

SPREADER SYSTEM

Proportional three function



1. Features and Specifications

MAIN FEATURES

- Up to 3 functions with/without feedback.
- Engine management.
- Light management.
- Integrated GPS device (optional) for vehicle speed measurement.
- 3 potentiometers for function ergonomic setting.
- GSM-GPRS device (optional) through CANbus.
- Graphic display 128x64 dot backlit.

- 9 backlit pushbuttons.
- 4 high brightness LEDs.
- Real time clock with calendar for event recording.
- 192 kbyte memory for events.
- 434 MHz radio connection (optional).
- 35 way AMPseal connector.
- 9-30Vdc voltage power supply.
- Function setting: minimum, maximum, ramps, dither, frequency.

DIMENSIONS

- Aluminium enclosure, IP67.
- Width 225 mm, height 110 mm, depth 45 mm.

12 INPUTS

- 3 interrupt digital inputs.
- 3 digital inputs for engine control (alternator, accelerator, oil alarm).
- 1 digital input for tachometer (squared, sinusoidal, half wave signals).
- Other 2 analog inputs.
- Other 3 digital inputs.

Note: almost all inputs are analog and can be configured as digital (PNP or NPN).

12 OUTPUTS

- 3 PWM current outputs with feedback (1500mA max, 3A as option).
- 5 outputs for engine management (alternator, accelerator, decelerator, start, stop).
- 2 outputs for chute positioning.
- 2 outputs for beacon and working lamps.

Note: on/off outputs can drive up to 3A.

For higher currents a relais box has to be used.

CONNECTIVITY

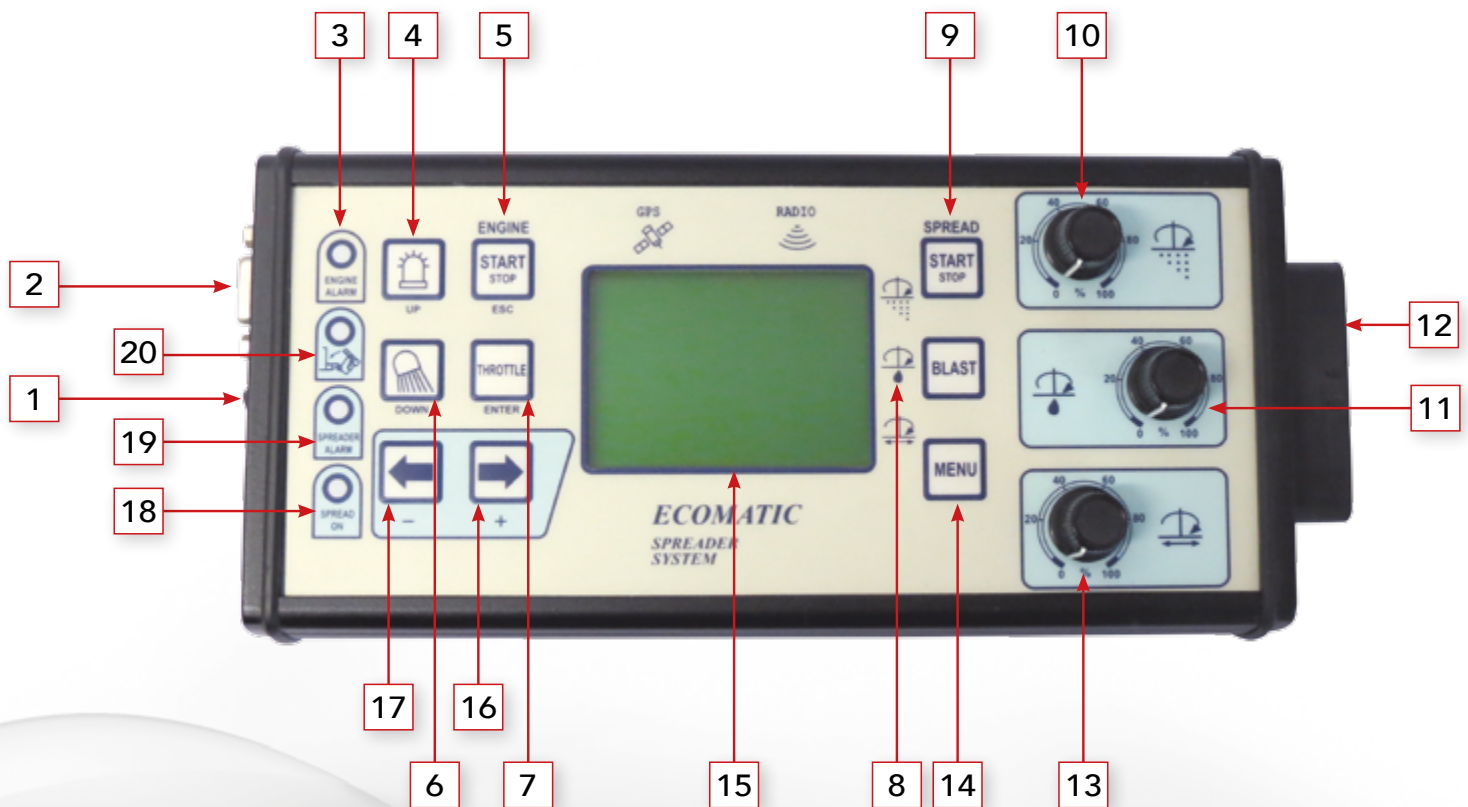
- RS232 serial line to connect a host computer for data upload and download.
- CAN bus line.
- 434 MHz bidirectional radio communication line (option).

GPS SPECIFICATIONS

- Position accuracy: **1.8 m (CEP95)**
- Vehicle speed accuracy: **0.1 m/s**
- Update rate: **1Hz, optional 5Hz**

Note: GPS device is backup supplied. The Cold start (first time on) can require up to 20 minutes, a Warm start is typically 20 seconds.

Proportional three-function control box for salt spreader



2. Description and Function of the Operators

1. MAIN SYSTEM SWITCH

Through the main relay contained in the shunt box, the main system switch enables the activation of the system, if the emergency push-button is released.

2. SERIAL CONNECTOR BUS RS232

DB9 connector to serial gates of your personal computer. It can be used to edit settings and for firmware upgrade.

3. ENGINE WARNING LIGHT

It lights up in case of engine oil pressure or alternator alarm signal.

It blinks in case of low fuel if the above mentioned alarm signals are off.

4. ROTOLAMP ON/OFF ILLUMINATED PUSHBUTTON (2° FUNCTION UP)

It works as a set/reset pushbutton. Switches on and off the rotating lamps. In the diagnostic or calibration mode, it is the UP pushbutton (menu scroll up).

5. ENGINE ON/OFF ILLUMINATED PUSHBUTTON (2° FUNCTION ESC)

When the engine is off, the pushbutton

activates the engine start in presence of an oil pressure alarm signal. When the engine is running, the starter will not be activated. In the diagnostic or calibration mode, it is the ESC pushbutton (menu quit).

6. HEAD LAMP ON/OFF ILLUMINATED PUSHBUTTON (2° FUNCTION DOWN)

Switches on and off the head lamp. In the diagnostic or calibration mode, it is the DOWN pushbutton (menu scroll down).

7. THROTTLE ILLUMINATED PUSHBUTTON (2° FUNCTION ENTER)

Switches on and off the vibrators with timer (10 seconds ON then it switches them OFF).

In the diagnostic or calibration mode, **it is the ENTER pushbutton (menu confirmation).**

8. BLAST ILLUMINATED PUSHBUTTON

With spreading mode running ("Spread On" light on), the pushbutton allows to force maximum material spreading as long as the pushbutton is held down.

9. SPREADING FUNCTION START/STOP ILLUMINATED PUSHBUTTON

If the material spreading isn't activated, push the pushbutton to activate it and vice-versa. Spreading mode activation is indicated by the "Spread On" green led light.

10. MATERIAL AMOUNT SETTINGS POTENTIOMETER

After a minimum spreading width is set, the potentiometer sets the material spreading amount from a minimum to a maximum, by acting on the proportional valve which controls the rotation speed of the screw conveyor engine.

11. LIQUID AMOUNT SETTINGS POTENTIOMETER

After a minimum spreading width is set, the potentiometer sets the material spreading amount from a minimum to a maximum, by acting on the proportional valve which controls the rotation speed of the engine water pump engine.

12. AMPSEAL MALE CONNECTOR 35 POLES

It connects the control box to the shunt box containing the relays and cables directed to wards the system users.

13. SPREADING WIDTH SETTINGS POTENTIOMETER

It sets the spreading width from a minimum to a maximum, by acting on the proportional valve which controls the spinner engine.

14. MENU ILLUMINATED PUSHBUTTON

Illuminated pushbutton which allows to enter the diagnostic or calibration mode menu.

15. BACKLIT DISPLAY

It shows the current operating modes and parameters.

16. ILLUMINATED PUSHBUTTON FOR RIGHT TAIL SHIFTING (2° FUNCTION +)

Operate the DC motor for right tail shifting. In the diagnostic or calibration mode, **it is the PLUS pushbutton (to increment a value).**

17. ILLUMINATED PUSHBUTTON FOR LEFT TAIL SHIFTING (2° FUNCTION -)

Operate the DC motor for left tail shifting. In the diagnostic or calibration mode, **it is the MINUS pushbutton (to decrement a value).**

18. "SPREAD ON" GREEN LIGHT

If on, indicates spreading mode activated. It blinks if the vehicle speed is under 5km/h, thus spreading mode is not active.

19. "SPREADER ALARM" RED LIGHT

If spreading mode is activated, the indicator lights up in case of material exhaustion. If spreading mode is activated, the indicator blinks in case of low water. In case of low water the water pump is switched off.

20. SPINNER RAISED RED WARNING LIGHT

It lights up if the spinner slants compared to the operating position. In such cases, the buzzer also emits three acoustic signals.

Whenever this warning light is up, the material spreading is stopped and the relevant "Spread On" turns off. In order to reset the spreading mode, the spinner must be lowered to its normal operating position, then the spreading mode activation pushbutton must be pushed a new.



3. System Use

POWER SUPPLY

The power supply can be 12Vdc direct current or 24Vdc direct current (depending upon the application and the relay kit ordered with the system).

Always supply power to the system with the correct voltage in order to avoid breakdowns and system failures.

After system installation, connect it to the battery. Connect the blue wire to the positive terminal and the brown wire to the negative terminal.

Even though the system is protected against reverse polarity of the power supply, always

be careful to perform the correct cable connection.

To activate the system, release the emergency push-button.

Press the emergency push-button whenever needed.

Before disconnecting the control unit, press the main push-button or the emergency push-button to make sure the system isn't powered.

SYSTEM START

The system is started by the switch button #1 which will activate the system by the main relay contained in the shunt box. If the emergency push-button is not released, the

system will not start.

If the system has been successfully started, the display will turn on.

ENGINE START/STOP

With the engine turned off and the oil pressure warning light turned on, (warning light #3), the engine can be started by holding the Engine Start (pushbutton #5) for at least three seconds.

The three seconds are those needed by the diesel engine glow plugs.

If the engine is running, pushing again the pushbutton #5 will activate the engine stop.

If the engine is running, the light #3 indicates the amount of fuel reserve.



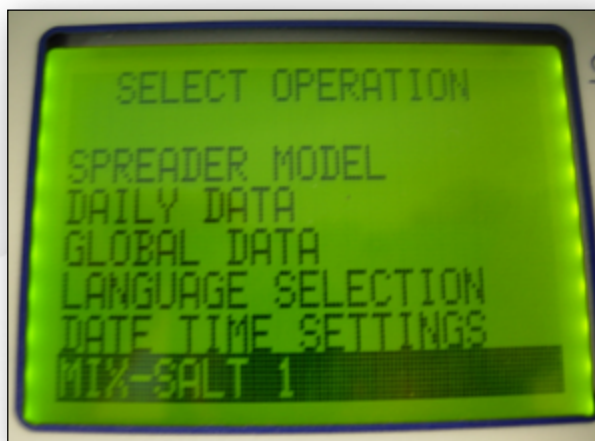


4. Operating Mode Selection

By holding down the Menu pushbutton #14 the display will visualize the SELECT OPERATION page showed here.

By pushing the pushbuttons #4 UP and #6 DOWN it is possible to scroll the list in order to select the operating mode needed. The selected operating mode is identifiable by light text on dark background.

Once the operating mode has been selected, it is validated by holding the pushbutton #14.



It is possible to choose between the following operating modes:

MIX-SALT 1 Moistened salt spreading with the 1st parameter set.

MIX-SAND 1 Moistened sand or gravel spreading with the 1st parameter set.

MIX-SALT 2 Moistened salt spreading with the 2nd parameter set.

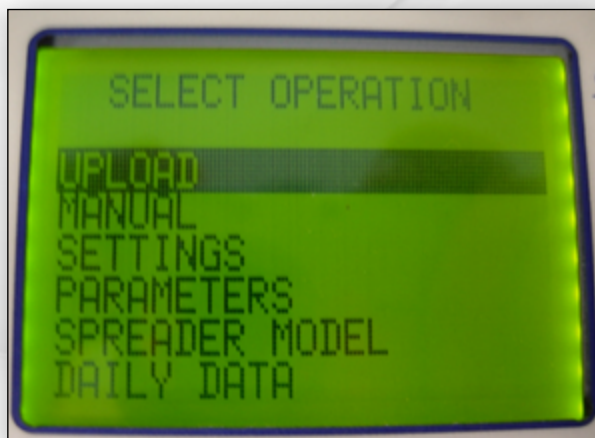
MIX-SAND 2 Moistened sand or gravel spreading with the 2nd parameter set.

SALT Salt spreading.

SAND Sand spreading.

UPLOAD Material unload.

MANUAL Manual mode.



CALIBRATION Calibration of tachometer, conveyor/screw, spinner, water pump.

PARAMETERS Parameter settings.

SPREADER MODEL Selection of operating parameter set from A to H.

DAILY DATA Daily operating data (amount of material used, spread amount, kms covered).

GLOBAL DATA Global data (amount of material used, spread amount, kms covered).

LANGUAGE SELECTION The operator can select between 5 languages.

DATE AND TIME Date and time settings.

5.1 MIX-SALT 1 Mode

Once the MIX-SALT 1 automatic spreading mode has been selected, the display will visualize the page showed below. It displays the following operating parameters:

A. MATERIAL TYPE SELECTED FOR AUTOMATIC SPREADING MODE

B. VEHICLE SPEED IN KM/H

Connection to GPS step: 0km/h with dark text on blinking light background.

Speed automatically detected by GPS: dark text on light background (opposite of the picture above).

Manually set speed: light text on dark background (as in the picture above).

C. TAIL POSITION

Detectable in systems provided with tail shift actuator with potentiometer.

D. SPREADING WIDTH IN METERS

Value settable with potentiometer #13 between 1 and 12 meters.

E. LIQUID PERCENTAGE OF THE TOTAL AMOUNT OF MATERIAL, IN %.

Value settable between 0 and 30% with the potentiometer #11.

Should the liquid be low, the percentage value is replaced by "- - -" and the "Spread Alarm" #19 will blink.

F. MATERIAL AMOUNT SELECTED FOR SPREADING IN g/m².

Value settable between 5 e 40 g/m² with the potentiometer #10.

AUTOMATIC SPREADING

While being in one of the following operating modes:

MIX-SALT 1

MIX-SAND 1

MIX-SALT 2

MIX-SAND 2

SALT

SAND

Push the pushbutton #9 to start spreading.

If no spreading mode is activated, push the pushbutton to activate it, and vice-versa.

Automatic spreading is based upon the vehicle speed detected by the GPS device within the control box.

Spreading mode activation is indicated by the "Spread On" warning light #18 lighting up.

- It blinks whenever the spreading mode is active but not working, because the vehicle stopped or the GPS signal is not yet detected.
- It lights up whenever the spreading mode is active because vehicle is moving or it has



been set a manual speed.

- It is turned off whenever the spreading mode is NOT active (push the pushbutton #9 to activate).

Speed detection must be over 5 Km/h for the spreading mode to be working after it has been activated.

Spreading **depends upon vehicle speed** and it is stopped whenever speed falls below 5Km/h. Spreading is resumed without any intervention of the operator whenever vehicle speed exceeds 5Km/h.

If the vehicle speed exceeds a maximum limit, the system activates an acoustic alarm (from the buzzer inside the control device) **without stopping** the spreading mode.

Should the detection of the GPS signal fail while spreading, the system utilizes the last correctly detected speed, then after 10 seconds of signal absence, the anomaly is indicated by the alarm condition as follows.

WARNING because the vehicle speed is still set to the last detected value, the pushbutton # 9 must be pushed to stop the spreading mode. It is now possible to start spreading with manual speed (see below).

- Should there be problems of the GPS system detecting speed (e.g. in scarcely covered or not covered areas, like tunnels), speed indication (position #B on the display) will be blinking: at regular and close lapses, it will blink from dark text on light background to light text on dark background. Also the buzzer will beep repeatedly emitting a 1 second lasting sound then it will be

silent for 3 seconds, until the GPS signal is detected.

In order to spread in areas without any GPS signal, the vehicle speed must be set MANUALLY as follows:

- Press for a short time the pushbutton #14 "Menu".

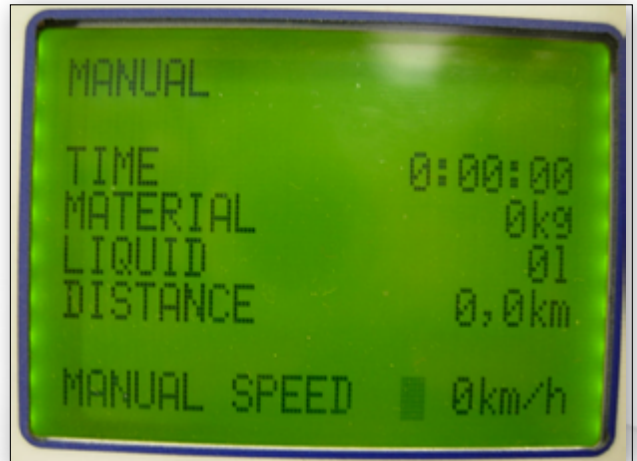
- The display will visualize the following page (please note that manual speed is ZERO because the saltspreader is automatically set. The operator's intervention is needed to switch to manual mode).

- set the required speed (e.g. 40 Km/h) with the two pushbuttons #17 + (to increase the speed value 5 by 5 Km/h) and #16 - (to decrease the speed value 5 by 5Km/h).

In spreading mode with MANUAL speed (manual speed greater than 0), the system starts spreading considering the speed vehicle constant and equal to the input value.

In order to spread with the same density as displayed, the vehicle must proceed at the input speed showed on the display. Because the spreading mode now doesn't depend upon the actual vehicle speed, the pushbutton #9 must be pushed to start and stop the spreading mode, e.g. when the vehicle stops at a stop light.

Spreading mode activates only if the spinner is not raised, or when the warning light #20 is turned off. When this warning light is on, the spreading is stopped and the relative "Spread On" warning light #18 is turned off. In order to resume spreading, the spinner must be lowered to its normal operating



position and the spreading activation pushbutton must be pushed.

The BLAST command is activated by the pushbutton #8 and it is effective only if the spreading mode is active. It forces the material spreading amount to its maximum regardless of vehicle speed and spreading density. Previously set spreading width will not change.

The BLAST command allows to spread the material more effectively in dangerous areas or where ice clusters are more likely to appear.

The BLAST command is still effective if the spreading have been stopped due to vehicle speed falling below 5Km/h:

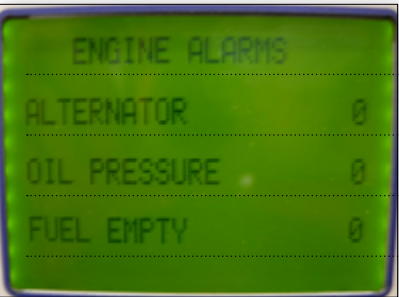
that is to allow material spreading next to intersections or during vehicle acceleration from stop, i.e. when vehicle starts to move until GPS speed exceeds 5Km/h (where it starts automatic spreading).

Note: that intersections are dangerous areas and material spreading should be more abundant.

Operating mode diagnostics MIX-SALT 1 / MIX-SAND 1 / MIX-SALT 2 / MIX-SAND 2 / SALT / SAND

By simultaneously holding down the pushbuttons #4 Up and #6 Down it is possible to enter system diagnostic mode.

There are 6 diagnostic pages. Browse by pushing the pushbutton #14 Menu.



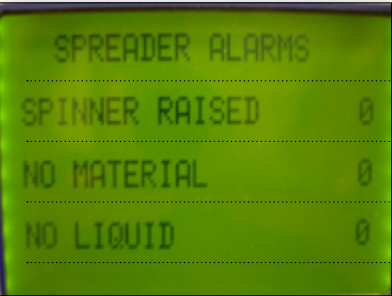
ENGINE ALARMS

- Engine alarm
- | | | |
|--------------|---|--------------------|
| ALTERNATOR | 0 | Alternator alarm |
| OIL PRESSURE | 0 | Oil pressure alarm |
| FUEL EMPTY | 0 | Fuel empty alarm |
- 0 = absent
1 = present



PUSHBUTTONS

- Control box push-buttons
- Push-button position
(released/pushed)
on the control box
- 0 = released
1 = pushed



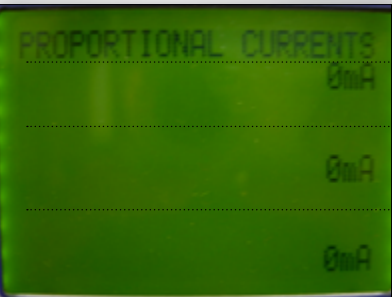
SPREADER ALARMS

- Spreading mode alarms
- | | | |
|----------------|---|----------------------|
| SPINNER RAISED | 0 | Spinner raised alarm |
| NO MATERIAL | 0 | No material alarm |
| NO LIQUID | 0 | No liquid alarm |
- 0 = absent
1 = present



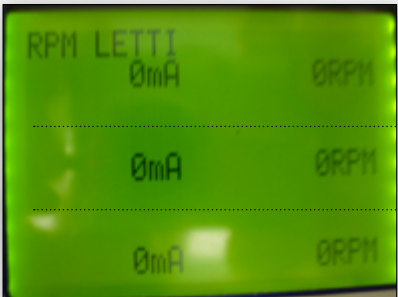
SIMMETRY SENSOR

- Tail simmetry actuator stroke
- Actuator stroke length for tail
simmetry
- 0% = minimum stroke
100% = maximum stroke



PROPORTIONAL CURRENTS

- Proportional current values
on the following electro-valves:
- | | |
|---------------|-----|
| CONVEYOR EV | 0mA |
| WATER PUMP EV | 0mA |
| SPINNER EV | 0mA |
- Current values in mA



RPM of SPEED SENSORS

- RPM of speed sensors
in hydraulic engines
- RPM CONVEYOR
- RPM WATER PUMP
- RPM SPINNER

By simultaneously holding down both #4 Up and #6 Down pushbuttons, it is possible to quit diagnostic page and return to the main operating page MIX-SALT 1.

5.2 UPLOAD Mode

After selecting the UPLOAD unload mode, the paged showed below will be displayed:

A. NOMINAL FLOW OF THE CONVEYOR PROPORTIONAL VALVE (expressed in %)

The value can be set between 0 and 100% (i.e. maximum flow) with potentiometer #10.

B. NOMINAL FLOW OF THE WATER PUMP PROPORTIONAL VALVE (expressed in %)

The value can be set between 0 and 100% with potentiometer #11.

In case of low water level, "---" will be displayed instead of the percentage value and the warning light #19 will blink.

This mode allows to unload the spreading material in a safe and simple way. Unload can be useful when it must be changed the material type or at the end of the season in order to avoid material left in the tank.

If the unloading mode is not active, the pushbutton #9 will activate the spreading mode and vice-versa. Unloading mode activation is indicated by the "Spread On" warning light #18.

During the unload, the vehicle speed cannot exceed the top limit of 5km/h.

If the vehicle exceeds the speed limit of 5km/h, the material unload will stop and an acoustic alarm will be activated.

WARNING: if the stop is caused by exceeding the speed limit, material unloading mode can be resumed by pushing the START pushbutton. It will not be resumed only by the speed falling again below 5km/h.

In the unloading mode, the spinner raised alarm is ignored.



5.3 MANUAL Mode

After selecting the MANUAL operating mode, the following page will be displayed:

A. NOMINAL FLOW OF THE CONVEYOR PROPORTIONAL VALVE (expressed in %)

The value can be set between 0 and 100% (i.e. maximum flow) with potentiometer #10.

B. NOMINAL FLOW OF THE WATER PUMP PROPORTIONAL VALVE (expressed in %)

The value can be set between 0 and 100% with potentiometer #11.

In case of low water level, "---" will be displayed instead of the percentage value and the warning light #19 will blink.

C. NOMINAL FLOW OF THE SPINNER PROPORTIONAL VALVE (expressed in %)

The value can be set between 0 and 100% with potentiometer #13.

This mode allows to control the correct system functioning in a safe and simple way. Manual operating mode can be useful to check the flow rate of the hydraulic parts of the system, e.g. the water pump, the spinner hydraulic engine, and others). If manual spreading is not active, the pushbutton #9 activates it and vice-versa. The activation of the spreading mode is indicated by the "Spread On" warning light #18.

If manual mode is active, vehicle speed will be ignored.

OTHER MODES

The other operating modes, as:

MIX-SAND 1	moistened sand or gravel spreading with the 1 st parameter set.
MIX-SALT 2	moistened salt spreading with the 2 nd parameter set.
MIX-SAND 2	moistened sand or gravel spreading with the 2 nd parameter set.
SALT	salt spreading
SAND	sand spreading

Will follow the functioning of the "MIX-SALT 1" mode, as showed before in the present user manual.

