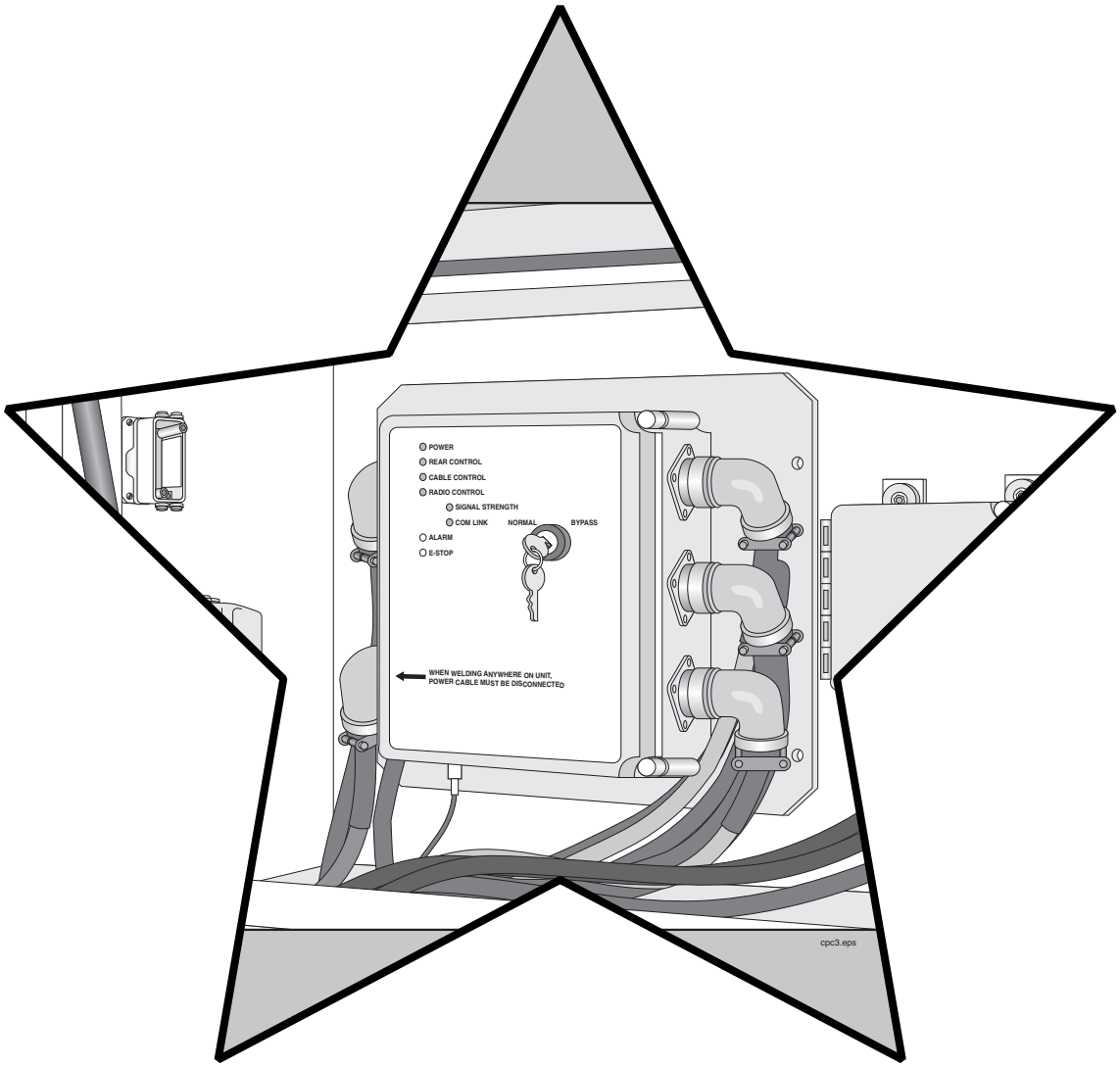

CPC Operation Manual

Part Number 30355883

Version 1.0.1

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Product Overview

CPC Operation

Radio Remote

Glossary

Product Overview

System Explanation

The CPC system is comprised of a main controller, rear control panel, T47 cable remote control box, an optional T45 radio transmitter, and a receiver.

The CPC system diagram is summarized in Figure 1. Various self-contained sensors mounted on the chassis and boom send feedback information to the control system. This feedback information, together with the operator commands (input via switches and joysticks on operator panels), determine the drive outputs to the electric-over-hydraulic valves and indicator lamps (on operator control panels). Sophisticated computer programs, permanently encoded into the firmware chips in the major assemblies, govern the mapping of inputs to outputs.

Features of the computer program include safety interlocks to prevent injury to personnel as well as damage to the concrete pump unit. The program incorporates a **"restart"** check, which ensures that functions do not actuate unexpectedly due to operator panel switches being left ON by accident. A **"restart"** check occurs on power up, mode change, or after E-Stop restart.

All vehicle wiring to the system is through waterproof circular M.S. connectors on the outside of the enclosures to ensure that the NEMA 4X rating of the enclosures is preserved.

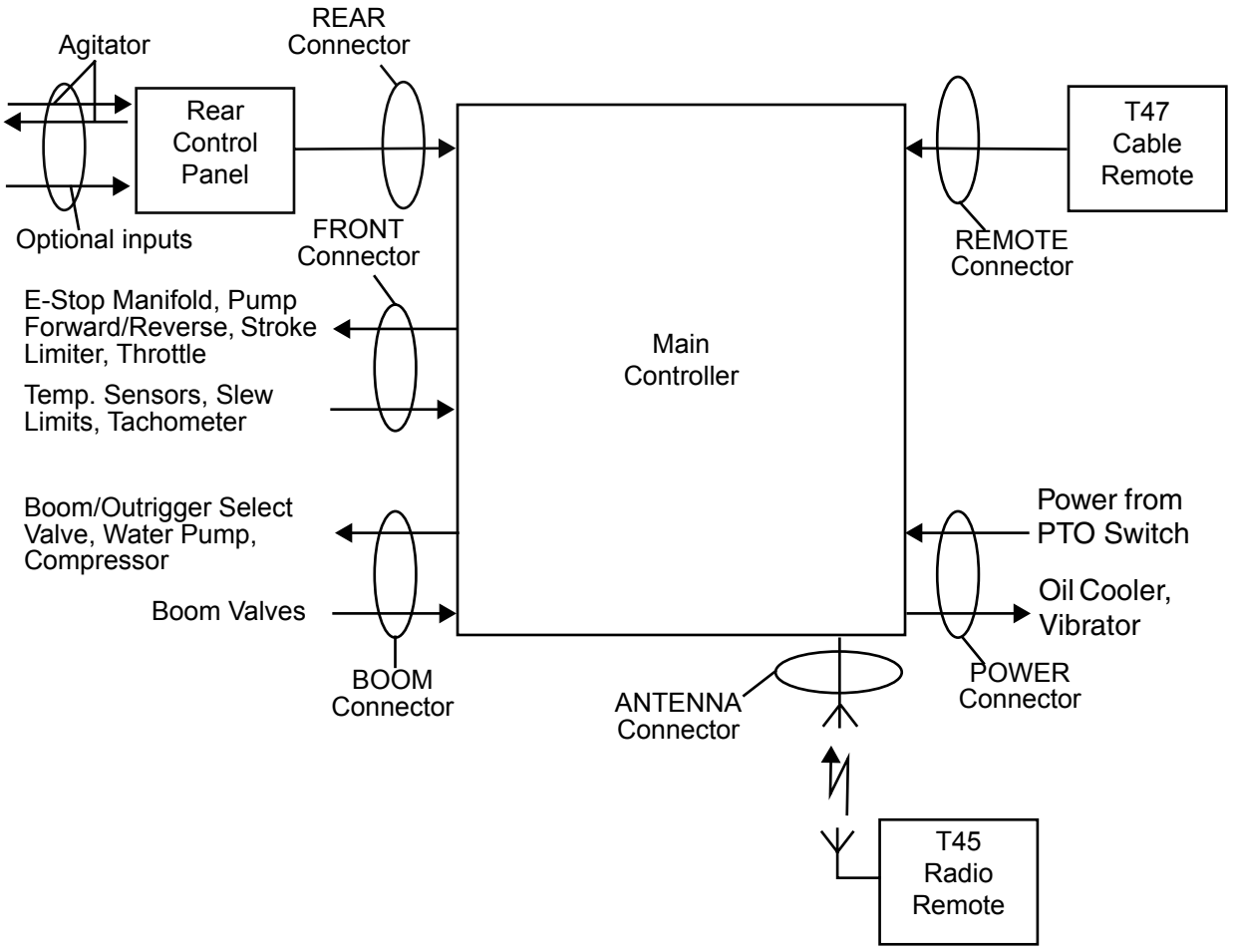


Figure 1
CPC system diagram

CPC Enclosure

The CPC (Figure 2) provides a proportional signal to each of the boom functions and the concrete pump output. It also controls all on/off functions on the unit. The CPC is designed to be a modular device, allowing the components to be easily changed for troubleshooting and repair. The eight lights on the cover of the CPC give the operator a visual status report of the controller, the peripheral devices, communications, E-Stop status, and alarms.

There are five connectors on the main controller for termination of all truck wiring used for the various inputs and outputs.

Considerations for electrowelding

The electronics in the CPC system can be damaged by the high currents and voltages employed in electrowelding. If electrowelding must be performed after the CPC is installed, observe the following precautions to reduce the risk of damage:

- Do not connect the ground clip to a point on the chassis close to the CPC enclosure.
- Disconnect all cables from the CPC enclosure and sensors. Also, disconnect the battery, PTO switch, and ground connections going into the enclosure.
- Do not strike an arc close to the enclosure and sensors or wiring leading into the enclosure and sensors.
- Do not weld to the sensors.

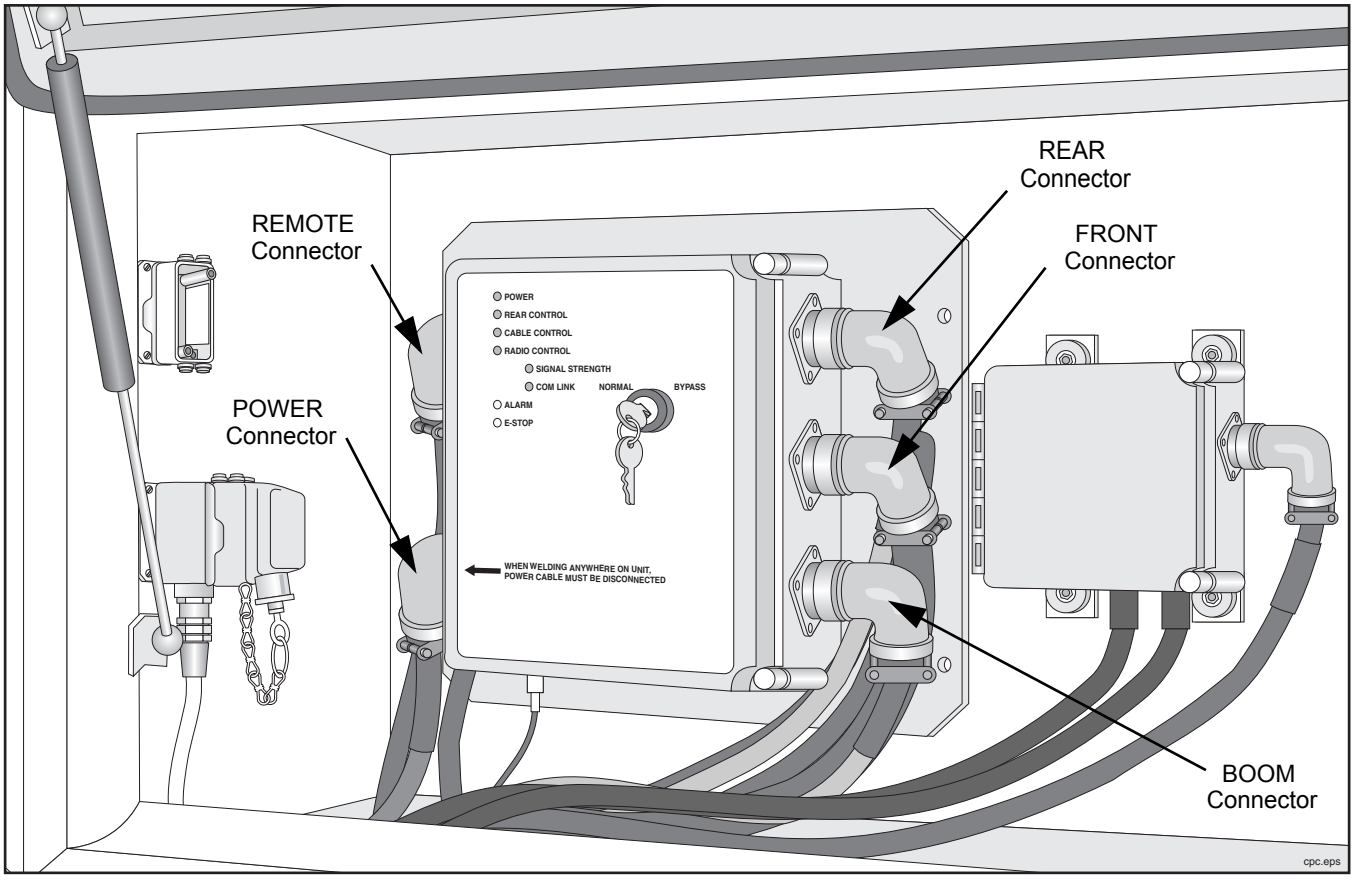
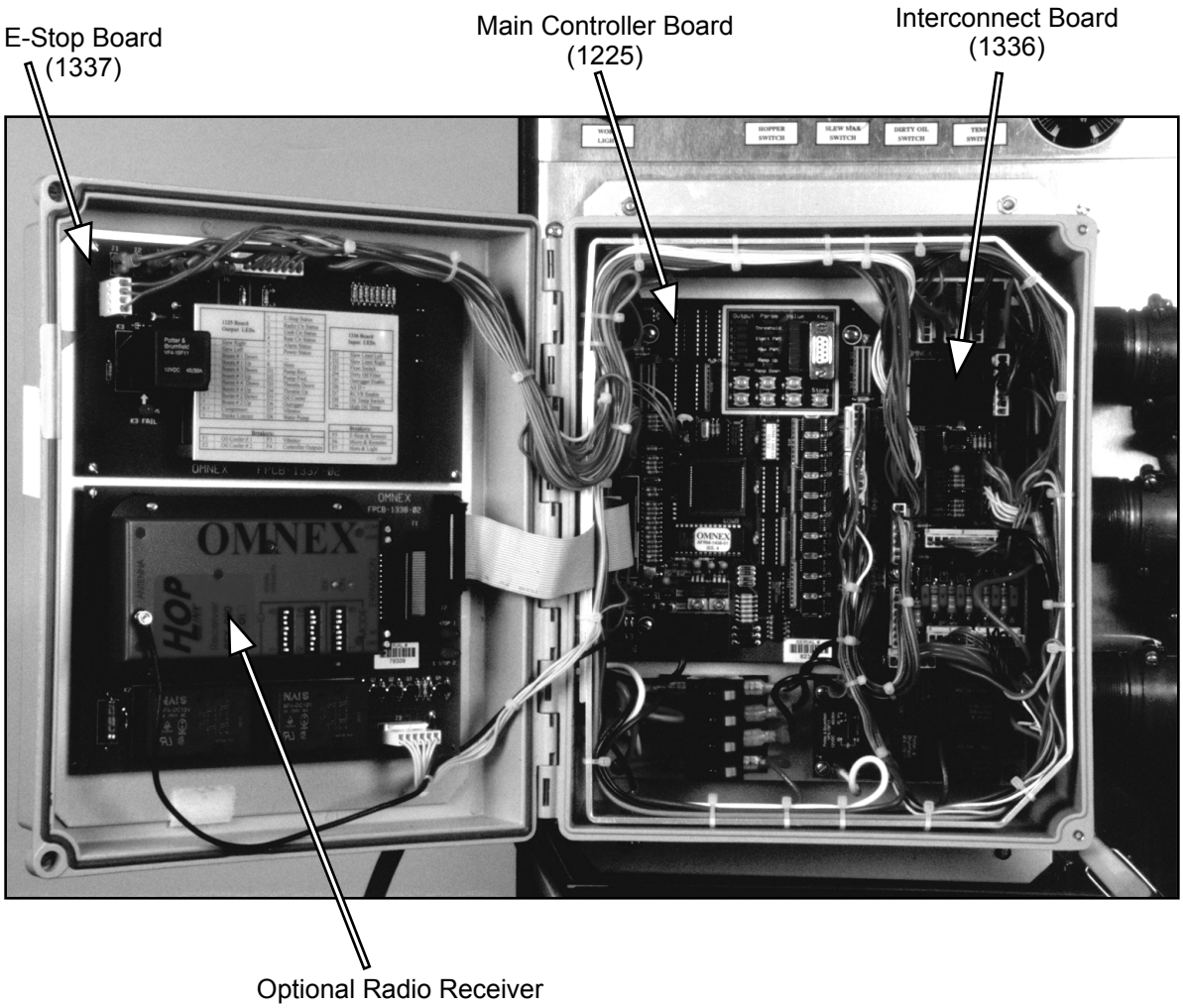


Figure 2
CPC front cover and connectors

Inside the CPC there are 3 electronic boards, an optional radio receiver, various fuses and circuit breakers, several wiring harnesses, and connectors (Figure 3).



E-Stop Board (1337)	Part # 30344125
Main Controller Board (1225)	Part # 30344114
Interconnect board (1336)	Part # 30344110
Optional Radio Receiver	Part # 30343395

Figure 3
CPC component locator

E-Stop and radio receiver board location

The E-Stop and the optional radio receiver boards are mounted on the inside of the CPC cover (Figure 4).

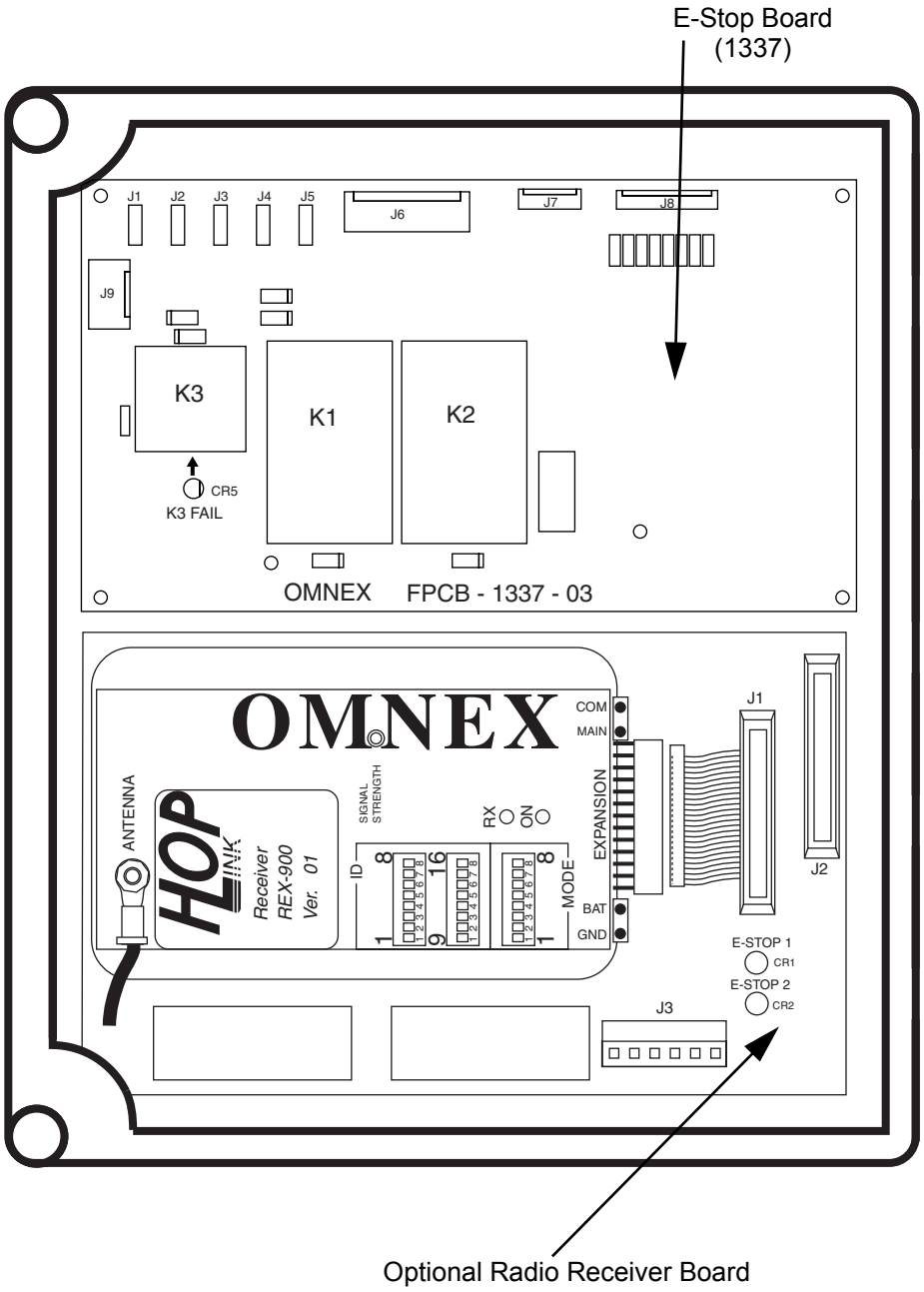


Figure 4
E-Stop board and the radio receiver board

Interconnect board

The interconnect board (Figure 5) connects the inputs from the pump sensors to the main processor, as well as controlling the outputs to the oil cooler, vibrator, and throttle increase and decrease. LED's D1 to D9 indicate input status of the sensors to aid in troubleshooting the alarm indication. Breakers located on the board include F5, which protects the E-stop; F6 protects the microprocessor and remote, F7 protects the horn and lights, and F8 protects the sensors circuits (tach. sender, temp. sender, etc.). Connection points are provided to check the pulse width modulation (PWM) outputs to the boom control valves. LED's in the upper right hand corner indicate if the E-Stop circuit is complete.

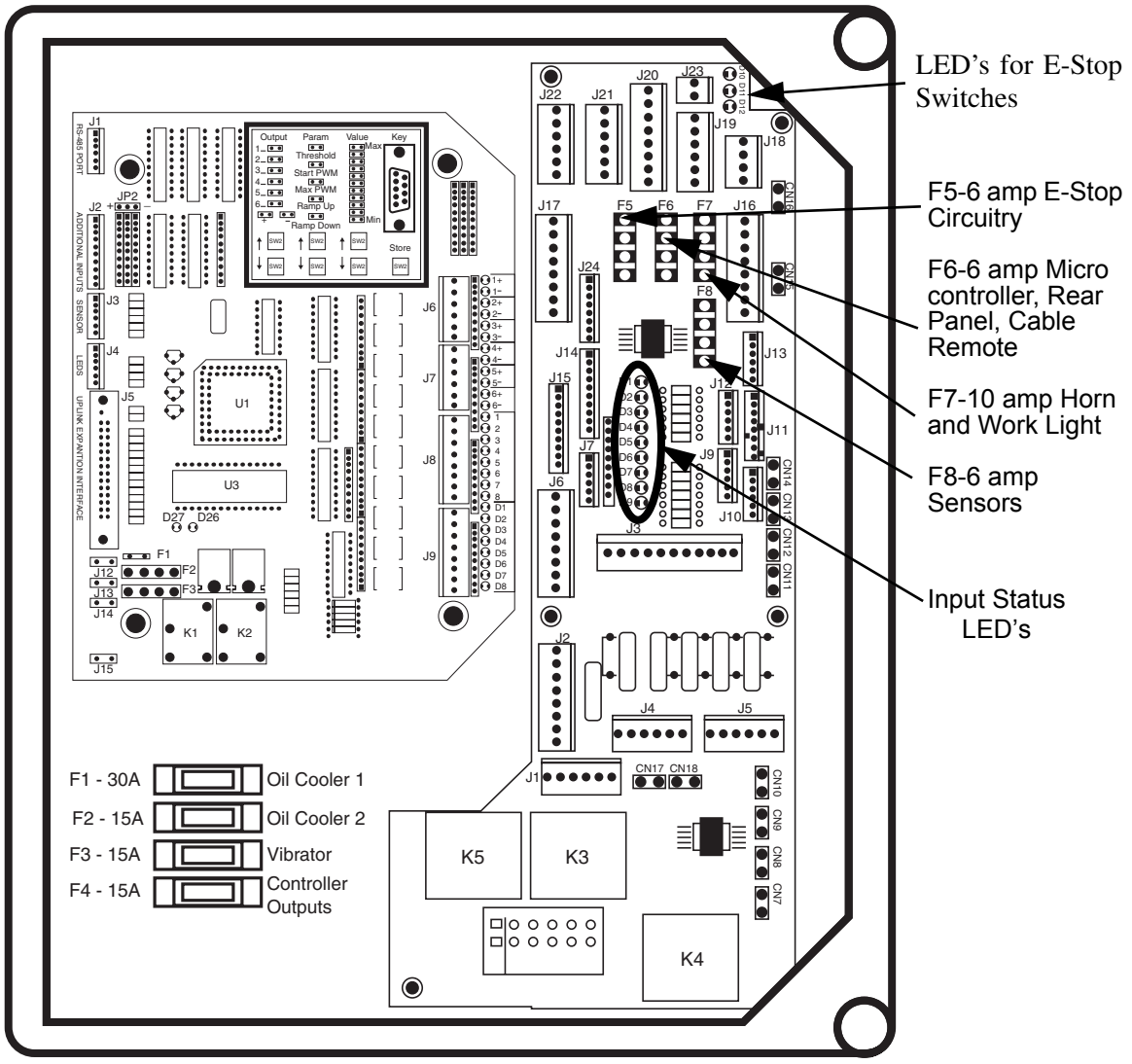


Figure 5
Interconnect board (1336)
(with terminal strip and screw connectors on circuit breakers)

Main controller board

Inside the controller is the 1225 main controller board (Figure 6). This board contains the electronic components for controlling inputs and outputs. It also contains a configuration panel that allows access to the proportional settings to fine-tune the boom movements. Monitoring the outputs and inputs is possible with the status lights.

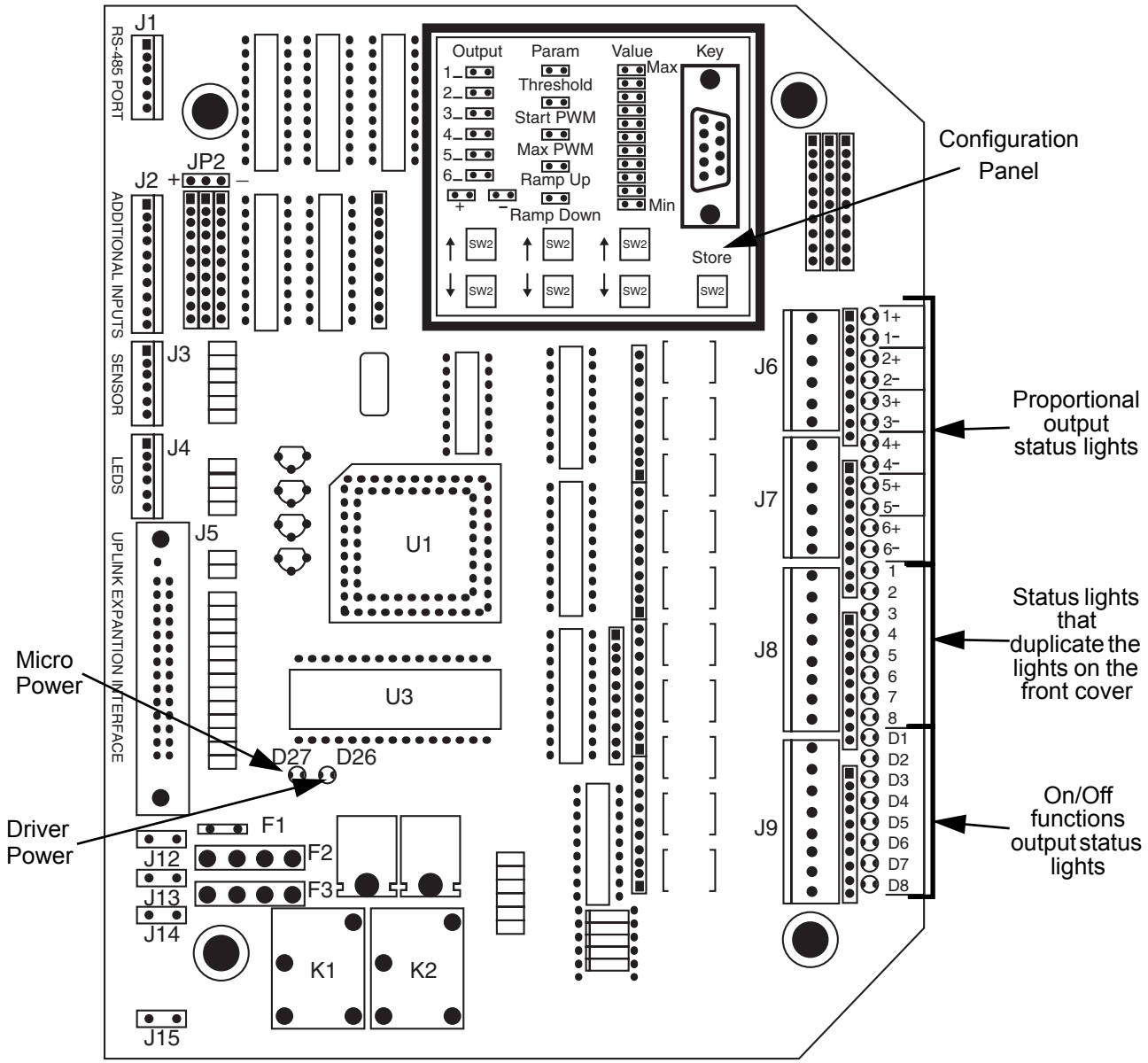


Figure 6
Main controller board (1225)

E-Stop board

On the top half of the inside cover, underneath the status light decal, is the 1337 E-Stop board (Figure 7). It has two E-Stop relays (K1 and K2). Relay K3 supplies the main driver power for the system. There is an LED to indicate if relay K3 should fail.

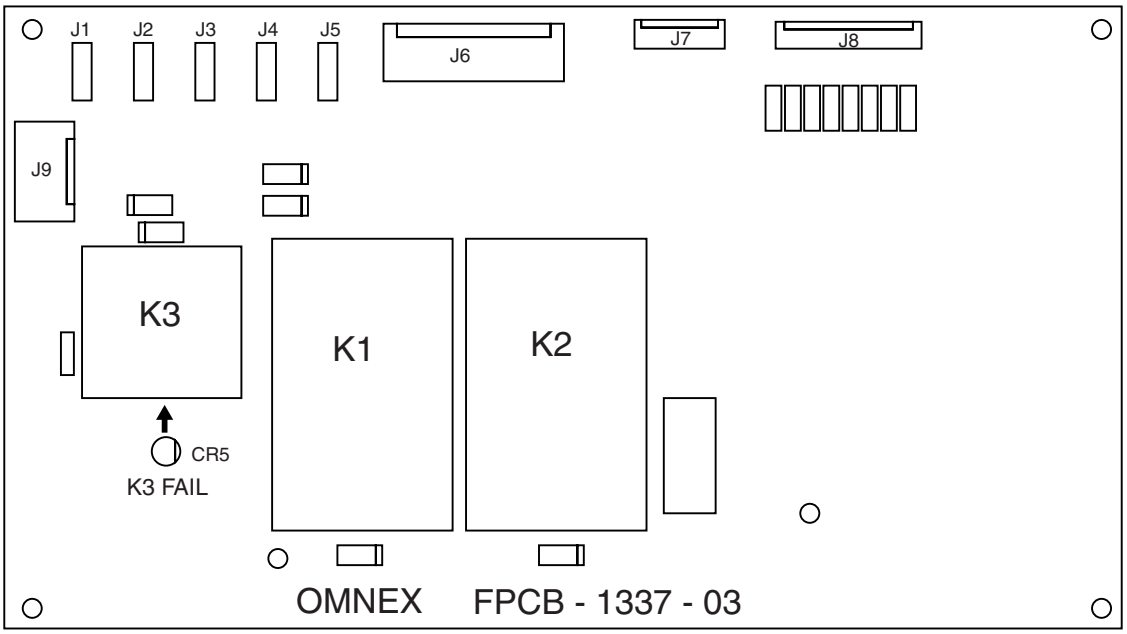


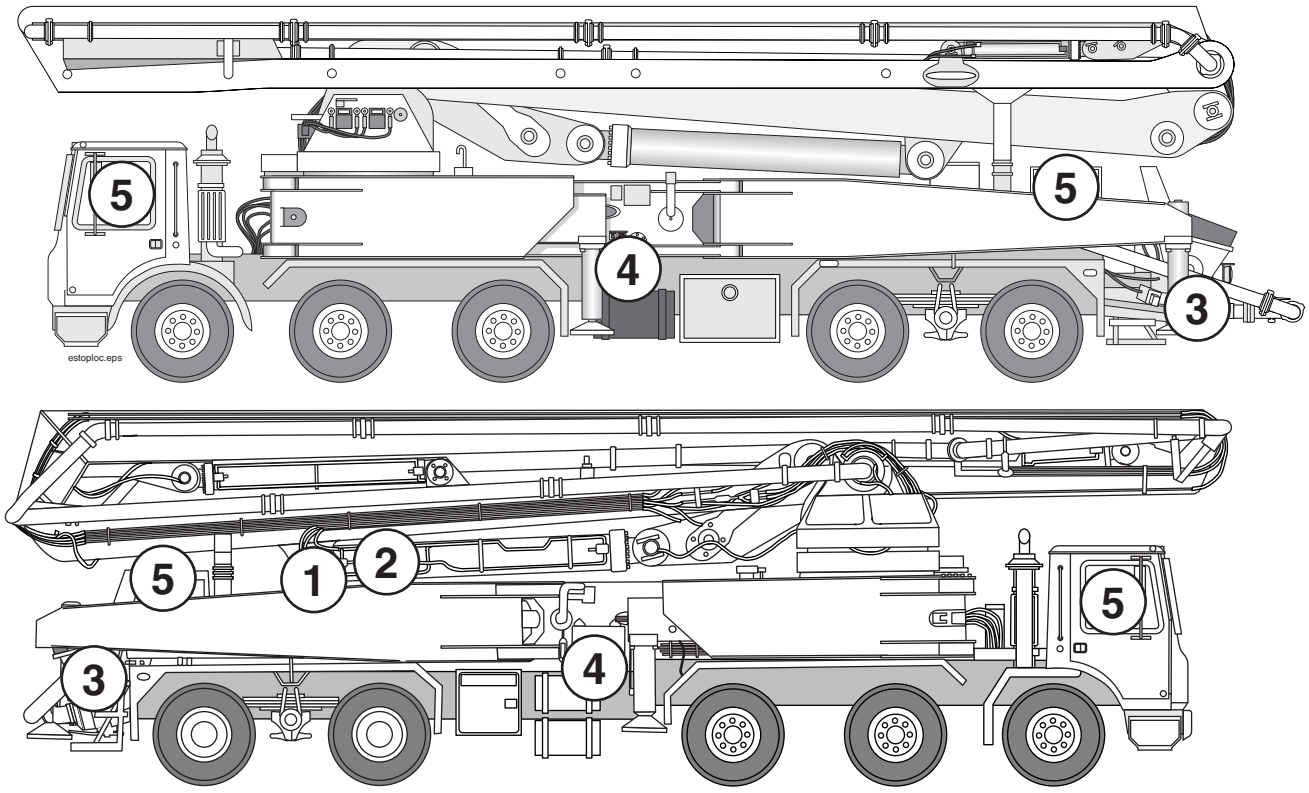
Figure 7
E-Stop Board (1337)

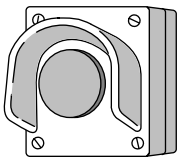
E- Stop switches

For operator safety and convenience, there are seven to nine E-Stop push buttons as shown in Figure 8. They are located next to the boom control hand valves, the waterbox, both sides of the hopper, the rear control panel as well as each remote box. On some units there is also one button near each set of outrigger controls.

NOTE!

The location and number of the E-Stop switches may vary on each different concrete pump. Refer to the *Operation Manual* of your specific unit for the correct location of E-Stop switches.





E-stop locations

1. Manual boom controls (On the 52, the e-stop for the water box is the same as the one for the manual controls)

2. Near the water box

3. Both sides of the hopper

4. Near outrigger controls (On most units with slewing outriggers)

5. One on each remote box

Figure 8
E-stop locations

Rear control panel

The rear control panel (Figure 9) gives the operator local control of all on/off functions and allows monitoring of the oil temperature, oil filter status, and the engine RPM. The E-Stop indicator light indicates the status of the control system. The boom can be controlled manually at the hand valves or remotely, by using either the *cable* or the *radio* remote box.

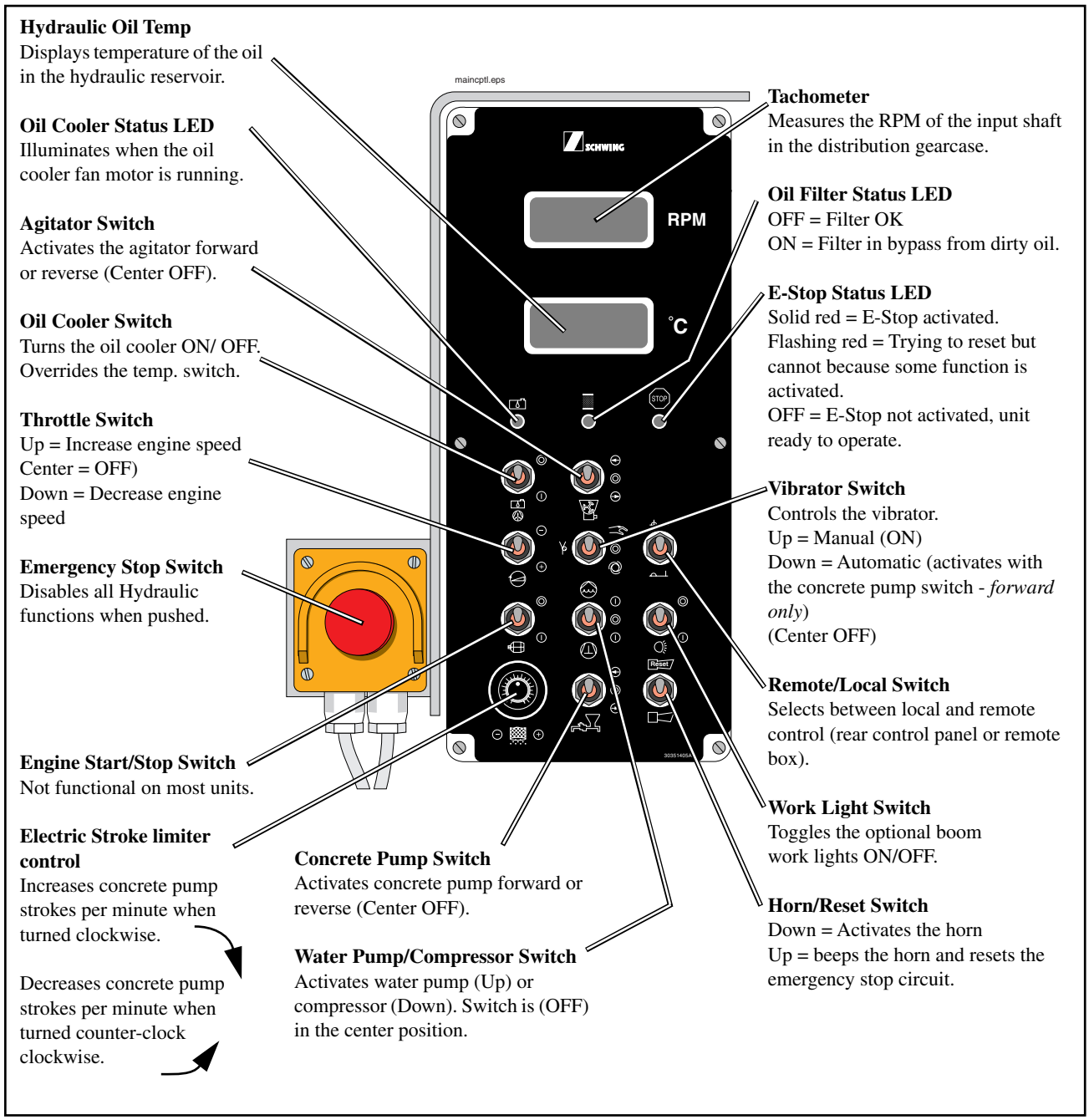


Figure 9
Rear control panel

Remote receptacle

On current production models the remote receptacle is located in the electrical control system enclosure (Figure 10) on the passenger side of the unit.

NOTE!

Figure 10 shows the location of the remote receptacle on a current production model. The receptacle may be in a different location on your concrete pump. Refer to the *Operation Manual* for your specific unit to locate the remote receptacle.

When using either the cable or radio remote box, the *local/remote* switch on the rear control panel must be in the *remote* position. The remote receptacle is used to complete the E-stop circuit. The unit will not operate if there is not a connector in this receptacle. The cable connector should be plugged in when using the cable box or the shorting plug (Figure 10) should be plugged in when operating with the optional radio remote. Either plug will work when the unit is in local control. Avoid high pressure water washing of this receptacle.

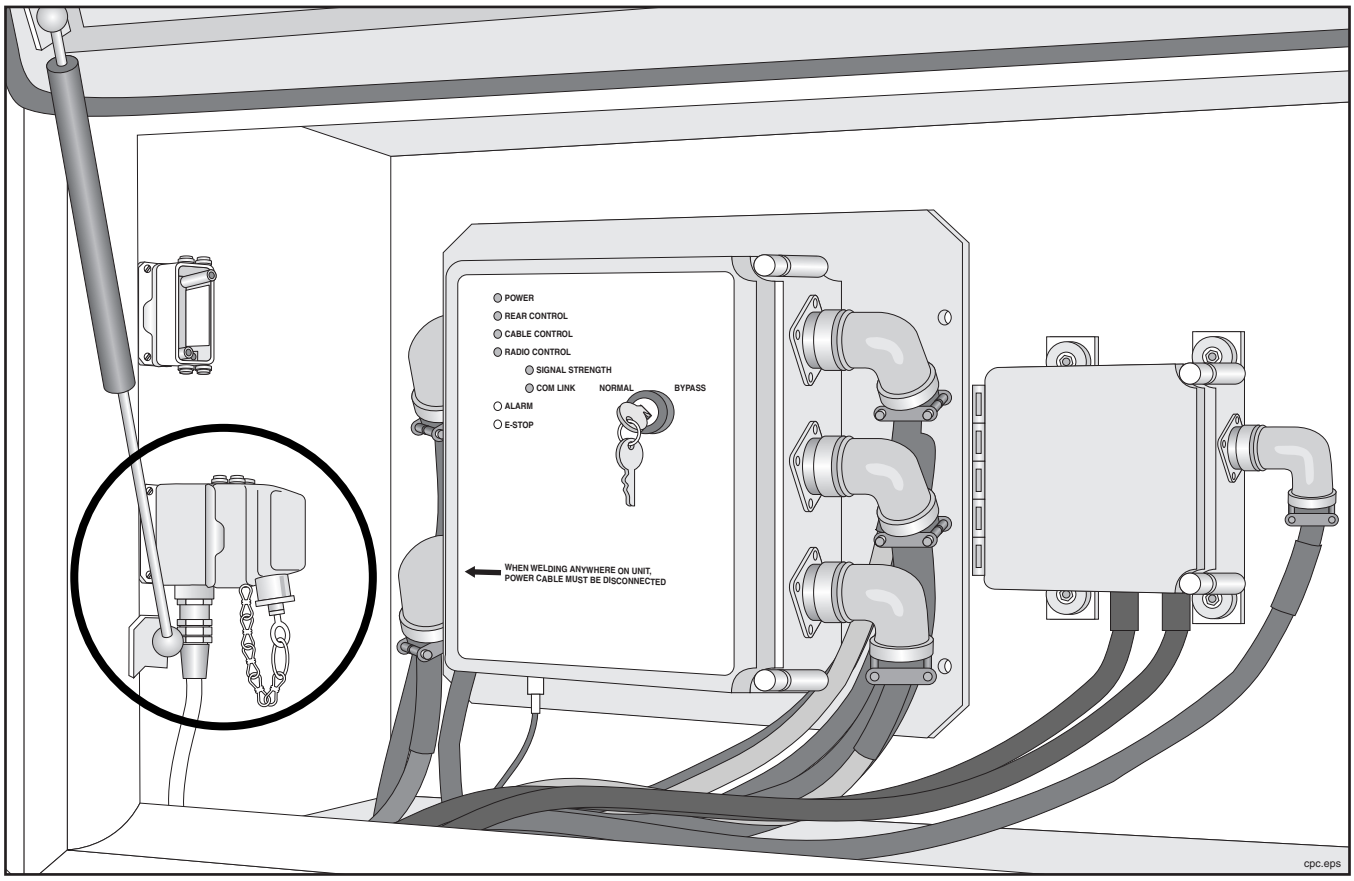


Figure 10
Remote receptacle

Cable remote box

Connecting the remote cable (Figure 10) and changing the *local/remote* switch on the rear panel to the *remote* mode activates the cable remote box (Figure 11) and deactivates all functions of the rear panel, *except* engine speed decrease. Remote control allows operation of the boom controls and all other functions from the cable remote box. To initialize the cable remote, the operator must have all functions in the off or "0" position and the *second section speed selector* in the #2 position. After pressing and releasing the *E-Stop* push button, the communication light on the remote should be solid green. If the E-Stop light is flashing, one of the switches is on, a *joystick* is active, or an *outrigger enable switch* is active. Activating the horn switch sounds the horn and resets the E-Stop. The horn also alerts anyone near the pump that the unit is in use.

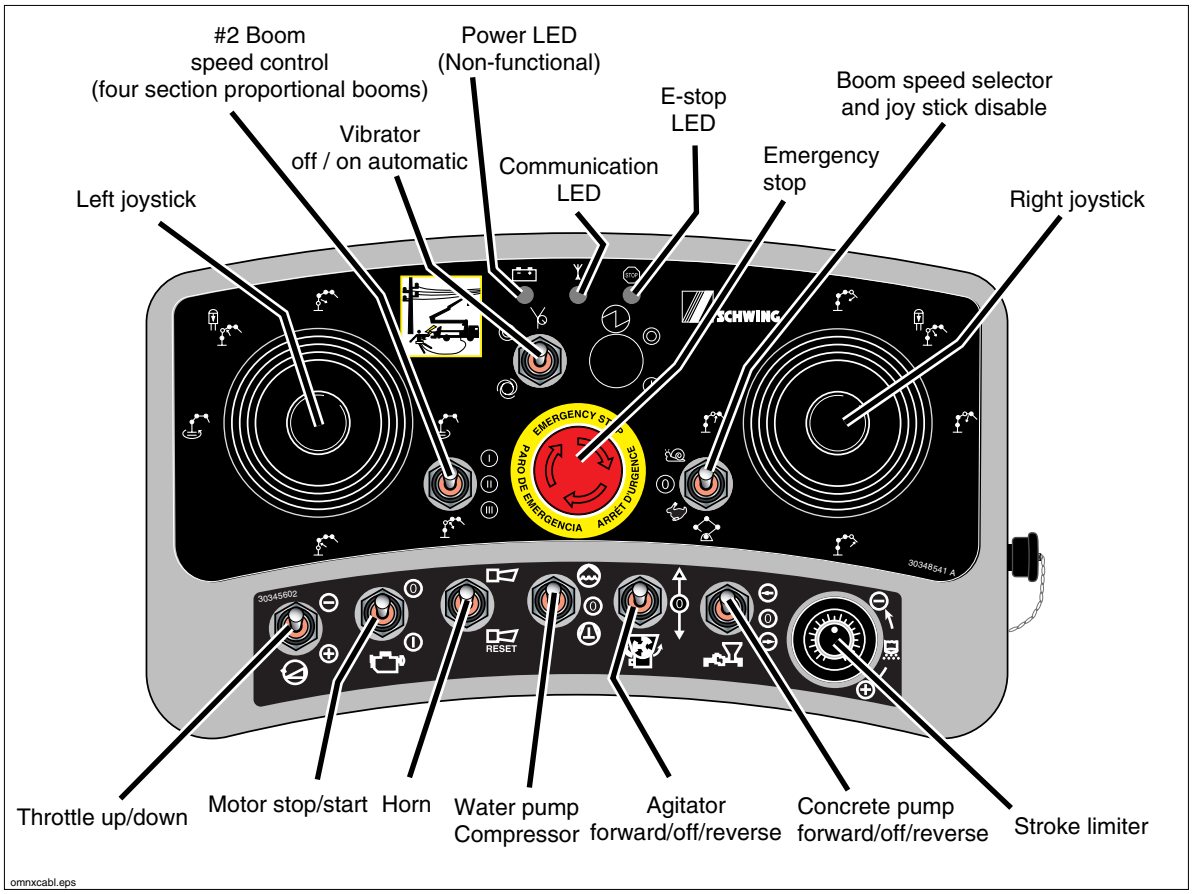
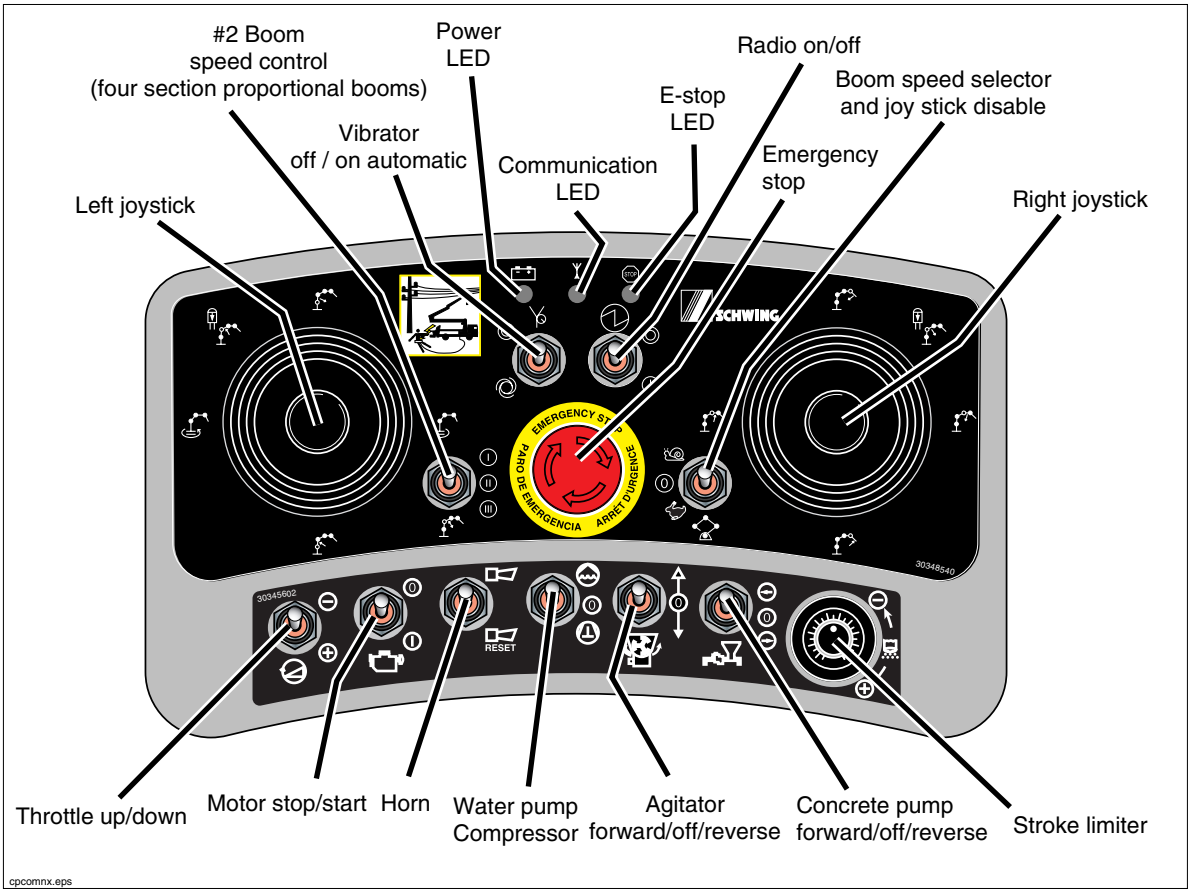


Figure 11
Cable remote box

Radio remote box

The optional radio remote (Figure 12) has all the features of the cable remote without the restrictions of a cable. The radio remote is activated by inserting the shorting plug (Figure 12) into the remote receptacle and turning the remote to the *ON* position.

As with the cable remote, the *local/remote* switch must be in the *remote* position, all functions must be off, and the second section must be in the #2 speed to initialize. Pressing and releasing the *E-stop* button should turn on the solid green light. Activating the horn switch sounds the horn and resets the E-stop. The horn also alerts anyone near the pump that the unit is in use.



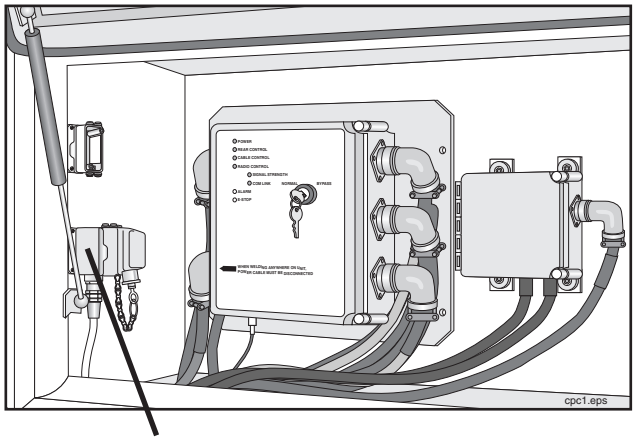


Figure 12
Radio remote (above) and remote receptacle with shorting plug (right)

Cable Remote Receptacle with shorting plug installed

Joystick

The joysticks (Figure 13) used in the cable and radio remote boxes function through circuit boards instead of mechanical devices. By not using limit switches or potentiometers on the joysticks we eliminate the possible mechanical failure of those components. There are no replaceable components on the joystick. The entire joystick must be replaced if it fails.

Troubleshooting LED

The circuit board on the bottom a the joystick is equipped with a troubleshooting LED which will flash every three seconds while the box is activated. If the box is turned on and the LED is flashing faster than every three seconds, or not flashing at all, the joystick is defective and should be replaced.

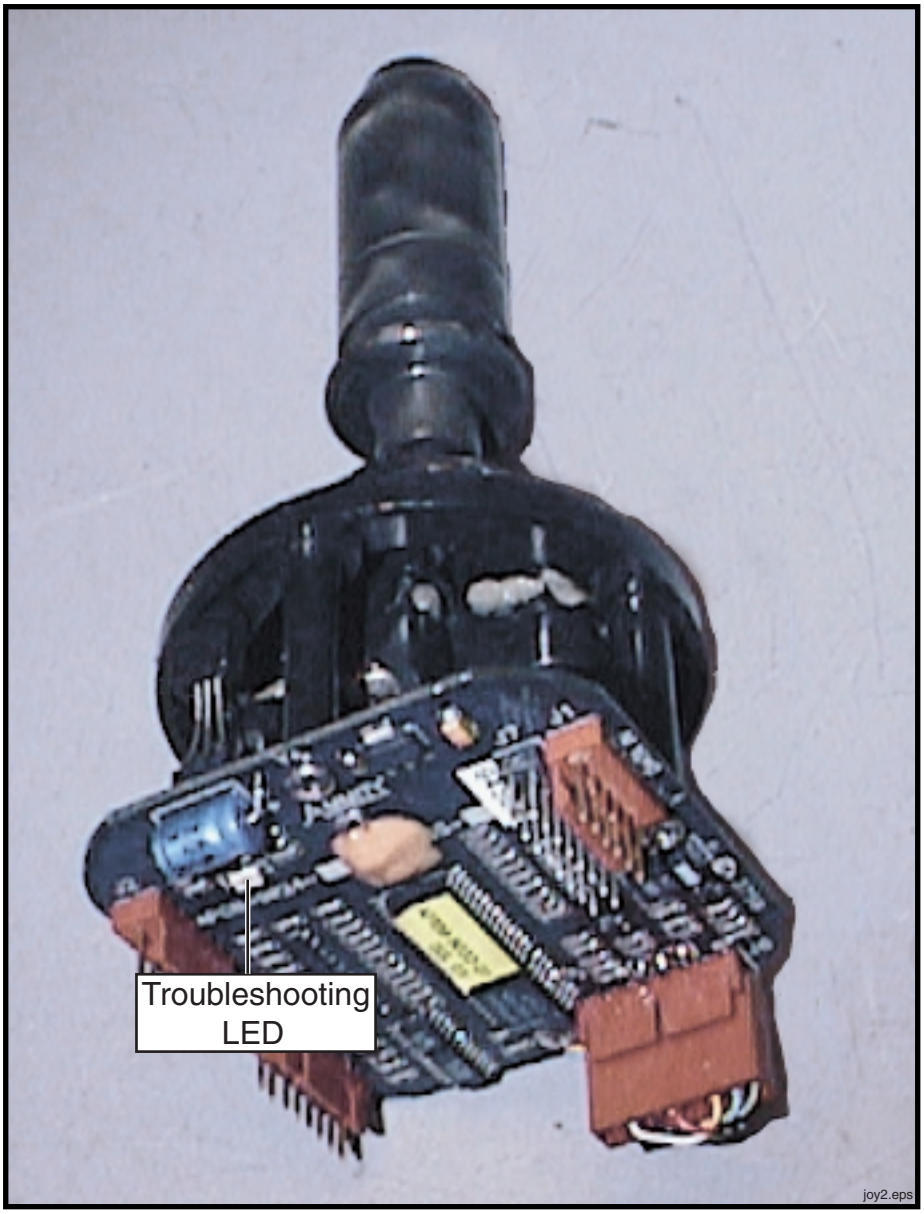
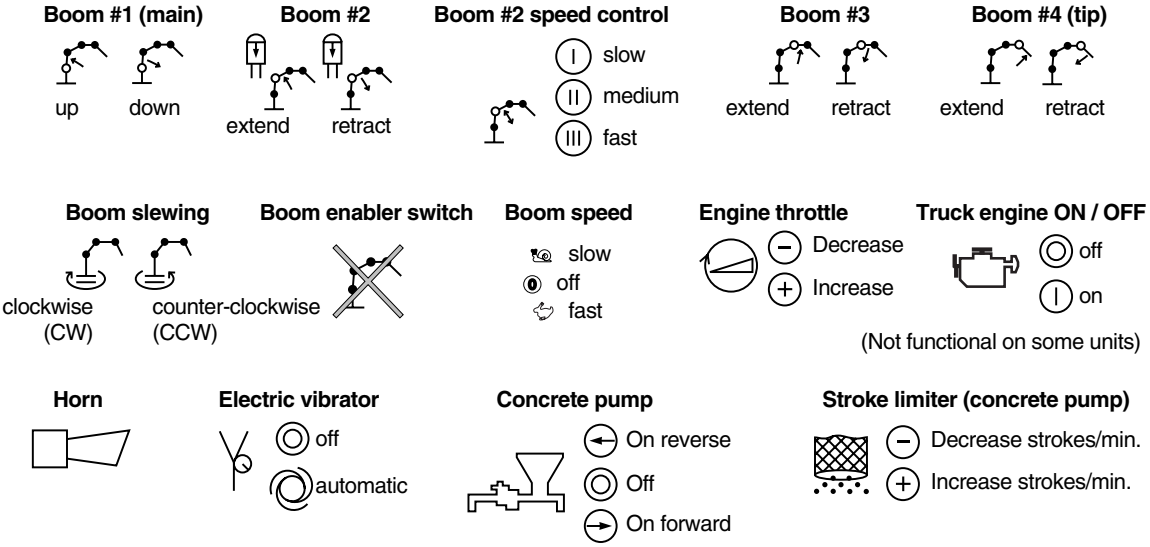


Figure 13
Joystick

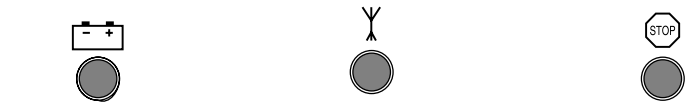
Pictograms

The following pictograms are used on the CPC components and the concrete pump. Refer to the *Operation Manual* of your concrete pump for the actual pictograms used on that model.

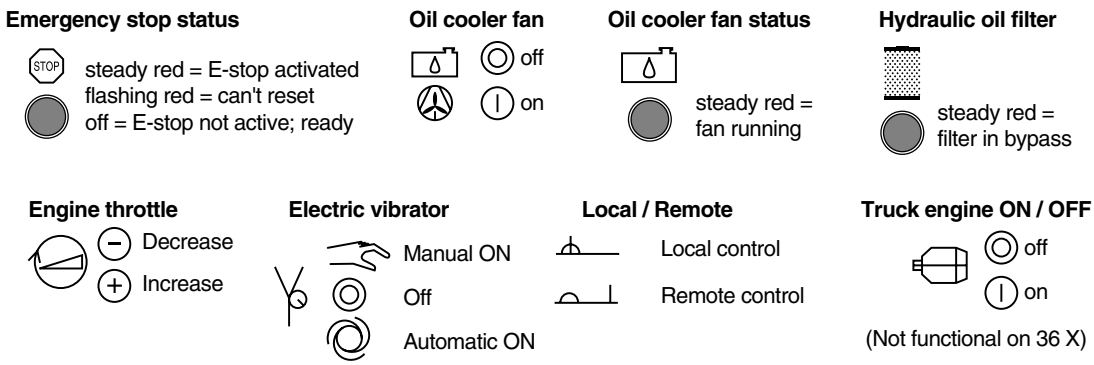
REMOTE CONTROL BOX



Note:
These indication lamps have different colors and indications on each remote box. See LED status info. for the cable remote and the radio remote later in this book.



OPERATOR'S PANEL



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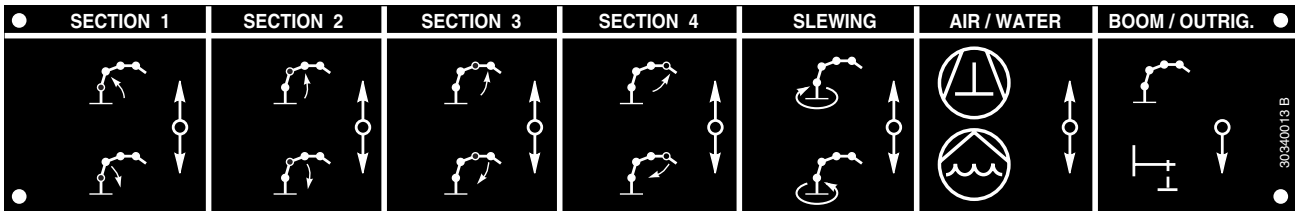
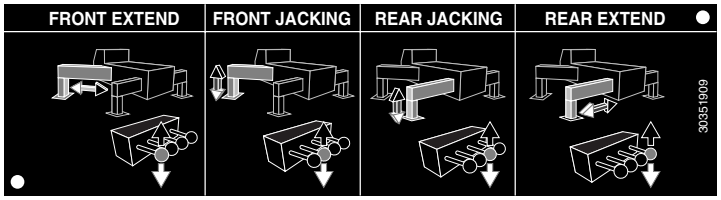
BOOM



#1 BOOM	#2 BOOM	#3 BOOM	#4 BOOM	BOOM SLEWING	WATERPUMP / COMPRESSOR	BOOM / OUTRIGGERS
up - pull down - push	extend - pull retract - push	extend - pull retract - push	extend - pull retract - push	clockwise (CW) - pull counterclockwise (CCW) - push	waterpump-pull compressor-push	outrigger - pull boom - push

OUTRIGGERS



EXTEND FRONT OUTRIGGER	JACK FRONT OUTRIGGER	JACK REAR OUTRIGGER	EXTEND REAR OUTRIGGER
Hydraulic valve handle (shown above) must also be activated, and determines direction.	Hydraulic valve handle (shown above) must also be activated, and determines direction.	Hydraulic valve handle (shown above) must also be activated, and determines direction.	Hydraulic valve handle (shown above) must also be activated, and determines direction.

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MISCELLANEOUS

AGITATOR DIRECTION

Forward = concrete moved from back and sides to middle.
Reverse = concrete moved from middle to back and sides.

CPC Operation

The CPC is a pulse width modulation (PWM) control device. Instead of holding the valve open with constant signal, the signal is pulsed to the valve. As Figure 14 shows, the duty cycle or percent on time corresponds directly to the speed of each function. Moving the joystick on the remote box changes the "on" time, which in turn changes how long the valve is open. The longer the "on" time, the greater the flow of oil to the cylinder.

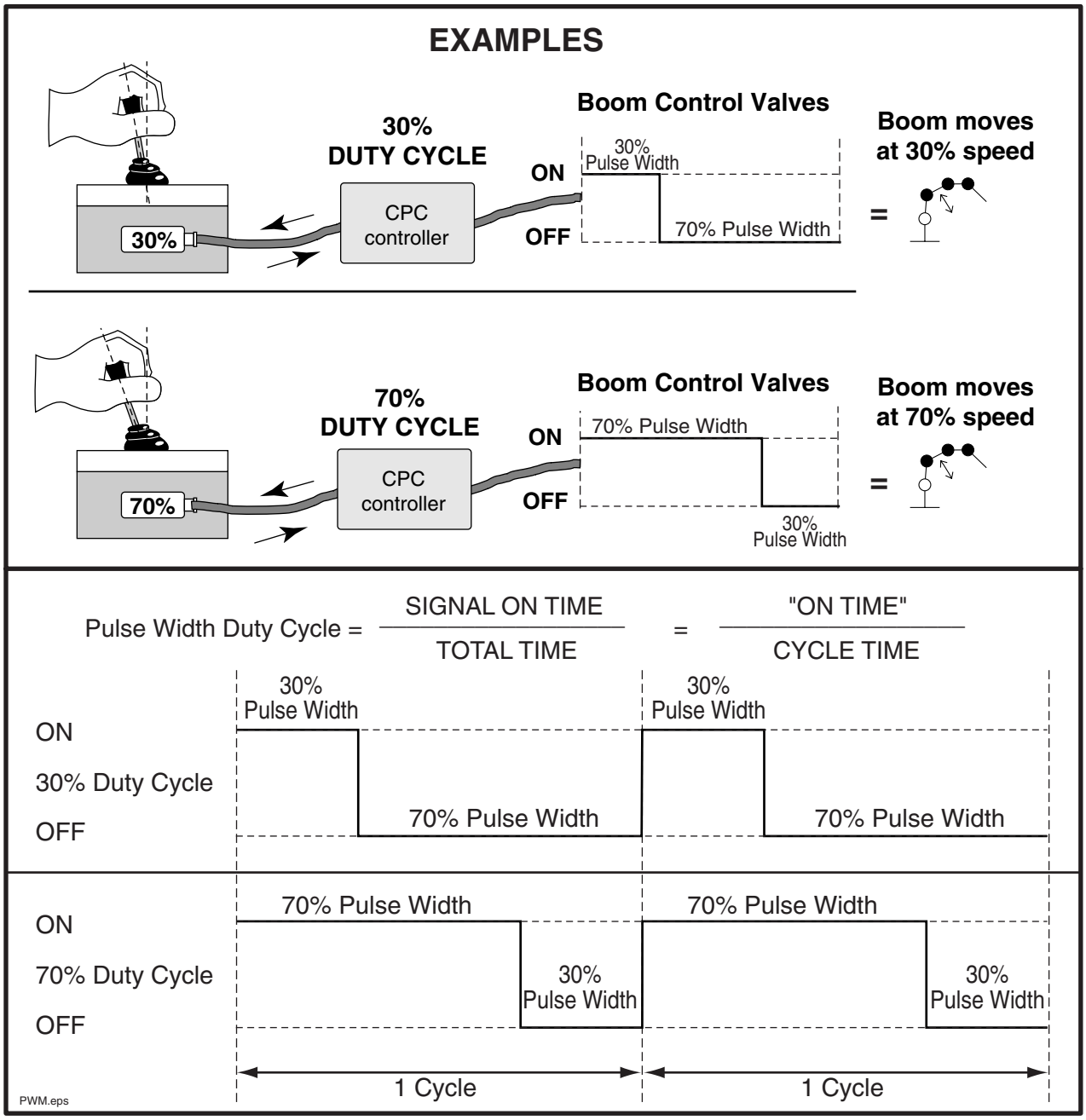


Figure 14
PWM output

Apitech Hand Valve

The major components (Figure 15) are:

1. Body
2. Manual control lever
3. Main spool
4. Mechanical stops
5. Compensator assembly
6. Pulsar coils

The main spool is a metering device that directs oil to the boom cylinder. There is a spring on the main spool to center the spool in the neutral position. There are also mechanical stops at each end of the spool to control the maximum oil flow. The compensator regulates the pump flow to the main spool based on load pressure. The main spool can either be run by the manual control lever or electrically by the pulsar coils. The pulsar coils operate at a frequency of 33hz, which causes one cycle to occur 33 times a second. One cycle is a total of the "on" time and "off" time as shown in Figure 14. The amount of "on" time determines how much oil is applied to the main spool. An increase of "on" time causes the boom to move faster.

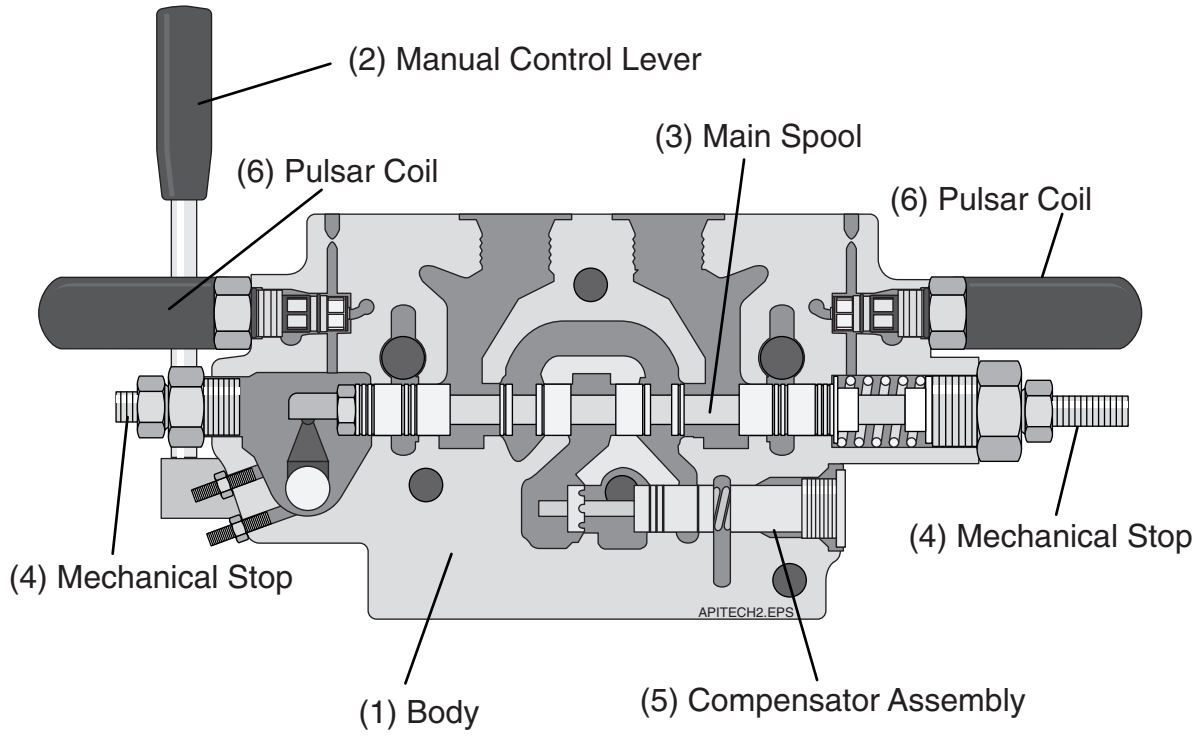


Figure 15
Apitech hand valve cutaway

Pulsar Coil

The main components shown in Figure 16 are:

1. Coil
2. Control disk
3. 0.040 orifice
4. 0.024 orifice to tank

As the control disk pulses “on” and “off”, pre-tension oil is allowed to flow from the pressure passage to the tank passage. Since the top orifice is larger than the bottom orifice, eventually more oil will be in the tank passage than can leave through the 0.024 orifice. At this point, pressure will build in the main spool control port and move the main spool.

The longer the “on” time, the greater the pressure in the control port, and the further the main spool is moved, causing the boom to go faster.

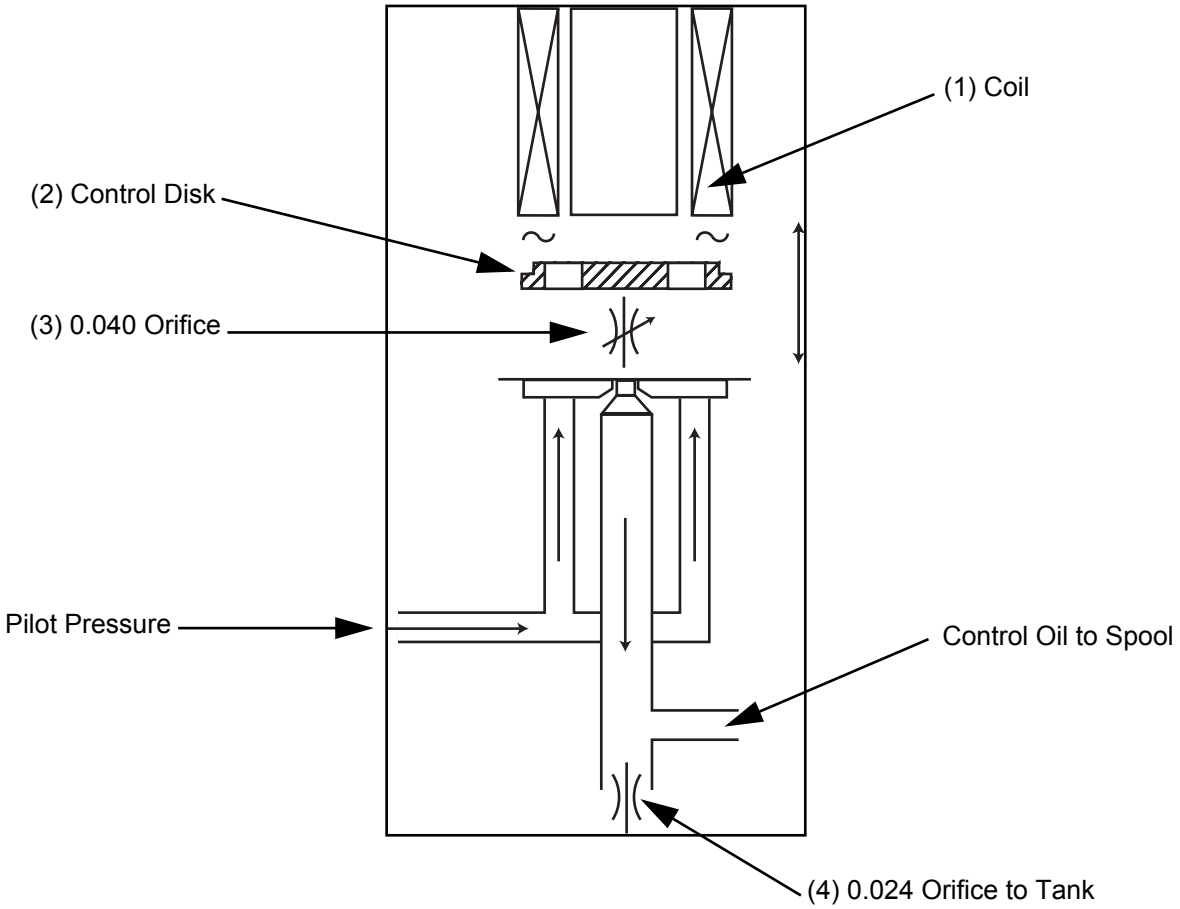
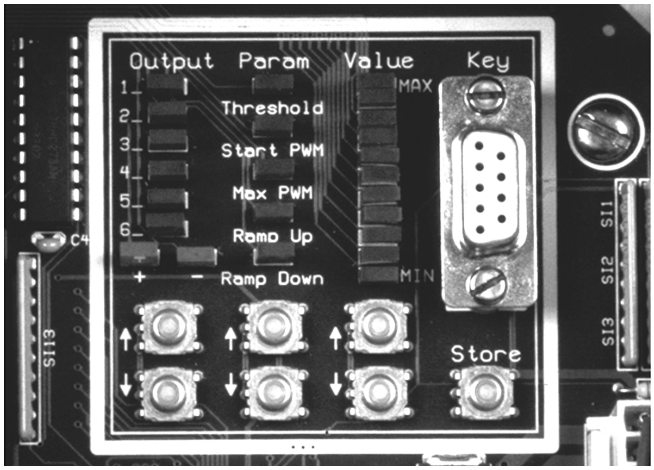


Figure 16
Pulsar coil schematic

Programming

R1300 Configuration Panel



1225 Board Output LEDs				1336 Board Input LEDs	
		1	E-Stop Status		
		2	Radio Ctr Status		
		3	Umb Ctr Status		
		4	Rear Ctr Status		
1 +	Slew Right	5	Alarm Status		
1 -	Slew Left	6	Power Status	D1	Slew Limit Left
2 +	Boom # 1 Down	7	---	D2	Slew Limit Right
2 -	Boom # 1 Up	8	Horn	D3	Float Switch
3 +	Boom # 3 Down	D1	Pump Rev.	D4	Dirty Oil Filter
3 -	Boom # 3 Up	D2	Pump Fwd.	D5	Outrigger Enable
4 +	Boom # 4 Down	D3	Throttle Down	D6	Alt D +
4 -	Boom # 4 Up	D4	Throttle Up	D7	RCVR Enable
5 +	Boom # 2 Down	D5	Oil Cooler	D8	Oil Temp Switch
5 -	Boom # 2 Up	D6	Outrigger	D9	High Oil Temp
6 +	Compressor	D7	Vibrator		
6 -	Stroke Limiter	D8	Water Pump		

Breakers:				Breakers:	
F1	Oil Cooler # 1	F3	Vibrator	F5	E-Stop & Sensors
F2	Oil Cooler # 2	F4	Controller Outputs	F6	Micro & Remotes
				F7	Horn & Light

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Figure 17
Configuration panel and Output labels

The R1300 configuration panel (Figure 17) is built into the 1225 board. The panel consists of three columns of indicator lights, seven push buttons, and a socket for a user configuration key. There are five configurable parameters (center column of lights) for each pulse width modulation or PWM output of the 1225. The five parameters are **Threshold, Start PWM, Max PWM, Ramp Up,** and **Ramp Down.**

The PWM parameters set-up via the configuration panel apply to the boom functions and the stroke limiter. Outputs are listed on the legend chart or "I/O" map (Figure 17) located on the E-stop board, inside the CPC cover. The parameters do not affect the behavior of the pump on/off control, water pump or other on/off outputs.

The Ramp Up and Ramp Down parameters control how fast the output builds up or down to the final value. The Threshold, Start PWM, and Max PWM parameters control the transfer function from input (joystick position) to PWM-Output value. The joystick position (Figure 18) can go from 0 to 100%. To get maximum range of the joystick and the best proportional response, the output should move the hand lever on the valve to the mechanical stop when the joystick is at the maximum position.

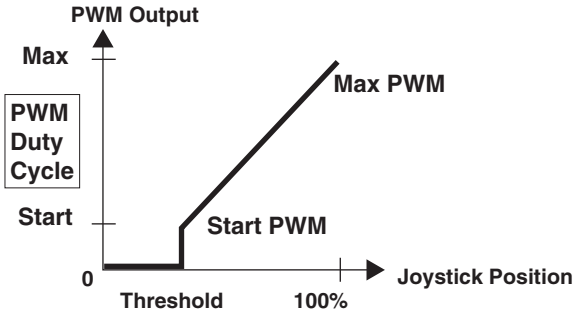


Figure 18
PWM Output in Relation to Joystick Position

The Stroke Limiter output is only adjustable in the **START PWM** and **MAX PWM** parameters. Changes in the other parameters will not affect the stroke limiter's operation. The **Threshold** on all functions, except boom #2, is simply the dead band beyond which the joystick must move in order to actuate the PWM output (Figure 18). The Threshold setting for the #2 section is the #2 speed on the boom speed selector switch. The PWM output begins at **Start PWM** as soon as the joystick has exceeded the threshold and maps linearly with joystick position up to **Max PWM.** The **Threshold** setting for all sections, *except boom #2,* should be the second light from the bottom.

To customize various parameters for the PWM outputs, the configuration panel must be "enabled" by plugging in the gray **R1300 User Configuration Key** (Figure 19) supplied with the controller. The panel will initially be displaying *"Output" 1+*, no **Param** lights will be illuminated, the **Value** lights display the **Start PWM** and **Max PWM** as solid lights, and the actual function output value displays as a flashing light.

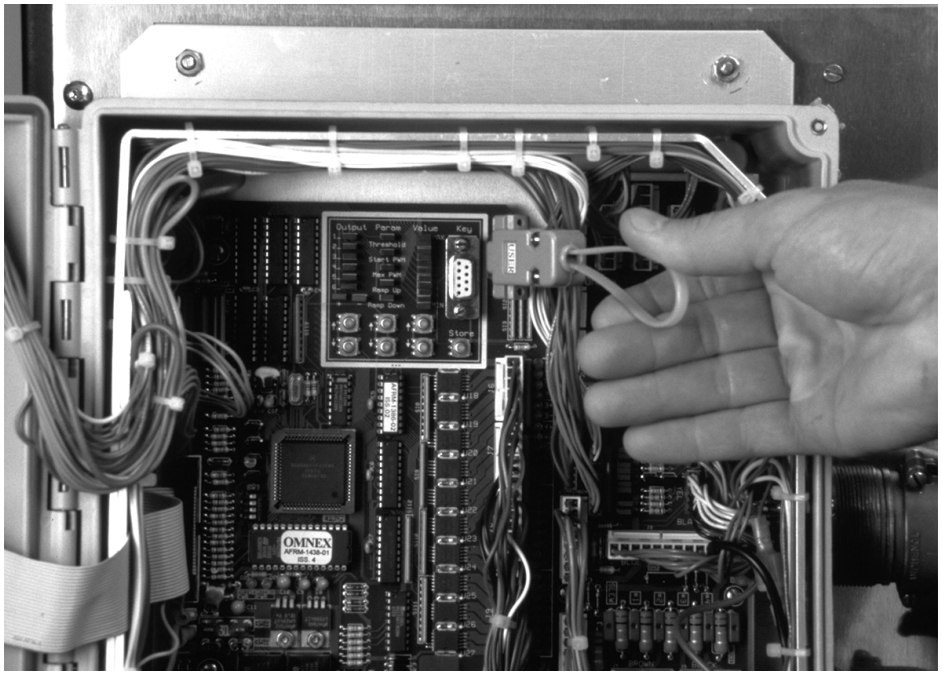


Figure 19
R1300 User Configuration Key

The flashing light moves as the corresponding joystick on the transmitter is moved, and the green light (Figure 20) next to the 1+ output indicator (located to the right and below the R1225 controller board) goes brighter and dimmer as the joysticks move.

To select the output you want, for the purpose of changing the parameters, press the buttons under the **Output** lights (Figure 20) until the desired output light comes on. To change a parameter, press the buttons under the **Param** lights until the desired parameter lights up **(Threshold, Start PWM, Max PWM, Ramp Up, Ramp Down).** The **Value** lights will now show one solid light, indicating where the selected parameter is currently set in relation to the **max** and **min** values allowed for that parameter. Press the buttons below the **Value** lights to raise or lower the value. The light may not move each time a button is pressed, but the parameter is actually changing. There are not enough lights to show every step. For an extreme change to the parameter, press and hold the button and it will auto repeat as on a computer keyboard.

The **Ramp Up** and **Ramp Down** parameters control how fast the output builds up or down to the final value, according to a first-order difference equation. The separate Ramp Up and Ramp Down time allows you to tune the valve response for smooth actuation. **For boom applications, the default values are "O"**. This should not be changed, except for boom section #2, which is operated from the push buttons on the joystick handles. The **ramp up** should be set to 90% or the second light from the top in the ***value*** column. **Ramp down** should not be used on any function**.**

When you are satisfied with the parameters, press and hold the ***Store*** button (Figure 22) until all of the lights come on. Immediately release the button and this indicates that the new parameters have been stored.

If you have made changes but do not want to save them, simply unplug the key. Then you can plug the key back in and start again from the last stored settings.

If you have stored a set of new parameters that are so far off that the machine will not operate properly, press and hold the **Store** button until all the lights begin to flash. Release the button and all of the parameters will return to factory-default values.

NOTE!

Important: Do not leave the R1300 key plugged in after completing the set up procedure. Leaving the key plugged in may allow others to change the parameters accidentally and also allow the long-term vibration of the vehicle to damage the key.

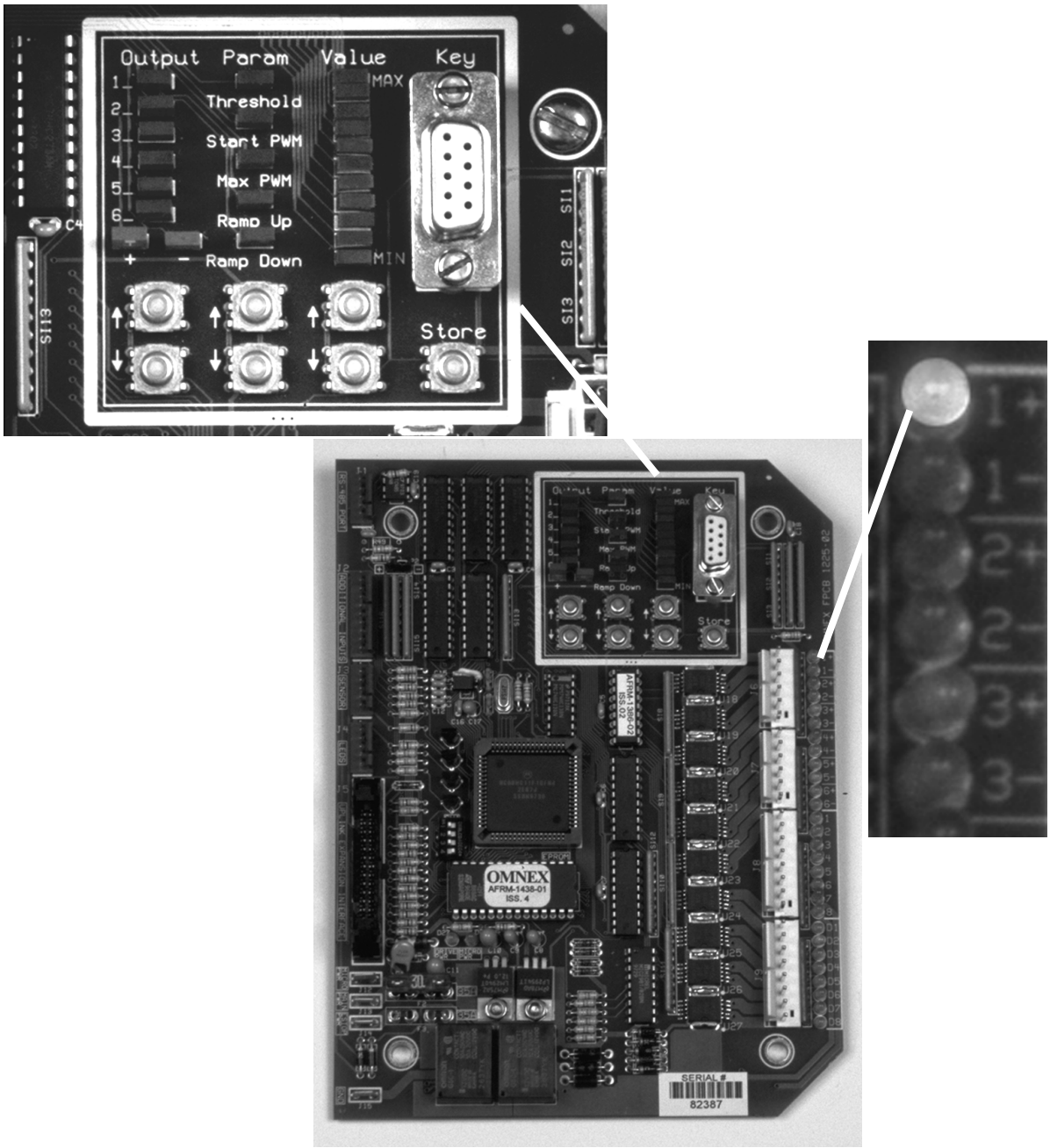
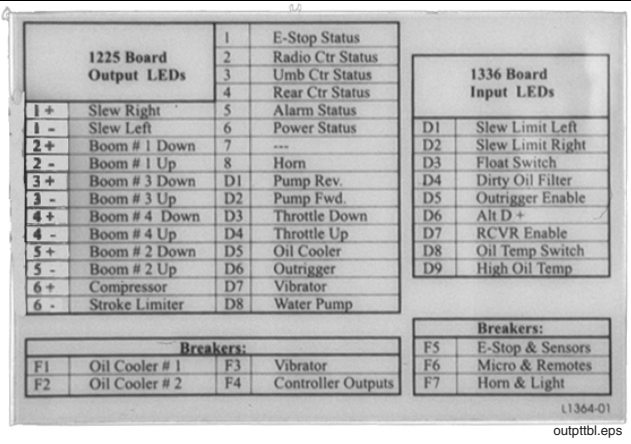


Figure 20
Push buttons and output lights

Setting up the *Slew Right* Function

(or functions other than Boom #2 and stroke limiter)

1. Open up the receiver box, so the internal lights can be observed.
2. Turn on the transmitter and the radio receiver, or connect the cable remote.
3. Move the **Slew Right Joystick**, and observe the lights inside the receiver.
4. While activating ***Slew Right*** you will find that one of the lights on the right side of the controller board corresponds to this function. The light will be labeled **1+** for this function. (Check the "I/O" map inside of the CPC cover as shown in Figure 21 for other output locations.)



1225 Board Output LEDs				1336 Board Input LEDs	
		1	E-Stop Status		
		2	Radio Ctr Status		
		3	Umb Ctr Status		
		4	Rear Ctr Status		
1 +	Slew Right	5	Alarm Status		
1 -	Slew Left	6	Power Status	D1	Slew Limit Left
2 +	Boom # 1 Down	7	---	D2	Slew Limit Right
2 -	Boom # 1 Up	8	Horn	D3	Float Switch
3 +	Boom # 3 Down	D1	Pump Rev.	D4	Dirty Oil Filter
3 -	Boom # 3 Up	D2	Pump Fwd.	D5	Outrigger Enable
4 +	Boom # 4 Down	D3	Throttle Down	D6	Alt D +
4 -	Boom # 4 Up	D4	Throttle Up	D7	RCVR Enable
5 +	Boom # 2 Down	D5	Oil Cooler	D8	Oil Temp Switch
5 -	Boom # 2 Up	D6	Outrigger	D9	High Oil Temp
6 +	Compressor	D7	Vibrator		
6 -	Stroke Limiter	D8	Water Pump		

Breakers:				Breakers:	
F1	Oil Cooler # 1	F3	Vibrator	F5	E-Stop & Sensors
F2	Oil Cooler # 2	F4	Controller Outputs	F6	Micro & Remotes
				F7	Horn & Light

L1364-01

outpttbl.eps

Figure 21
"I/O" Map located inside CPC cover

5. Insert the gray **User Configuration Key** into the key connector (Figure 22) on the R1300 Board.
6. Using the buttons under the group of lights labeled ***Output,*** scroll to lights #**1** (red) and **+** (green).
7. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Threshold.*** The ***Value*** display should be set at the fourth light from the bottom.
8. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Start PWM.*** The ***Value*** display should be as follows:

With the machine working, and while watching the **Slew Right** function on the machine, adjust the response using the buttons underneath the ***Value*** display. This should be done by moving the joystick off center or until the output light just comes on, and then adjusting the controller so that the boom just starts moving.

9. Using the 2 buttons under the group of lights labeled ***Param***, scroll to the light labeled ***Max PWM.*** The **Value** display should be as follows:

With the machine working, and while watching the **Slew Right** function on the machine, adjust the response using the buttons underneath the ***Value*** display. This should be done by moving the joystick to maximum and then adjusting the receiver so that the hand valve just reaches the mechanical stop.

You can then observe both set points along with the current position of the joystick by using the buttons under the ***Param*** column to shut off all lights on that row. The ***Value*** column of lights will then display the actual output.

10. When you are satisfied with the parameters you have set, you can then save them by pressing and releasing the ***Store*** button. All lights will go on for a second and then go out. This is to verify that the values you have programmed have been stored correctly.

You may then select another function and continue until all functions operate properly.

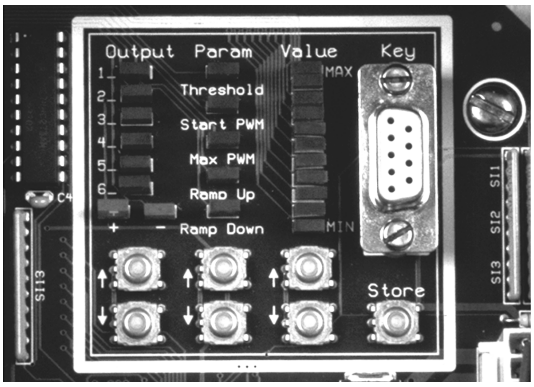


Figure 22
Configuration Panel

Set up #2 Extend Function

1. Open up the receiver box, so the internal lights can be observed.
2. Connect the cable control, or turn on the transmitter and the radio receiver.
3. Place the speed selector switch in position 1.
4. Press the button on top of the left joystick, and observe the lights inside the receiver.
5. While activating #2 extend you will find that one of the lights corresponds to that function. The light is labeled (5-) for this function.
6. Insert the gray **User Configuration Key** into the key connector on the R1300 board.
7. Using the two buttons under the group of lights labeled ***Output,*** scroll to the red light next to the number **5** and the green light above the **(–)** minus sign.
8. Boom #2 settings must be sequenced Ramp Up, and Ramp Down, Min, Max and then Threshold.
9. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Ramp Up.*** The ***Value*** display should show the setting on the 2nd light from the top.
10. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Ramp Down.*** The ***Value*** display should show the setting at the bottom light.
11. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Start PWM.*** The ***Value*** display should show the minimum setting.
12. With the machine working and while watching **#2** extend, adjust the boom response using the buttons underneath the ***Value*** display. Do this by pressing the left joystick button and then adjusting the controller so that the boom just starts moving.
13. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Max PWM.*** The ***Value*** display should show the output value when the handle reaches the mechanical stop in the hand valve.
14. With the machine working, set the speed switch on the remote to position **#3**, and press the left joystick button. While watching the boom section **#2** extend function on the machine, adjust the response using the buttons underneath the ***Value*** display. Do this by holding the joystick push button and then adjusting the controller so that the boom just achieves the mechanical stop of the hand valve.
15. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Threshold.*** The **Value** display should show Threshold setting.
16. The Threshold setting of **#2** speed should be set so the boom travel speed is between the **#1** (MIN) and **#3** (MAX) travel speeds or at the operators preferred speed.
17. With the machine working, set the speed switch on the remote to position **#2**, press the left joystick button, and while watching the boom section **#2** extend function on the machine, adjust the response, using the buttons underneath the ***Value*** display. Do this by holding the joystick push button and then adjusting the receiver so that the boom just achieves its desired speed.
18. You can then observe both set points along with the current position of the joystick by using the two buttons under the ***Param*** column to turn all lights in that row off. The ***Value*** column of lights will then display Min, Max, and Output.
19. When the parameters have been set satisfactorily, you can then program them permanently by pressing the ***Store*** button. All lights go on for a second and then go out. This verifies that the values you have programmed have been stored correctly.
20. You may then select **#2 Down** and repeat above procedure until all speeds operate properly.
21. When all functions have been adjusted, remove the programming key. This will prevent unqualified personnel from making adjustments

Set Up for Stroke Limiter CPC

Pumps that do not use the Accumulator pump pressure for destroking the pumps must have a minimum of 100 bar system pressure for this procedure.

NOTE!

The Hydraulic pumps are set to start destroking at 8 bar and be fully destroked at approximately 30 bar.

1. Plug a 40 or 100 bar pressure gauge into the stroke limiter gauge port.

   CAUTION:
   When using the 40 bar gauge, do not exceed 40 bar pressure, or you will destroy the accuracy of the gauge.
2. Open up the controller box, so the internal lights can be observed.
3. Turn on the transmitter and the radio receiver, or connect the cable remote.
4. While moving the ***Stroke Limiter,*** you will find that one of the lights on the right side of the controller board corresponds to this function. The light will be labeled **(6+)** for this function. (Check "I/O" map on inside of cover for other output locations).
5. Set stroke limiter pot on remote box to **9** on the dial.
6. Insert the gray **User Configuration Key** into the key connector on the R1225 Board.
7. Using the two buttons under the group of lights labeled ***Output,*** scroll to lights **#6** (red) and the **+** (green).
8. Using the two buttons under the group of lights labeled ***Param,*** scroll to the light labeled ***Start PWM.***

By pressing the buttons under the value column, you can raise or lower the output current. Adjust this until you see **8 bar** on the Hydraulic gauge.

9. Set stroke limiter pot on remote box to **2** on the dial.
10. Using the 2 buttons under the group of lights labeled ***Param,*** illuminate the light labeled ***Max PWM.***

By pressing the buttons under the value column, you can raise or lower the output current. Adjust this until you see **25 bar** on the Hydraulic gauge. This pressure should destroke the pump and allow you to "fine-tune" the adjustment. To lower the Minimum strokes, you raise the pressure on the gauge (MAX PWM output). To raise the Minimum strokes, you decrease the pressure or lower the (MAX PWM).

NOTE!

You can then observe both set points along with the current position of the potentiometer by using the buttons under the *Param* column to shut off all lights on that row. The *Value* column of lights will then display the actual output.

11. When you are satisfied with the parameters you have set, you can then save them by pressing and releasing the ***Store*** buttons. All lights will go on for a second and then go out. This is to verify that the values you have programmed have been stored correctly.

If you have stored a set of new parameters that are so far off that the machine will not operate properly, press and *hold* the **Store** button until all the lights begin to flash. Release the button, and all of the parameters will return to factory-default values.

NOTES

1. There are four dip switches located on the R1300 board. These must all be in the "Off" or "0" position for the controller to operate correctly. The #4 switch is used for factory diagnostics.
2. The rear panel throttle down is hard-wired to relays.
3. If power is lost to Rear Panel drive, power is still available to dump valves, but no control is possible from the radio or the rear panel. Control will default to cable box. Rear Control and E-Stop will blink. If you are controlling via radio and the rear panel fails, the radio will shut down. However, the cable controls can be used, or the machine can be operated manually. The dump valve will still be active.

The stroke limiter must have the diode in the coil connector or operation will be affected, and the stroke limiter will fail.

Ram Change Station

If your unit has a ram change station, it will be located on the rear boom cradle (Figure 23).

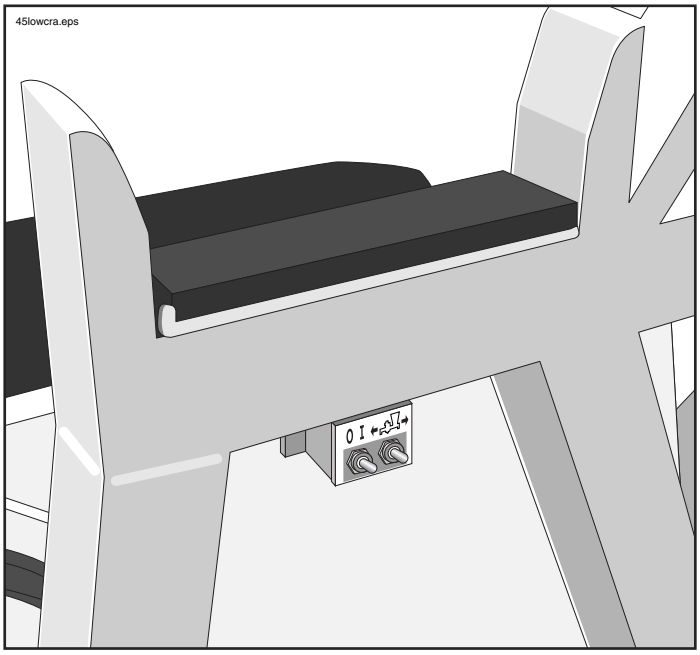
The ram change station houses the *"OI"* switch and the *"concrete pump forward/reverse switch"* (Figure 23).

1. Select *local* control on the rear panel.
2. Select **"I"** on the **"OI"** switch.

The concrete pump can now be actuated at the ram change station by using the *forward/reverse* switch.

Selecting the **"I"** position of the **"OI"** switch activates the "ram change station," and the following things happen automatically:

- The diesel engine R. P. M. will return to idle.
- The stroke limiter is adjusted to minimum output.
- All control stations, except the *ram change station*, are disabled.
- The pistons will move at the slowest possible speed.
- All three lights on the rear operator panel will flash.
- If an E-stop is pushed while the unit is in *ram change mode*, the *E-stop mode* can only be reset from the rear operator panel. The *forward/reverse switch* on the *ram change panel*, must be in the off position, to prevent restart blocking.



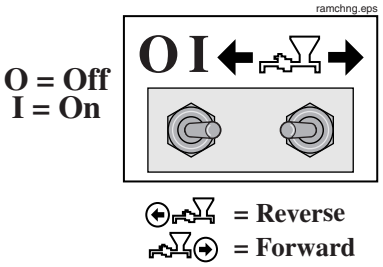


Figure 23
Ram change station on the rear boom cradle

Troubleshooting

The front cover of the CPC (Figure 24) is equipped with eight status lights as an aid in troubleshooting the system. It also has an emergency bypass keyswitch which allows the operator to fold up the boom and outriggers in the event of an electrical malfunction.

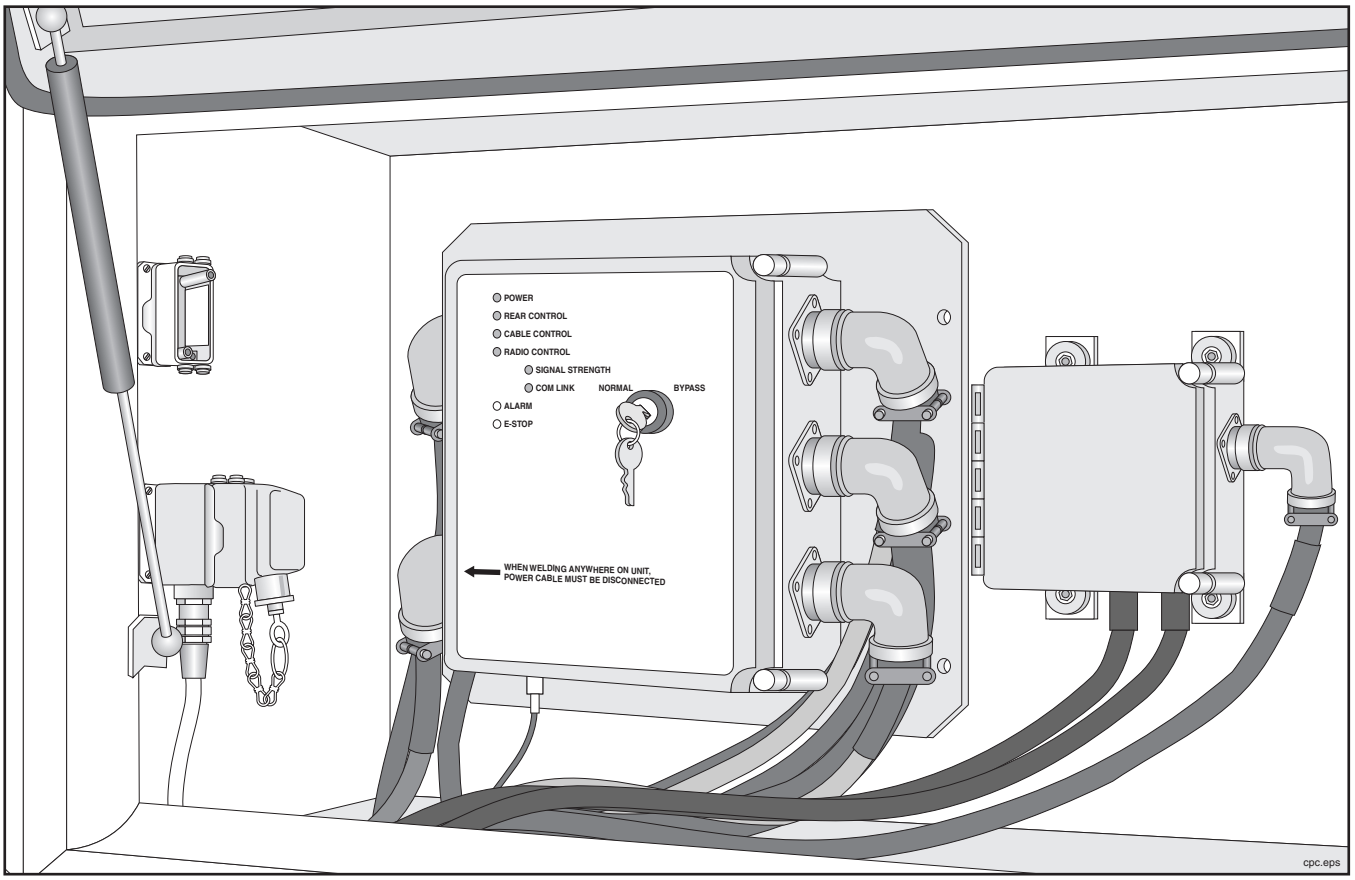
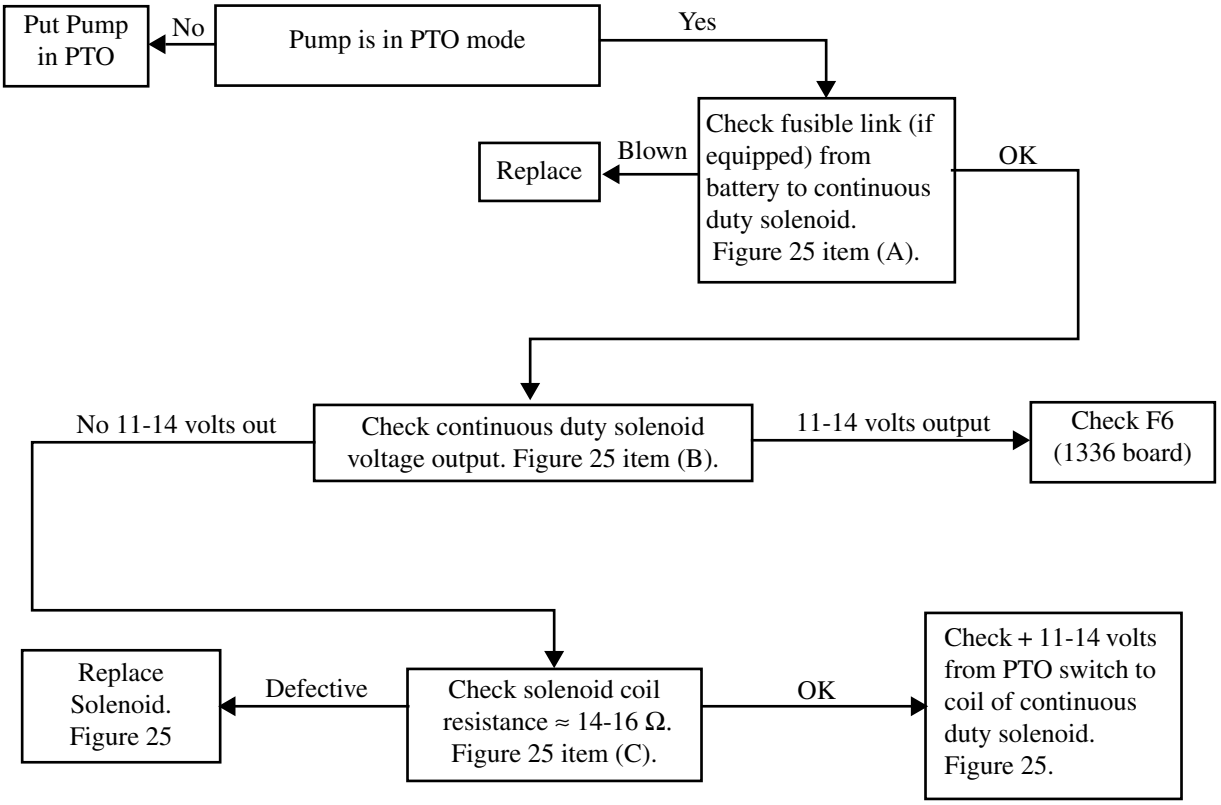


Figure 24
CPC (Concrete Pump Controller)

Power Light

The power light is illuminated anytime the system is turned on. If the power light is not on, follow the flow chart below to find the problem.



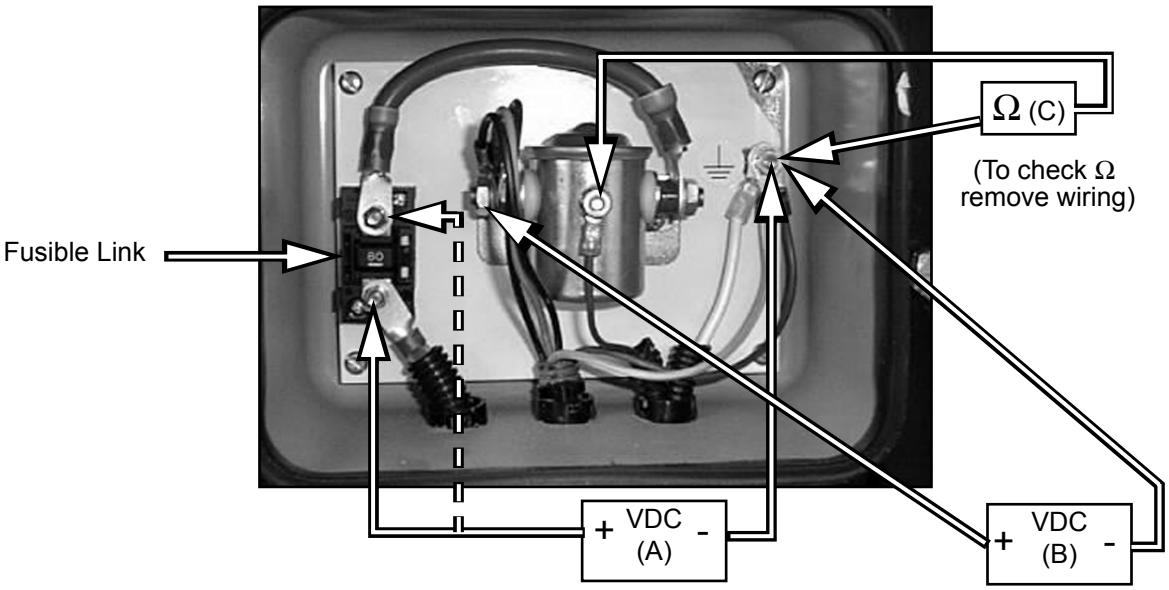


Figure 25
Continuous Duty Solenoid

Control Panel Indicator Lights

	OFF	ON	FLASH
Rear Control	Remote mode selected	Local mode selected	No communication data exchanged between main controller and local control.
Cable Control	Local mode or radio select	Cable control is selected	Either cable remote is not plugged into remote receptacle, or there is a communication problem between the cable remote and the main controller.
Radio Control	Cable or local mode is selected	Radio control is selected (funk plug inserted)	The unit is not equipped with a radio remote control, or the receiver is defective.

When a *Point Of Control* light is flashing, the problem could be with the components (local control circuit board, cable control circuit board, or receiver circuit board) or with the connection between the main controller and the components.

If the rear panel has failed, the unit will automatically default to cable controller mode.

Signal Strength and Com Link Lights

The two green lamps indicate the state of the optional radio receiver. If your control system includes a radio receiver, these two lamps will illuminate whenever your radio transmitter is transmitting (switched on and radio transmitter's E-Stop button has been reset), regardless of the selected *Point Of Control*.

The SIGNAL STRENGTH lamp will flicker during normal radio transmitter to radio receiver communication; the less it flickers, the stronger the radio signal.

The COM LINK lamp will be illuminated constantly whenever the radio signal quality is sufficient, to allow wireless remote control of the machine.

Alarm Light

This red lamp illuminates when one or more of the following conditions exists:

1. The alternator D+ status signal is off, indicating the alternator is not turning or has failed.
2. The water tank float switch signal is off, indicating an empty water tank.
3. The high oil temperature switch signal is on, indicating the on-set of overheating. This condition will also sound the tower and boom horns three times every 20 seconds.
4. The boom slew function has reached either its left or right slew limits.
5. The contacts of the main power relay (D3 on the main e-stop board) have welded closed. (Check K3 FAIL lamp on the main E-stop board to verify.) The control system will disable all machine operation under this condition.
6. The contacts in at least one of the boom enable relays (bottom edge of the 1225 board) have welded closed. The control system will disable all machine operation under this condition.
7. This red lamp *flashes* when the oil temperature sensor or the wiring to it has failed because of an open circuit or a short circuit. This condition will also sound the tower and boom horns three times every 20 seconds. You must look at the temperature gauge on the rear panel to determine which condition is present.

E-stop light

This lamp serves three purposes:

1. When the control system has an E-stop engaged, this lamp is illuminated
2. When the control system is safety-blocking (a control switch is not in neutral position), the lamp flashes rapidly.
3. When the control system is in by-pass mode, the lamp flashes one time per second.

If the E-Stop light will not go out, follow the flow chart (Figure 26).

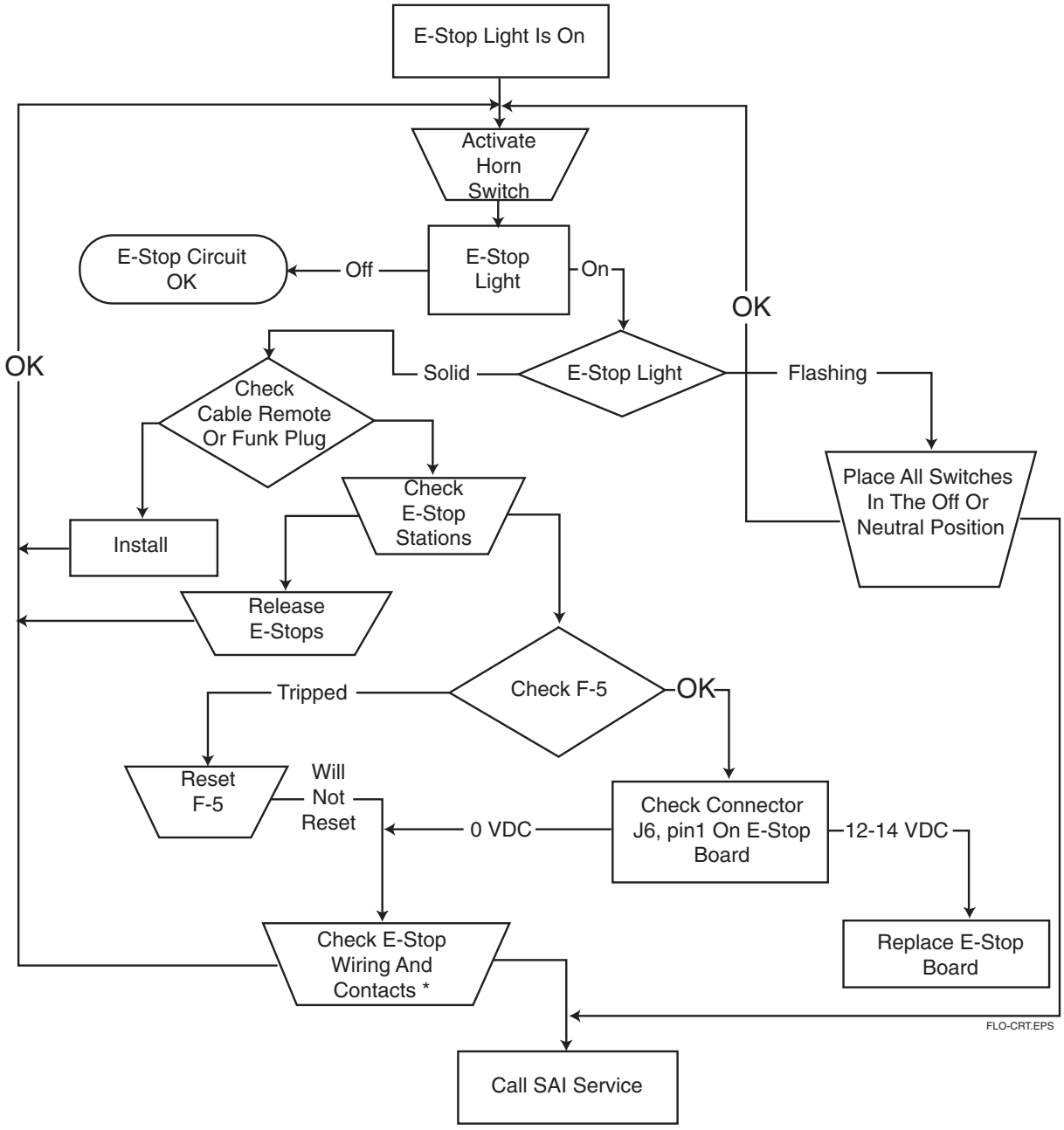


Figure 26
E-stop light troubleshooting flow chart

*On units with the revised 1336 board, if D10 is lit it indicates that the E-Stop circuit wiring is OK.

Radio Remote

Spread spectrum technology

The Schwing ***T45 Remote Control*** systems employ frequency hopping spread spectrum technology to provide the optimum performance allowable under present FCC and ISC regulations. This technology provides a unique performance advantage compared to conventional fixed frequency systems. The major benefits are listed below:

- **Interference Free:** It cannot be jammed by other RF transmitters or extraneous noise sources.
- **Coordination Free:** All Schwing-spread spectrum transmitters are factory coded. The user does not need to worry about which frequency the unit is operating on. It operates as if there is a unique frequency for each unit in existence. Any number of these units can be operated in the same location at the same time.
- **License Free:** These radios are certified by the U.S. and Canadian governments to meet their criteria for license-free operation. With Spread Spectrum Technology, these radios are allowed to transmit as much power and sometimes more than conventional licensed products. This makes for very high performance reliable RF links through many types of material and over great distances should the application require it.
- **Security:** Combine the Spread Spectrum robustness with the added 16-bit address space and CRC16 error-detection code built into the data protocol, and these units provide extremely reliable, error-free control.

Spread spectrum operation

How does frequency hopping work?

The license-free spread spectrum band goes from 902 to 928 MHz, a 26 MHz wide spectrum using the full band width. Compare that to a conventional radio that uses a band only 0.03 MHz wide.

Where traditional radios tune to one frequency, a Spread Spectrum radio uses 63 different frequencies. It stays 20 milliseconds on any one frequency and then moves on to the next (i.e. it uses 50 different frequencies every second).

On each frequency the Spread Spectrum transmitter sends all the information it reads from the switches and joysticks (both on/off and proportional). It adds a unique transmitter address (ID) plus an error checking code (CRC-16) to make the link safe and secure. The Spread Spectrum receiver thus gets 50 switch readings from the transmitter each second, all sent on a different frequencies.

If you work in a radio spectrum that is *clean*, the Spread Spectrum radio will function just like a traditional narrow band radio. If someone else is operating in the same area on the same frequency, however, you could get blocked or jammed by the other radio signal making the radio useless at that site. This will not happen with a Spread Spectrum radio.

If interference causes trouble for the Spread Spectrum at one frequency, the Spread Spectrum radio quickly moves onto another frequency where the information is likely to get through. It would take hundreds of ordinary radios at a site to block the 26MHz wide spectrum used by the Spread Spectrum radio.

Mounting the receiver antenna

The receiver antenna assembly (Figure 27) consists of a mounting bracket with attached coaxial cable and a removable whip antenna. For most close range applications (within 300 feet) the location of the antenna is not too critical, since the receiver is sensitive enough to pick up the signal almost anywhere. The mounting bracket may be bolted to the vehicle frame, but do not allow the antenna whip to contact metal parts! After mounting, insert the connector end of the cable into the mating receiver connector, and secure the cable with tie-wraps, if required, to prevent damage.

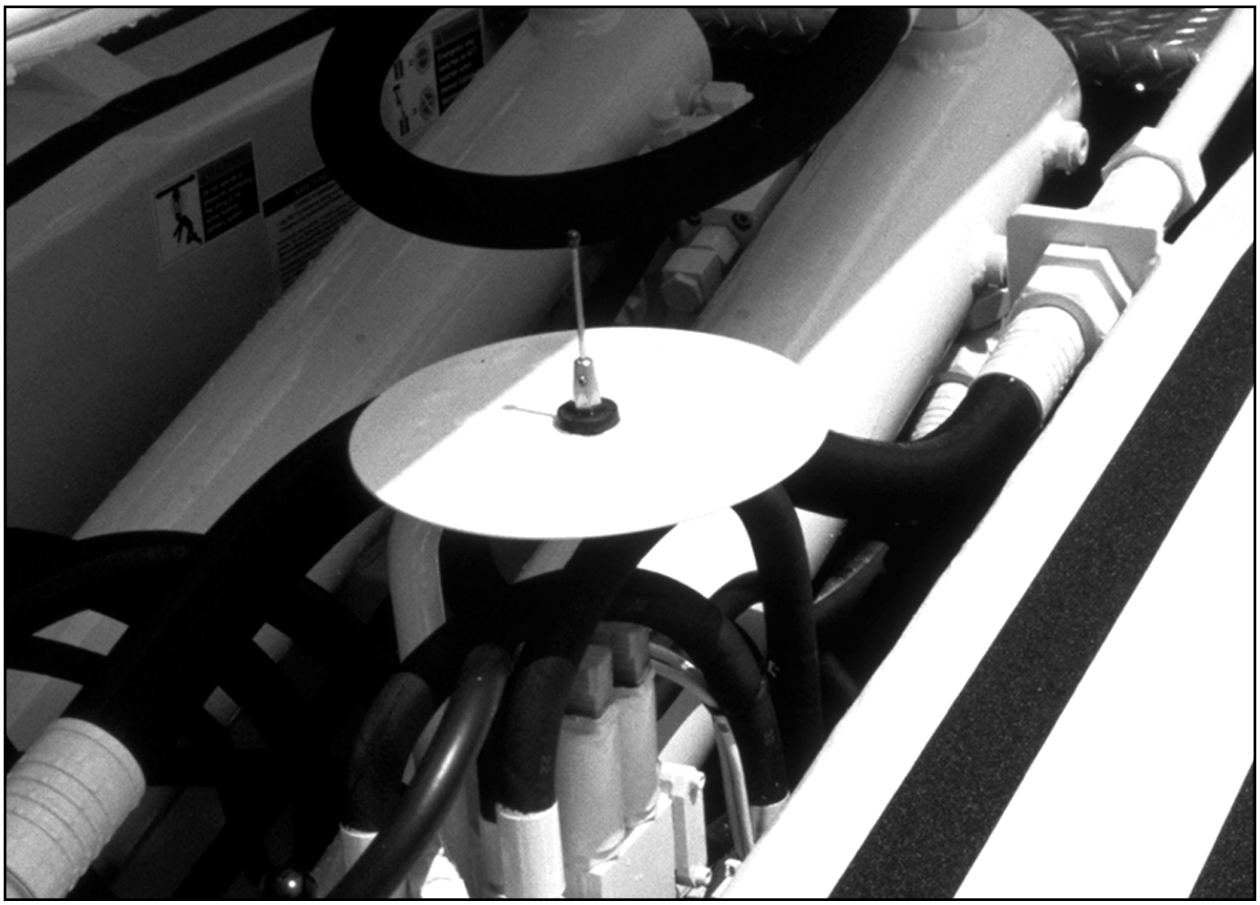


Figure 27
Receiver Antenna Assembly

Transmitter operation

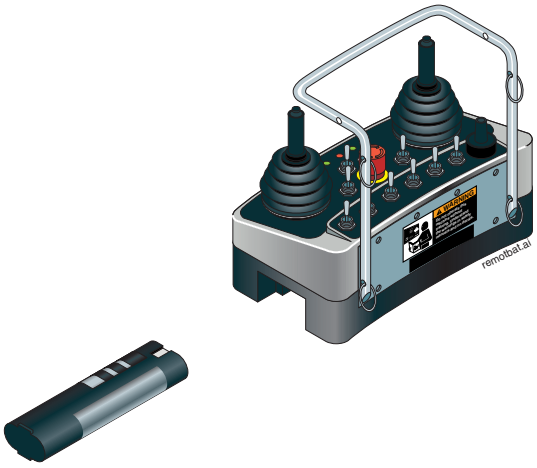


Figure 28
Rechargeable Battery Unit

The transmitter is light weight and has been designed for the utmost in durability. For ease of maintenance, it uses a readily available 9.6V rechargeable Makita® battery unit (Figure 28). A standard Makita® charger is supplied with the system. To remove the battery from the transmitter, grasp the lip on the battery door, and pull it down and out to open the door. Tilt the case to allow the battery to slide out. The battery is keyed to prevent incorrect installation. In addition, a number of diagnostic features have been built into it.

To ensure the utmost safety, the **Emergency Stop** switch is monitored each time during power up. In addition, the *Power Off* switch provides an additional level of safety. These switches activate different mechanisms and different relays on the receiver to ensure that a system can be shut down.

Radio remote control panel

The radio remote control panel is shown in Figure 29 with a brief description of switches and controls.

The LED indicator information for startup, operation, and fault messages is shown in Figure 30.

The functions of the Radio On/Off switch and the Emergency Stop Push Button are included in the following paragraphs.

Radio Transmitter On/off Switch

To ensure safe operation, the **E-Stop** switch on the transmitter is checked each time the unit is powered up. In addition, all functions must be off, or the unit will not power up.

The **ON** or start up sequence is as follows:

1. Ensure all functions are turned OFF.
2. Turn *Power Switch* ON; the Stop light will flash slowly until the E-Stop is depressed and released. If the E-Stop is depressed on power up, the light will flash rapidly until it is released.
3. If you have depressed and released the E-Stop button and both the stop light and power light are flashing, some function is activated.
4. You must honk the horn to clear the E-Stops and power the E-Stop solenoids.

Turning **OFF** the transmitter will cause the receiver to go into an E-Stop mode, and all functions will stop.

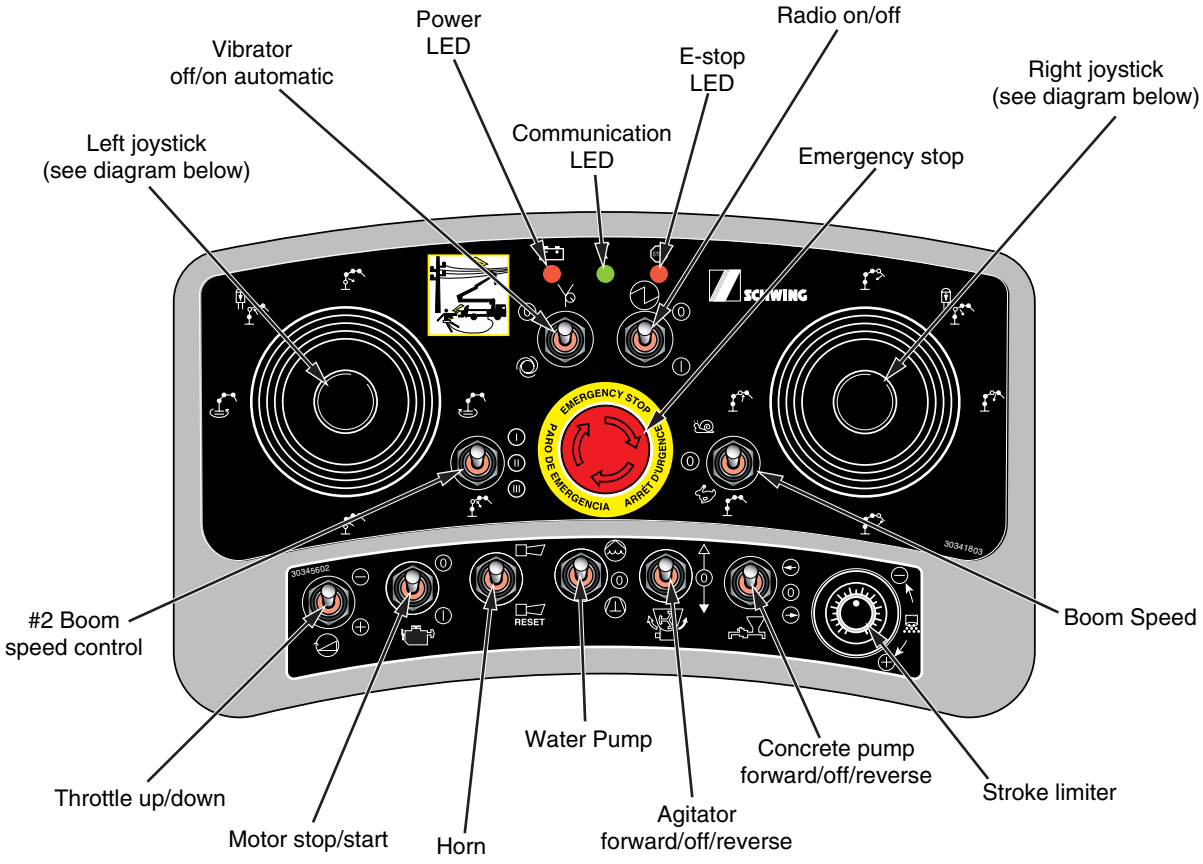
NOTE!

Always place the Radio ON/OFF switch in the OFF position when you are finished operating. Besides depleting the battery, an active, unattended transmitter is a safety hazard.

Emergency Stop Push Button

When any E-stop button is pushed, all outputs are disabled, and E-Stop manifold solenoids are de-energized.

Remote Box Functions



Joystick Controls

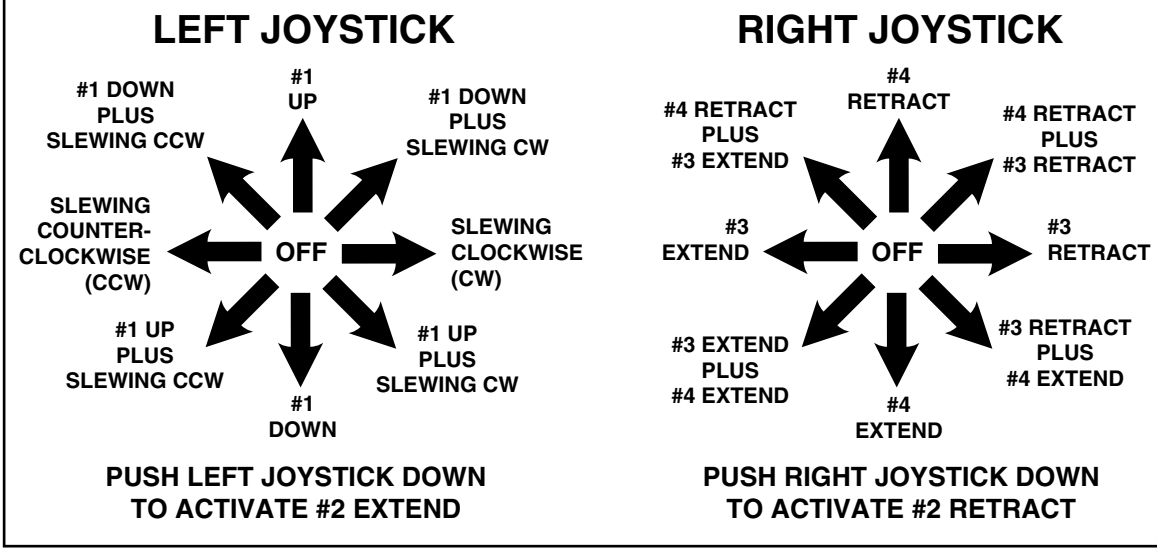
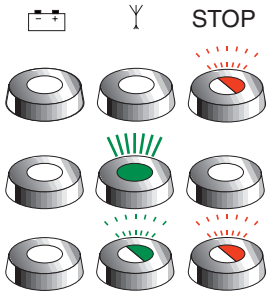


Figure 29
Radio remote

Key

OFF ON FLASHING SLOW FLASHING FAST

STARTUP SEQUENCE

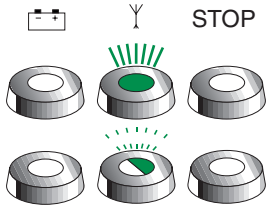


Power is on. An E-stop self-test is requested. Push the E-stop switch to begin the self-test procedure. When the LED flashes faster, the test is done. Release the E-stop switch. If the LED continues to flash fast, the E-stop failed. Cycle E-stop-if not remedied, circuit failed.

When the communications LED becomes steady green, the unit is ready to operate.

If the communications LED flashes green and STOP LED flashes red, some function is activated, and the unit cannot reset.

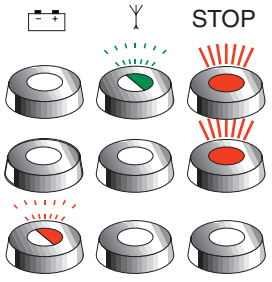
OPERATION



When the communications LED is steady green, the unit is ready to operate, but no function is activated.

When the communications LED flashes green, one or more functions are activated, and the remote box is sending data.

FAULT MESSAGES (OPERATIONAL MALFUNCTIONS)



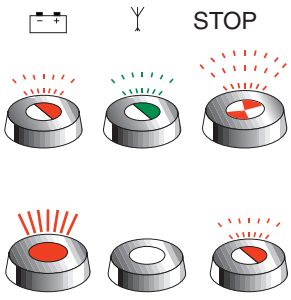
Communications LED flashes green, and the STOP LED is steady red. This happens when the boom disable/speed switch is in the off position and you are trying to run the joysticks. Selecting the snail position (slow) or the rabbit position (fast) eliminates the fault.

STOP LED is steady red. This means that the emergency stop switch is activated on the radio.

The battery LED flashes red. There are about 10 minutes of battery power remaining. Change batteries as soon as possible.

FAULT MESSAGES (ELECTRONIC MALFUNCTIONS)

LEDstat3.eps



The battery LED flashes red, the communications LED flashes green, and the STOP LED is flashing fast. Cycle power by removing and replacing the battery. If LED's continue to flash, open control box. Check LED's on base of joysticks. LED should flash every three seconds, if not the joystick module has failed. If the joystick is operational, replace the transmitter board for the radio circuit.

The battery LED is steady read, the communications LED is off, and the STOP LED is flashing red. This happens when the micro board has failed. Cycle power by removing and replacing the battery. If not remedied replace the transmitter board.

Figure 30
Radio remote LED status

Dip switch settings

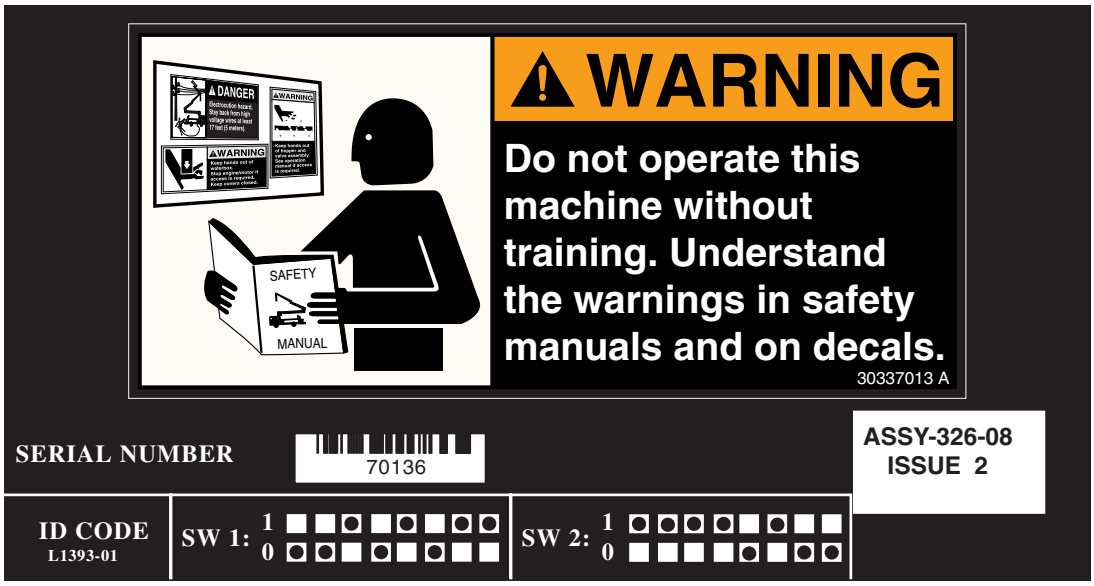


Figure 31
ID Code

Each T45 transmitter is supplied with a unique ID code (Figure 31). This code is marked on the label located on the handle mounting plate, along with the radio serial number. The receiver must be set to match this code. To match the settings, the power to the receiver must be off.

On the cover of the HOPLINK (located in the receiver) (Figure 32), you will see the dip switches (Figure 33). In the box marked ID, there are two rows of switches. The first row is SW1; it will have the numbers 1 & 8 printed above it. The second row, SW2, will have 9 & 16 printed above it. In order for the radio to operate, the switches must be set the same as the decal. EXAMPLE: If the punched hole in the decal for SW1-1 is a 1 (Figure 33), then the corresponding dip switch must be set to ON (switch in the “up” position). If the punched hole in the decal for SW1-1 is a 0, then the corresponding dip switch must be set to OFF (switch in the “down” position). After all switches are set, re-power the receiver.

Please note that the HOPLINK unit recalculates its spread spectrum sequence every time the ID is changed. Be patient; it may take up to 5 seconds on the first power up after an ID change before the receiver goes operational.

Make sure that switch #5 of the MODE dip switch (SW3) is on; all others must be off. SW3 will also have 1 & 8 printed below it; SW3 is located closest to the ribbon cable connection.

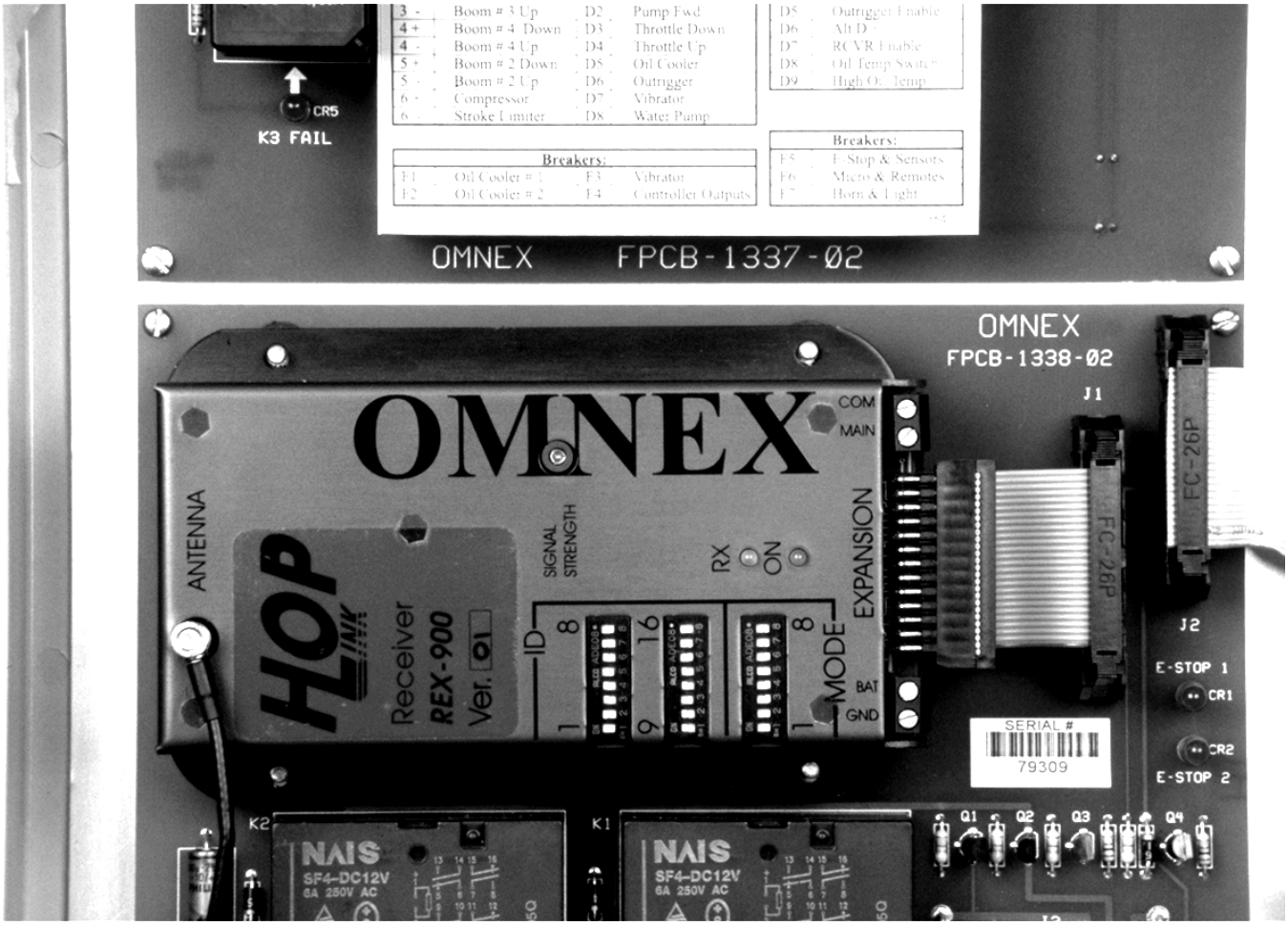
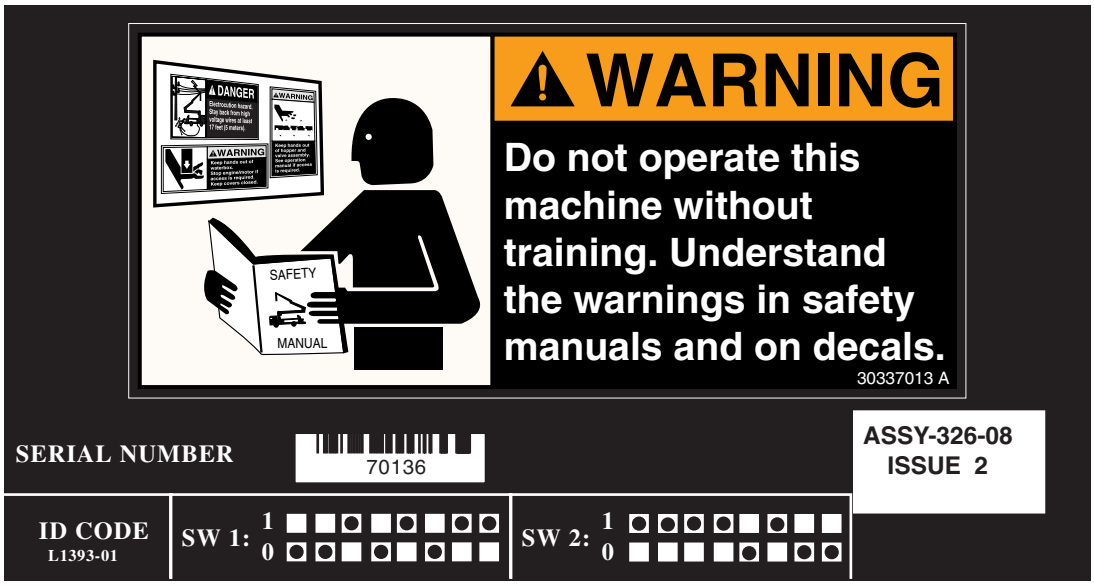


Figure 32
Hoplink



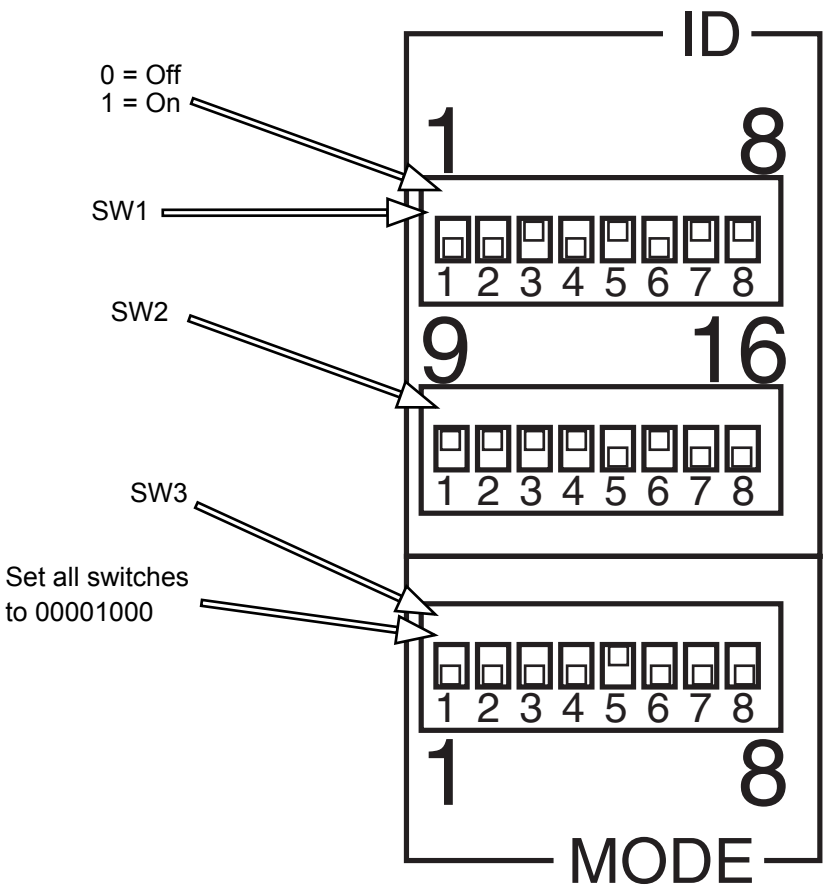


Figure 33
Dip switches

Glossary

Description of Terms

The following is a list with descriptions of some of the terms used in this manual:

Agitator

A device set in the concrete hopper to keep concrete moving, which prevents it from setting. It is typically a rotating shaft to which several paddles have been mounted.

By-pass Key Switch

Two-position switch found on the front cover of the CPC controller. Normal position should be selected at all times unless there is an electrical malfunction, which opens the dump valves. If the key is moved to the by-pass position, it will supply power to the normally open dump valves and close them. This will allow the operator to fold up the boom and outriggers in such an emergency.

Com Link Light

One of eight status lights found on the front cover of the CPC controller. The Com Link Light deals with the radio remote and will be illuminated constantly when the radio signal quality is sufficient to allow wireless control of the machine.

Configurable Parameters

Five adjustable areas of each Pulse Width Modulation output for the boom and stroke limiter, including Threshold, Start PWM, Max PWM, Ramp Up, and Ramp Down. The adjustments are made on the R1300 configuration panel of the 1225 board.

Configuration Key

The nine pole key plug required to make changes in parameter settings.

Continuous Duty Solenoid

Solenoid which is activated when the PTO is engaged and remains active until PTO is disengaged. This solenoid provides the voltage required to illuminate the Power light on the front cover of the CPC.

CPC

Concrete pump controller.

Dip Switches

Each T45 radio transmitter is supplied with a unique ID code, and the receiver must be set to match this code. The Dip switches, found on the cover of the Omnex Hop Link, are used to program the spread spectrum sequence of the receiver.

Electrowelding

Any form of welding which requires an electric current to flow through the equipment being welded.

Hop Link

Housing for dip switches and configurable electronic circuitry included in the Omnex radio receiver.

Joystick

Two directional levers found on the remote box which are used for the purpose of controlling the boom. Each movement of a joystick sends an electronic signal to the main controller, instructing it to open or close a hydraulic valve to facilitate the movement of the boom.

LED

Light emitting diode. Used as signal lamps for the purpose of communicating the status of an electronic circuit, these lamps have

proven to be much more visible and durable than conventional electric light bulbs.

Local/Remote Switch

A two-position switch located on the rear control panel, which allows the operator to chose between *local control* from the rear panel or *remote control* via either the cable box or radio remote box.

Main Spool

The main spool of the Apitech hand valve is a metering device that directs oil to the boom cylinder. There is a spring on the main spool to center the spool in the neutral position. There are also mechanical stops at each end of the spool to control the maximum oil flow.

Max PWM

One of the five configurable parameters of the CPC which apply only to the boom and stroke limiter. Max PWM is the maximum output value assigned to a specific function.

Min/Max Value Lights

The third row of lights on the R1300 configuration panel which indicate the range of value settings, minimum to maximum, that can be assigned to each parameter.

M. S. Connectors

Connectors that meet the more rigid *Military Specifications*.

NEMA 4X Rating

National Electrical Manufactures Association rating for weather proofing. 4X means enclosures are indented for indoor or outdoor use to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water; the unit will be undamaged by the formation of ice on the enclosure.

OI Switch

The ram change station houses the **"OI"** switch and the *"concrete pump forward/reverse switch."* Selecting the **"I"** position of the **"OI"** switch activates the "ram change station," and selecting the **"O"** position of the switch will deactivate the station.

Pictograms

A picture representing a word or idea. Pictograms are used on CPC components as well as remote boxes and control panels to illustrate the function of a specific switch.

POC

A reference to Point of Control. The CPC front cover contains three POC lamps to inform the operator of the selected point of control: either rear control, cable control, or radio control. When there is power to the system, one of the three POC lights will be illuminated at all times.

Proportional Settings

The R1300 configuration board allows the operator to adjust the parameters which control proportional movement of the boom. When proportional settings are adjusted properly, the boom speed will be directly proportional to the movement of the joystick.

Pulsar Coils

The main spool of the Apitech hand valve can either be run by the manual control lever or electrically by the pulsar coils. The pulsar coils operate at a frequency of 33hz, which causes one cycle to occur 33 times a second.

PWM

Pulse Width Modulation. The CPC is a *pulse width modulation* (PWM) control device. Instead of holding the valve open with constant signal, the signal is pulsed to the valve. The duty cycle or percent on time corresponds directly to the speed of each function. Moving the joystick on the remote box changes the "on" time, which, in turn, changes how long the valve is open. The longer the "on" time, the greater the flow of oil to the cylinder.

Radio Transmitter

Radio remote box which is used to send signals to the radio receiver in the CPC.

Ram Change Control Station

The ram change control station houses the **"OI"** switch and the *"concrete pump forward/reverse switch."* The station is usually mounted on the rear boom cradle near the water box.

Ramp

The Ramp Up and Ramp Down parameters of the R1300 configuration panel, control how fast the output builds up or down to the final value.

Rear Control Panel

Also referred to as the operator station or rear operator panel, this control panel houses the switches necessary to control the pumpkit during local control, including the local/remote switch. The rear control panel is always located on the passenger side of the unit near the hopper.

Remote Receptacle

The remote receptacle is located near the CPC housing and is the connector for either the cable remote cord or the shorting plug, also referred to as the dummy plug, which is necessary for radio remote operation.

Shorting Plug

The shorting plug, also referred to as the dummy plug, is necessary for radio remote operation. The plug must be connected to the remote receptacle to enable the E-stop circuit and allow the hydraulic system to function.

Signal Strength Lamp

One of the eight status lights found on the CPC front cover. The SIGNAL STRENGTH lamp will flicker during normal radio transmitter-to-radio receiver communication; the less it flickers, the stronger the radio signal.

Slew

Slew is the term used for the horizontal rotation of the boom.

Spread Spectrum

A radio band that provides security, free from interference. The spread spectrum band goes from 902 to 928 MHz, a 26 MHz wide spectrum using the full band width. Compare that to a conventional radio that uses a band only 0.03 MHz wide. Spread spectrum is a license-free band.

Start PWM

One of the five configurable parameters of the CPC which apply only to the boom and stroke limiter. Start PWM is the beginning output value assigned to a specific function.

Store Button

Located below the R1300 User Configuration Key socket. The store button allows the user to commit his newly set parameters to the memory of the CPC.

Stroke Limiter

A hydraulic device that controls the amount of strokes per minute of the concrete pump.

Threshold

The Threshold is simply the dead band beyond which the joystick must move in order to actuate the PWM output.