Instruction
programming

EPAC Lever Steer
892000

JRsystems

Presentation

Lever steer, function

The system gives a pulse width modulated output signal (PWM-signal), proportional to the lever position. The signal controls the vehicle's directional valve.
Extra on/off-signals are available to for instance control a loading valve in a load sensing hydraulic system or for shifting vehicle direction (F-N-R).
The system offers progressive steering, which means that the steering is fast when the groundspeed is low and that the steering signal proportionally decreases when the groundspeed increases. To measure the groundspeed you can use either a PNP-sensor or a magnetic pickup.
The function of the speedsensor is constantly monitored and if a sensor failure occurs the system locks to existing reduction value and the system indicates the malfunction to the driver. To reset this function turn the system off.

Parameters, general description

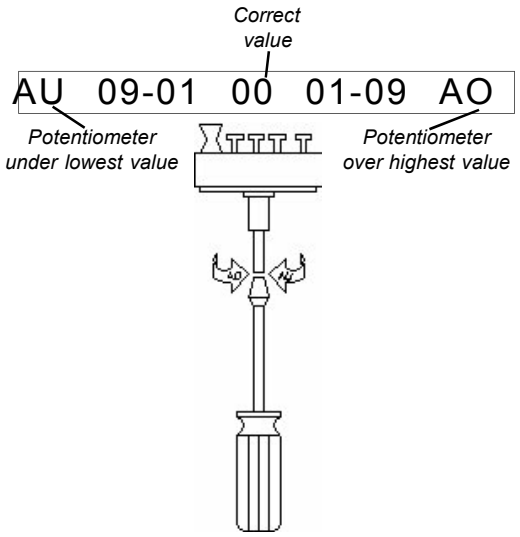
The parameters are used to adjust the systems sensitivity and function. The access code have to be entered before programming of parameter(s) -0 to -9 is possible. The access code does not have to be reprogrammed as long as the unit is switched on.
All the parameters can be adjusted from 00 to 99.
Please read the manual before trying to program the unit.

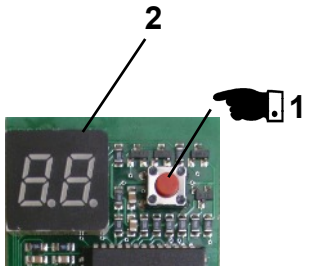
A1, adjusting the lever

The lever has to be adjusted properly in order to obtain high precision from the potentiometer. Normally this is done in the factory. The potentiometer is adjusted in parameter A1 the value should be as close to 00 as possible.

1. Press button #1 once. The display shows potentiometer value.
2. Adjust potentiometer to zero, or as close as possible.

A1, adjusting the potentiometer





Programming

Programming is done with the programming switch #1 and the lever. Use the switch to change parameter number and the lever to change the parameter value.

1. Press switch twice to go to access code 1. Enter correct value.
2. Press switch once to go to access code 2. Enter correct value. Continue in the same manner for access code 3 and 4.

3. Press switch once to go to parameter -0. Enter requested value. Use switch to step between parameter numbers and lever to change parameter value.

Once the desired parameter have been changed, locate the parameter (--), wait a second.... and the values are saved and programming terminated.
If you do not want to save changed parameter values, locate parameter (-), wait a second.... and programming is terminated without saving changes.

Access code			
Code	1=24*	or	00**
Code	2=03*	or	00**
Code	3=19*	or	00**
Code	4=35*	or	35**

*Software version 2.16 and older.
**Software version 2.17 and newer.

Parameter description

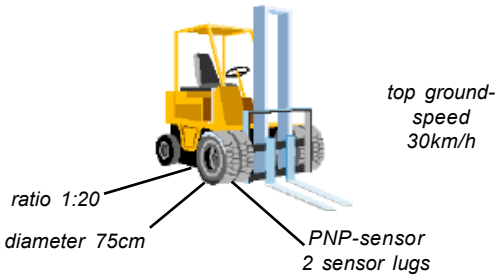
(-0) to (-3) Start- and end current
The start current is necessary amount of current needed to move the directional valve's spool to the activation point. The start current is adjustable between 130 mA and 0.8/1.6* A.
Parameter (-0) for left and (-2) for right.
The end current is necessary amount of current needed to obtain maximum desired flow in the directional valve. The value is adjustable between 130 mA and 0.8/1.6* A. Parameter (-1) for left and (-3) for right. The end current can never be programmed to a lower value then the start current.
* Depending on hardware and software version.

Programming

Parameter description, continued

(-4) Down ramp (damping)
This parameter is used to produce a soft and slow end of the output signal. The parameter adds a delay (down ramp) on the output signal to ensure a soft ending of the output signal.
The right display digit shows the right outputs ramp value and the left display digit shows the ramp value for the left output signal.

(-5) Vehicle groundspeed range
The groundspeed range is the vehicle top speed, translated into Hz.
An example;
The vehicle is equipped with a PNP-sensor to monitor the groundspeed. The sensor is attached by the transmission output shaft and has 2 sensor lugs. The ratio between the transmission output shaft and the wheels are 1:20. The diameter of the wheels are 75 cm. The vehicles top groundspeed is 30 km/h.



We start by converting the top groundspeed into meters per second by using the following formula:

$$\frac{30km/h}{3.6} = 8.3m/s$$

Then we calculate the number of pulses per meter by multiplying the number of sensor lugs with the transmission ratio and dividing the result with the diameter of the wheels.

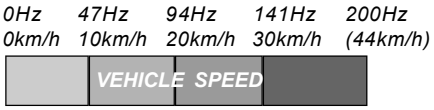
$$\frac{2 \times 20}{0.75m \times 3.14} = 17ppm$$

We can now calculate the reduction range in hertz by multiplying the top groundspeed in m/s with the number of pulses per meter.

8.3m/s x 17ppm = 141Hz, rounded off to 200Hz

Each parameter step equals 100 Hz, eg. value 5 = 500 Hz.
Due to filtration of incomming pulses, the parameter values 00 - 09 are used for PNP-sensors and 10 - 50 for magnetic pickups.

(-6) Vehicle groundspeed at start of reduction
The parameter value will set the groundspeed level where the speed reduction function* will start. The value is a percentage of parameter (-5). Example 1:
If you want the reduction to begin at 10 km/h and the top groundspeed is 30 km/h, the parameter value will be 24 (24%).



example 1

$$\frac{10km/h}{30km/h} \times 141 = 47Hz \qquad \frac{47}{200} = 24\%$$

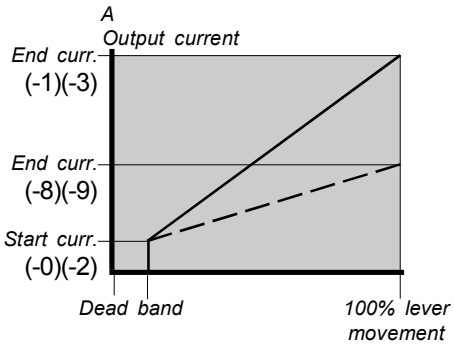
example 2

$$\frac{20km/h}{30km/h} \times 141 = 94Hz \qquad \frac{94}{200} = 47\%$$

(-7) Vehicle groundspeed at max reduction
The parameter value will set the groundspeed level where you will have maximum speed reduction* (see parameter (-8) and (-9)).
The value is a percentage of parameter (-5). Example 2:
If you want the reduction to end at 20 km/h and the top groundspeed is 30 km/h, the parameter value will be 47 (47%)

(-8) End current at max reduction (right output)
Parameter value specifies output current level for the right output, when a groundspeed corresponding to value of parameter (-7) is reached.

(-9) End current at max reduction (left output)
Parameter value specifies output current level for the left output, when a groundspeed corresponding to value of parameter (-7) is reached.



(AS) Calibration of the center-/end-positions
This parameter automatically calibrates the unit with the lever potentiometer.
1. Locate the parameter (AS). The display shows 00.
2. Move the lever to the far left and to the far right. Let go of the lever.
3. Wait....and the unit will save changed values and terminate programming mode.

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* The speed reduction function reduces proportionally maximum available output current, between the values of parameter (-1)/(-3) and (-8)/(-9), as the vehicle groundspeed changes between a speed corresponding to value of parameter (-6) and (-7). This enabling the sensitivity of the steering to decrease as the vehicle speed increase.

Technical specifications

Parameter list

A1	Adjusting the lever potentiometer
I	Access code 1
II	Access code 2
III	Access code 3
IIII	Access code 4
-0	Start current, left output
-1	End current, left output
-2	Start current, right output
-3	End current, right ouptut
-4	Down ramp (damping)
-5	Vehicle groundspeed range
-6	Vehicle speed-reduction start
-7	Vehicle speed-reduction max
-8	End current right-max reduced
-9	End current left-max reduced
AS	Calibration center/end positions
--	Exit and save programming
-	Exit without saving programming

Technical specifications

Supply voltage	12 V DC (10 - 18 V DC) 24 V DC (20 - 30 V DC)
Max. output current	1.6 A / output, PWM-signal 1.6 A xtra output
PWM frequency	125 Hz
Max. down ramp	2 sek
Working temp.	- 40° C - +70° C
Lever dead band	± 2°
Total lever movement	± 20°
Speed sensor	PNP-sensor or magnetic pickup Min 10p/wheel rev
In- and outputs	Short circuit protected

EMC- protected

The extra signal is activated when the lever is moved beyond the dead band

Colour codes, wiring

Red	Supply +12 / 24 V DC
Blue	Ground
White	PWM-signal, right
Grey	PWM-signal, left
Black	PWM-signal return, right/left
Brown	Pulses from groundspeed sensor
Green	Extra output
Blue / red	Supply forward/reverse switch
Yellow	Signal forward
Purple	Signal reverse

Error codes

E10, the unit has registered a sensor failure when the display shows E10. The speed reduction function is locked to existing value at the time of failure. If the pulses from the sensor returns the speed reduction will automatically go back to normal function, but the display will show E10 until the power has been turned off.
E11, the control lever was moved outside the lever deadband when the unit was switched on. The outputs are deactivated. This function is to prevent unintentional moving of the machine when starting-up the system. To reset you have to turn the power off.
E12, the unit has picked up values outside the control levers limit. The outputs are deactivated. This function is to prevent unintentional moving of the machine if the lever fails (for example intermittent connections).

Notes

JRsystems, Rev 2013-04

Important information about our control/ecu units

- Check that the contents of the package are according to order confirmation and that the items are in good condition. Put in claim for incorrectness to supplier as soon as possible.
- Ensure a stable voltage source for optimal function. This is true about electric forklift trucks in particular. Supply voltage is 12V or 24V and should be secured with a fuse.
- Wiring harness between the control/ecu unit and the actuator should not be drawn together with the vehicle's power cables or next to power connections on electric engines, radio transmitters, etc. Do not draw the control unit harness in a closed circle, or through circles of other cables.
- Disturbing effects from relays and other inductive loads used in the vehicle should be neutralised. NOTE: This is not valid for PWM-coils.
- Remove the vehicle voltage feed and ground connection from the vehicle if welding is necessary.
- Make sure that you protect the vehicle against static electricity whenever you work with it. Connect the chair armrest to the vehicle chassis in order to lead away static electricity caused by friction between the driver and the chair. Outgoing negative voltage from any DC/DC converter preferably be connected to the vehicle chassis.
- Do not open the control/ecu unit. Contact the service organisation if error occurs. If the control unit is opened or modifies the JRsystems AB guarantee will expire. If the control unit modifies without JRsystems AB permission we disclaim our responsibility for the product.
- Do not expose the control/ecu unit to impacts. If someone drop the control unit or similar it should be sent to supplier for control.
- Clean the control unit regularly with a damp rag with mild soap solution. The control unit cannot be soaked in water, washed with high-pressure wash or have any other direct contact with water.
- The control unit is to be placed on an armrest to give the best ergonomic benefits. Choose an armrest with switch in the joint of the chair. Supply voltage shall be disconnected when the armrest is raised.
- Turn off the control/ecu unit if error indication occurs and search for and correct the reason. If the problem is in the control unit it should be sent to supplier for repair. Do never use a vehicle with a control unit with error indication.
- Use shielded wires to sensors and connect the shield to the grounded box. Shielded wires should only have one ground connection point.
- Use sealed connectors and gold plated pins/sockets for analogue signals.
- Include the control unit in the daily inspection of the vehicle before every start-up. Check that the control unit is in good condition especially the bellow, the lever and the buttons. If possible check the harness and the connector. Contact the vehicle manufacturer for advice or service if you have any hesitations.
- Recommended wire areas: 1,5mm^2 for supply voltage and ground. Other wires 0,6mm^2. *For EMMI*: For use of 5A (Dig out 1 and Dig out 2) 1,5mm^2 is recommended.
- *Only valid for EMMI:* To secure the specified EMC requirements even in extreme circumstances, we recommend a ferrite placed on the harness as closed to the control unit as possible. Requirements of the ferrite: Impedance 168 at 25Mh, 250 at 100 MHz, 300 at 300 MHz and 205 at 500Mhz. JRsystems AB part number 848782 or 848783.