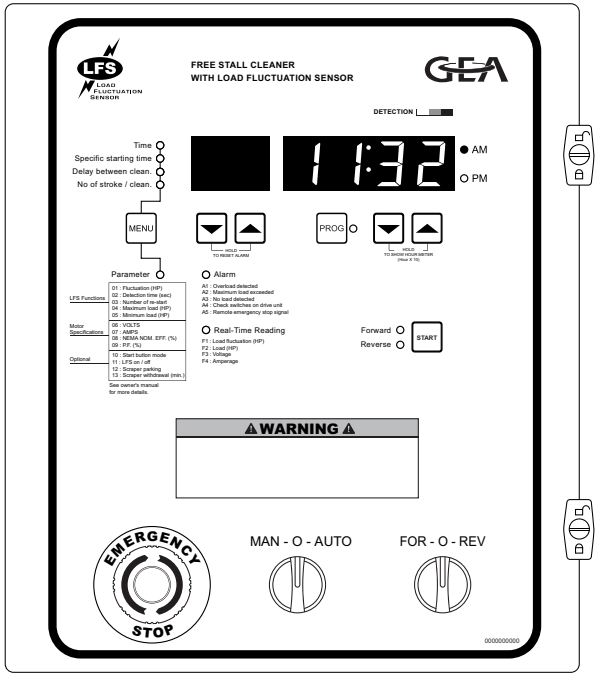
LFS control version 3.13

free stall cleaner system



Operator manual

Keep this manual for future reference

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The LFS control is made by: JPS Électronique inc.
2070 rue Joseph-St-Cyr, Drummondville, QC J2C 8V6 Canada

The LFS control complies to the following European directives and standards:

2006/95/CE Low voltage

2004/108/CE Electromagnetic compatibility

EN 60204-1:2006 Safety of machinery

EN 61439-2:2009 Low-voltage switchgear and controlgear assemblies Part 2: Power switchgear and controlgear assemblies

⚠ WARNING

Before connecting to the electrical power, programming, operation, maintenance, the installer, the operator, the maintenance technician must read and understand this manual.

This symbol ⚠ indicates important safety warnings that must be respected. Not respecting safety warnings may cause damage to machines and/or serious or lethal injuries to individuals and animals.

⚠ Disconnect and lock electrical power before wiring the LFS control panel and the free stall cleaner.

⚠ Disconnect and lock electrical power before maintenance, repair of the LFS control and/or the free stall cleaner.

⚠ Before programming, operation, maintenance, repair of the LFS control, make sure no one is standing close to the free stall cleaner, the scrapers, the cable, the chain.

⚠ Never operate the free stall cleaner if the LFS control panel is defective. When in doubt, disconnect and lock electrical power. Ask a qualified technician to inspect the LFS control before resuming operation of the free stall cleaner.

This symbol ⏚ indicates terminals that must be connected to earth ground. Installer and service technician must make sure that control panel and motor are connected to earth ground before connecting to electrical power.

Range of this manual

This manual is supplied with the LFS control panel. It explains the installation and the operation of the LFS control. Keep this manual for future reference. Information specific to the free stall cleaner can be found in the manual supplied by GEA Farm Technologies.

Electrical specifications, marking and serial number

Electrical specifications, CE marking, CSA marking and serial number of the LFS control are affixed inside the panel at the time of manufacturing. The LFS control must not be connected to electrical power if specifications are illegible, modified or missing.

Function of the LFS control

The LFS control is designed to operate a free stall cleaner with cable, or a free stall cleaner with chain, manufactured and sold by GEA Farm Technologies.

Normal operating conditions

Environment: the control panel must be mounted on a wall inside the barn, protected from weather

Electrical power: see marking inside the control panel

Operating temperature: -25°C to +45°C

Warranty

The LFS control panel is a part of the free stall cleaner system sold by GEA Farm Technologies. The LFS control panel and all other parts of the cleaner system are guaranteed by GEA Farm Technologies.
Terms and conditions of the warranty are determined by GEA Farm Technologies and explained in the sale contract. Warranty claim must be sent to GEA Farm Technologies or its authorized dealer. Special conditions may apply depending on local regulation.

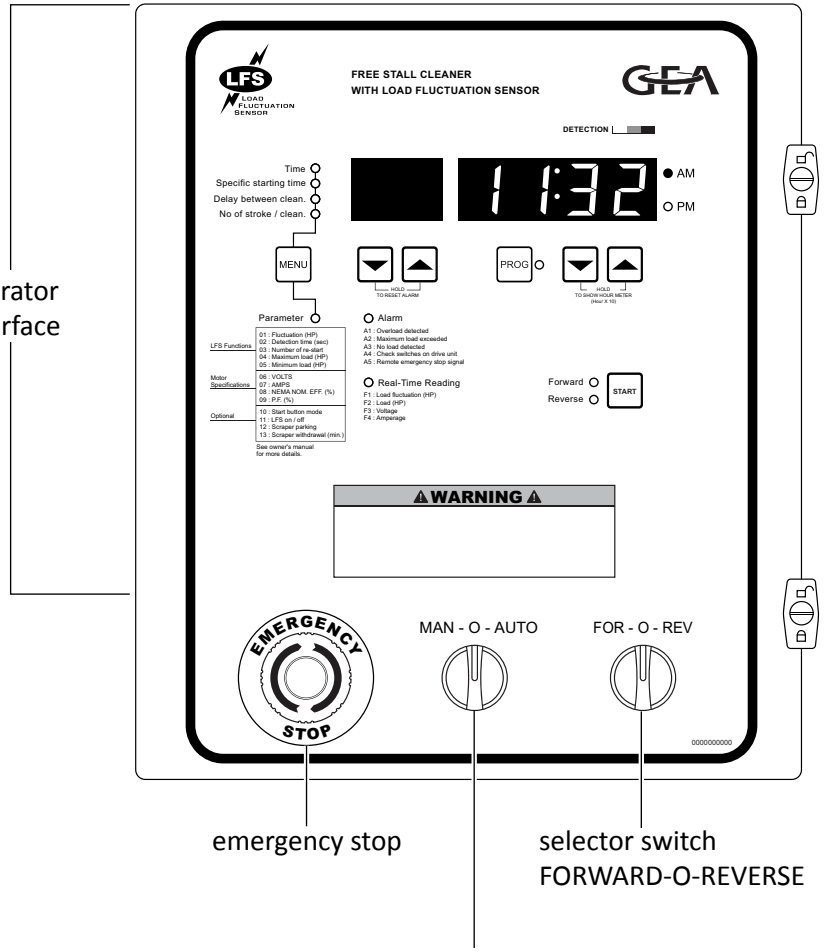
Modifications and improvements

JPS Électronique inc. is the manufacturer of the LFS control panel. JPS Électronique inc. reserves the right to improve, change, modify the LFS without notice, without obligation to make the same changes on existing control panels.

Trademarks

The words **LFS**, **Load Fluctuation Sensor** and **GEA**, and their logos, are trademarks used by GEA Farm Technologies.

PRESENTATION OF THE LFS CONTROL



MAN = manual operation
the cleaner system operates as per the position of the stroke limit switch <u>AND</u> the position of the FORWARD-O-REVERSE selector switch

O = off

AUTO = automatic operation
the cleaner system operates as per programmed cleanings

LFS features

The free stall cleaner system with cable or chain displaces manure loads in changing, unpredictable conditions. The resulting load on the free stall system is more than the quantity of manure. External loads must also be taken into account, for instance: condition of the manure alleys, length of stroke, scrapers configuration, reaction of the animals to the scrapers movement.

The LFS optimizes the operation of the free stall cleaner system in order to reduce unwanted stops and risks of mechanical failure.

While cleaning, the LFS sensor calculates the power delivered by the motor with reference to the actual electric power specifications. The LFS determines the best suited behavior according to load fluctuations, within the range of the parameters set by the operator.

The LFS can be programmed to clean alleys per **starting time** or per **delay between cleanings**. The **number of stroke per cleaning** can be set by the operator.

Sensitivity to load fluctuation is programmed by the operator in order to allow a gradual, progressive increase of the manure load in front of the scrapers. If the load suddenly exceeds the parameters set by the operator, the LFS stops and resumes operation of the cleaner automatically, as per the restart sequence programmed.

Automatic operation

1. Program cleanings, see **PROGRAMMING THE CLEANINGS**
2. Set the MAN-O-AUTO selector to AUTO.

Semi-automatic operation

1. Set the MAN-O-AUTO selector to AUTO
2. Press START The cleaner will start after 10 seconds as per the number of stroke set, see **No. of stroke / cleaning**

Manual operation

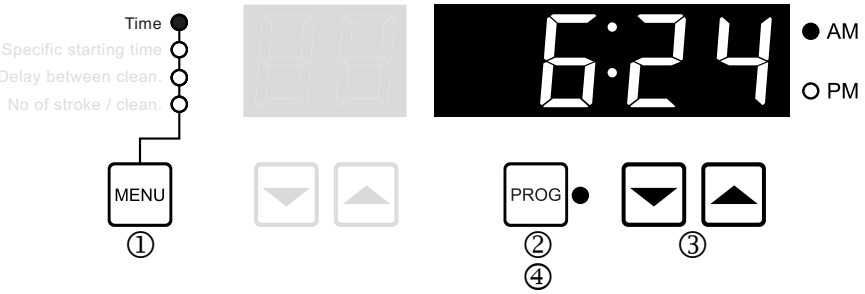
1. Set the MAN-O-AUTO selector to MAN
2. Set the FORWARD-O-REVERSE to FORWARD or REVERSE
3. To stop the cleaner, set MAN-O-AUTO and FORWARD-O-REVERSE selectors to Off.

PROGRAMMING THE CLEANINGS

Time

To set the actual time:
1. Press MENU to select Time
2. Press PROG
3. Set time using the arrows
4. Press PROG to confirm.

Note: The clock does not adjust to daylight saving time automatically. You must change time manually according to local time standards.

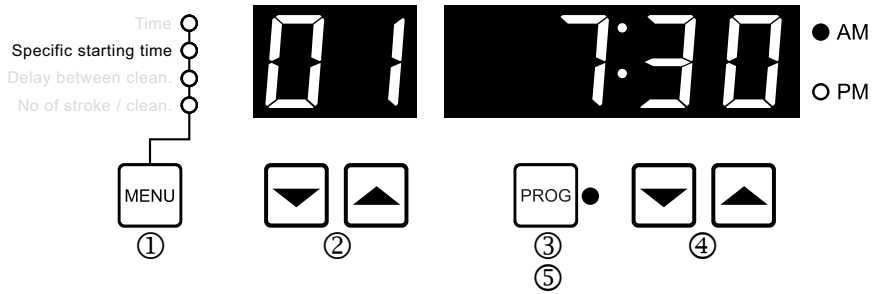


Specific starting time

Up to 36 different starting times can be programmed. Every starting time, the free stall cleaner makes 1 to 6 strokes according to the setting **No. of stroke / cleaning** (number of stroke per cleaning).

Note: If you want the free stall cleaner to operate as per specific starting time, the Delay between cleaning must be set to 0:00

1. Press MENU to choose Specific starting time
2. Choose the starting time (1 to 36) using the arrows
3. Press PROG
4. Set the starting time using the arrows
   To cancel a starting time, select - -:- -
5. Press PROG to confirm.

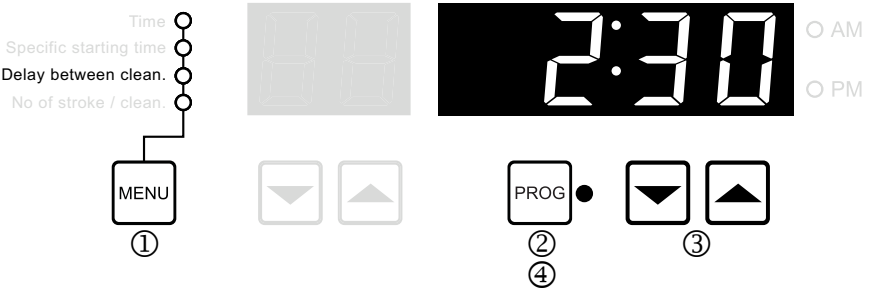


Delay between cleanings

The Delay between cleanings enables the free stall cleaner to operate **with no specific starting time**. Every cleaning, scrapers operate for the wanted number of stroke (1 to 6) then the cleaner stops as per the delay programmed (hour : minute).

Note: If the delay = 0:00, the free stall cleaner operates as per specific starting time.

1. Press MENU to choose Delay between cleanings
2. Press PROG
3. Set the delay between cleanings using the arrows
4. Press PROG to confirm.

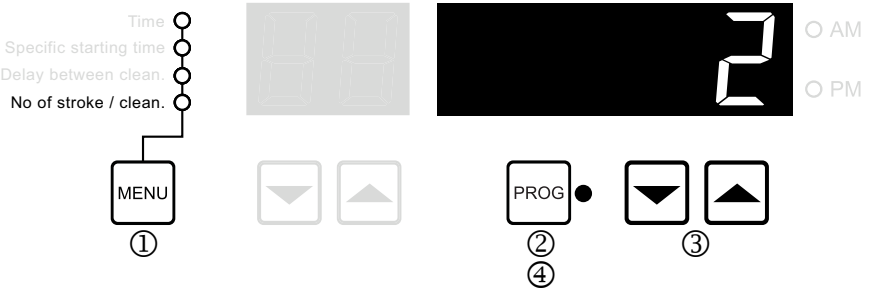


No. of stroke / cleaning

Every cleaning, scrapers operate for 1 to 6 strokes.

Note : Scrapers stop for 10 seconds between strokes.

1. Press MENU to choose No. of stroke / cleaning
2. Press PROG
3. Set the number of stroke using the arrows
4. Press PROG to confirm.



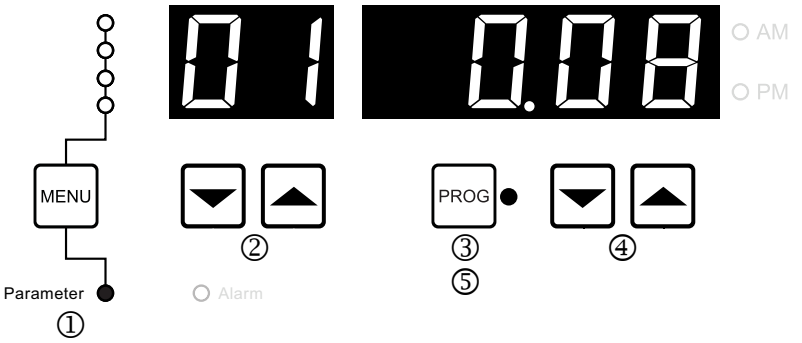
PROGRAMMING THE PARAMETERS

01 : Fluctuation (HP)

While cleaning, the actual load on the free stall cleaner (HP) fluctuates. A load increase (fluctuation) can be caused by an obstacle in front of the scrapers. A sudden load decrease can be caused by a mechanical failure.
The LFS sensor averages a few loads and compare the average with reference to the last load sample. The difference between the last load sample and the average is named «fluctuation».
The parameter «Fluctuation» sets the maximum load difference allowed in a given period of time (see 02 : Detection time). If the fluctuation is exceeded during the «Detection time», the LFS stops the free stall cleaner, which becomes in re-start mode.

Note: A 30 kg (66 lbs) load that is displaced in a smooth, horizontal alley should be sampled by the LFS at approximately 0.01 HP. A minor flaw of the manure alley can cause a fluctuation of 0.05 HP and over. «Fluctuation» should be set between 0.05 and 0.12 HP in most facilities.

1. Press MENU to choose Parameter
2. Select parameter 01 using the arrows
3. Press PROG
4. Set the fluctuation using the arrows (0.01 to 0.25 HP)
5. Press PROG to confirm.



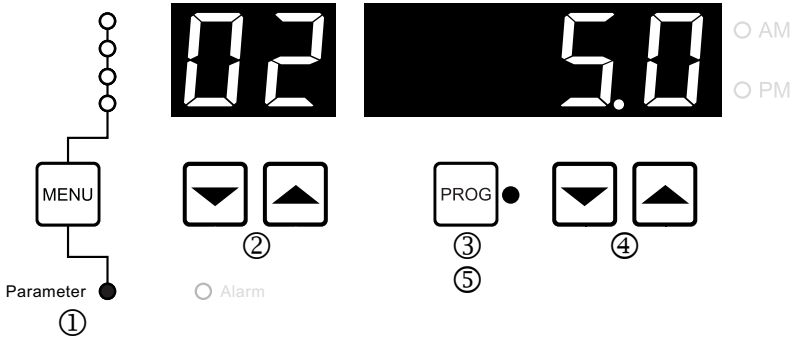
02 : Detection time (sec.)

The detection time is the period in which the fluctuation can be exceeded (see 01 : Fluctuation).

The detection time decreases automatically as the load fluctuation increases. For instance, if fluctuation is set to 0.08 HP and detection time is set to 5.0 seconds, the LFS will stop the free stall cleaner after 5 seconds of sampling a 0.08 HP fluctuation. Conversely, if the fluctuation is 0.16 HP (twice as much), the free stall cleaner will stop after 2.5 seconds (twice faster).

Note: If scrapers have been moving more than 40 seconds since the beginning of the stroke, scrapers will back up 30 seconds and stop. Then, the free stall cleaner will try to resume operation until the number of re-start is reached (see 03 : Number of re-start).

1. Press MENU to select Parameter
2. Select parameter 02 using the arrows
3. Press PROG
4. Set the detection time using the arrows (1.0 to 15.0 seconds)
5. Press PROG to confirm.

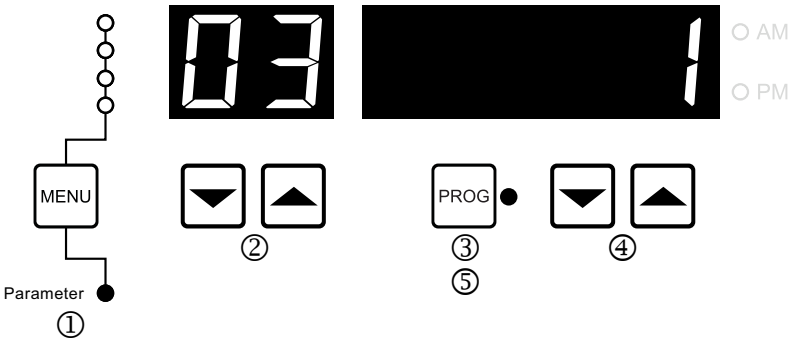


03 : Number of re-start

Whenever the LFS detects an obstacle and stops the free stall cleaner, the control can trigger the alarm or resume normal operation as per the number of re-start.
If an obstacle remains after reaching the number of re-start, the LFS stops the free stall cleaner and triggers the alarm.
The re-start counter is reset 60 seconds after operating under normal load or at the end of stroke.

Note: If scrapers have been moving more than 40 seconds since the beginning of the stroke, scrapers will back up 30 seconds and stop. The free stall cleaner will resume operation until the number of re-start is reached.

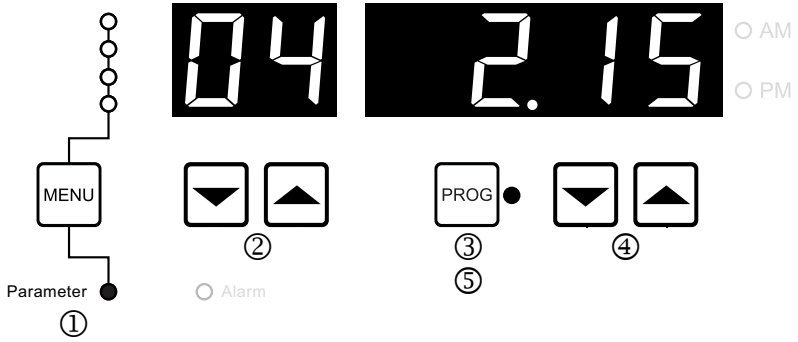
1. Press MENU to choose Parameter
2. Select parameter 03 using the arrows
3. Press PROG
4. Set the number of re-start using the arrows
   (0 to 5, or infinite inF)
5. Press PROG to confirm.



04 : Maximum load (HP)

The free stall cleaner cannot exceed the maximum load at any time. When operating the free stall cleaner for the first time, the maximum load should be set 0.15 HP above the HP rating of the motor. For instance, with a 2 HP motor, set the maximum load to 2.15 HP.

1. Press MENU to choose Parameter
2. Select parameter 04 using the arrows
3. Press PROG
4. Set the maximum load using the arrows (0.10 to 20.00 HP)
5. Press PROG to confirm.



Note: If the maximum load is reached 40 seconds (and over) after the beginning of the stroke, scrapers back up 30 seconds and stop. The LFS triggers the alarm «Maximum load exceeded» (see Alarm A2 : Maximum load exceeded).

Advanced user

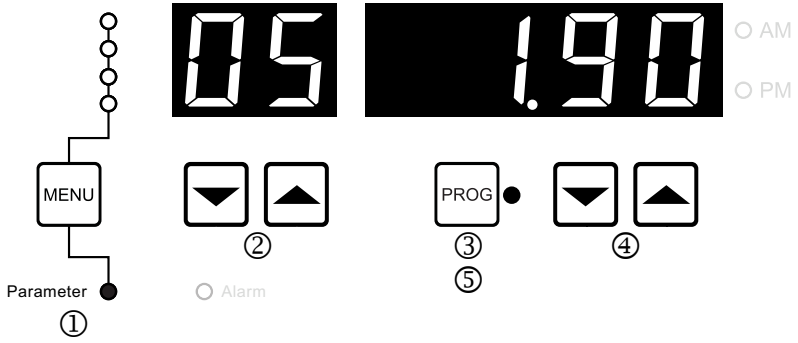
If your familiar with the operation of the LFS and the free stall cleaner, you can fine tune the maximum load:

a) Start the free stall cleaner when alleys are full of manure
b) Select the HP display, see Real-time reading
   F2 : Load (HP)
c) Take note of the higher HP value in one minute. This value should be set as the maximum load.

05 : Minimum load (HP)

The minimum load is caused by a mechanical failure of the free stall cleaner (i.e. drive belt, cable, chain). When operating the free stall cleaner for the first time, set the minimum load to 0.10 HP.

1. Press MENU to choose Parameter
2. Select parameter 05 using the arrows
3. Press PROG
4. Set the minimum load using the arrows (0.10 to 20.00 HP)
5. Press PROG to confirm.



Note: If no load is detected during 15 seconds, the free stall cleaner stops. The LFS triggers the alarm «No load detected» (see Alarm A3 : No load detected).

Advanced user

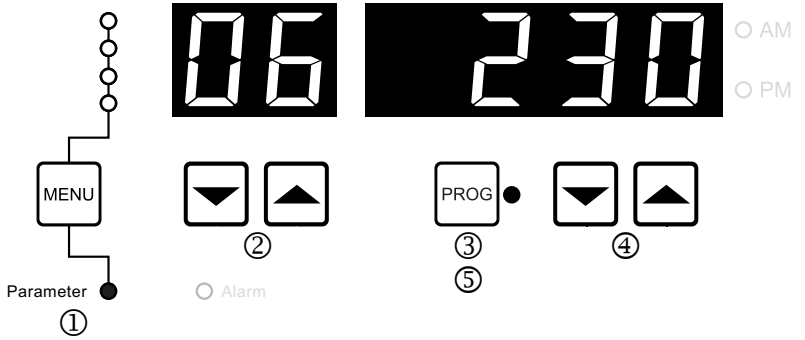
If your familiar with the operation of the LFS and the free stall cleaner, you can fine tune the minimum load:

a) Disconnect and lock electrical power
b) Remove the drive belt
c) Turn on electrical power
d) Start the free stall cleaner, then select the display **HP**, see **REAL-TIME READING F2 : Load (HP)**
e) Add 0.1 hp to the HP displayed. This value is the minimum load in case of mechanical failure.

06 : VOLTS

Set «voltage» as per the motor specification.

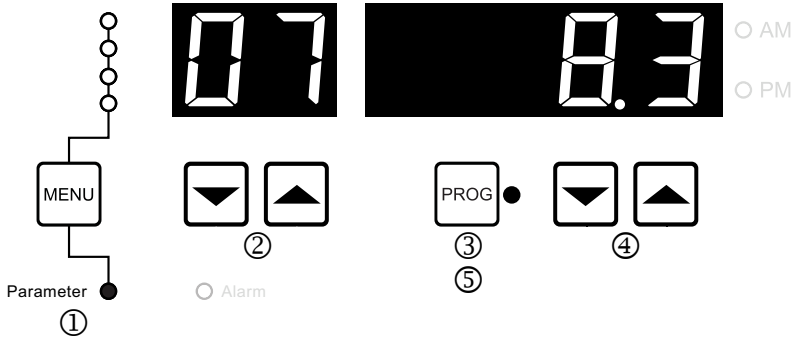
1. Press MENU to choose Parameter
2. Select parameter 06 using the arrows
3. Press PROG
4. Set voltage using the arrows (50 to 700 volts)
5. Press PROG to confirm.



07 : AMPS

Set «amperage» as per the motor specification.

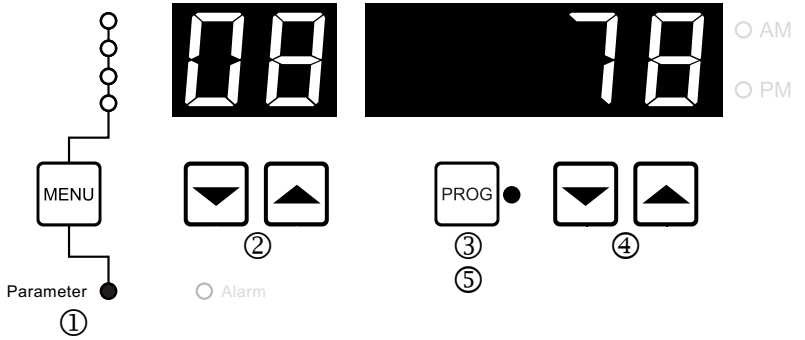
1. Press MENU to choose Parameter
2. Select parameter 07 using the arrows
3. Press PROG
4. Set amperage using the arrows (0.5 to 20.0 amps)
5. Press PROG to confirm.



08 : NEMA NOM. EFF. (%)

Set «nominal efficiency» as per the motor specification.

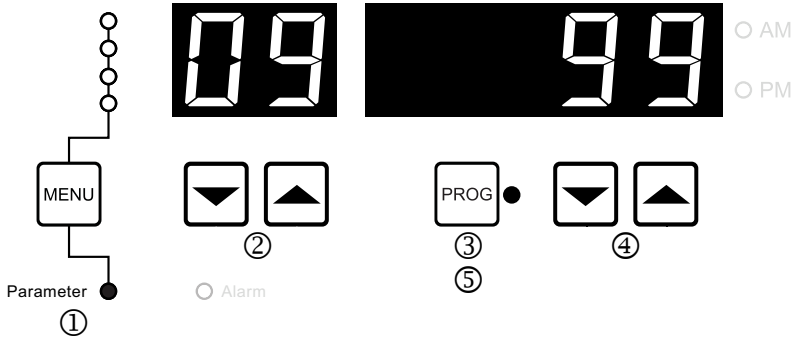
1. Press MENU to choose Parameter
2. Select parameter 08 using the arrows
3. Press PROG
4. Set nominal efficiency using the arrows (10 to 100 %)
5. Press PROG to confirm.



09 : P.F. (%)

Set «power factor» as per the motor specification.

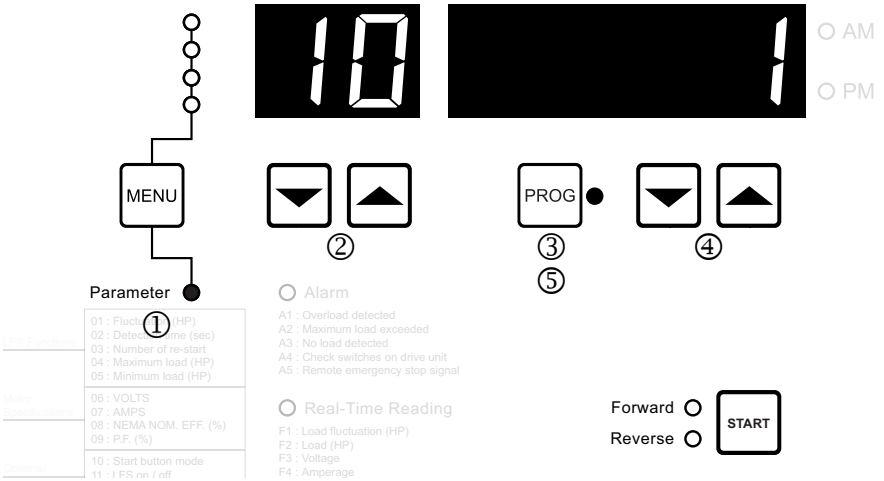
1. Press MENU to choose Parameter
2. Select parameter 09 using the arrows
3. Press PROG
4. Set power factor using the arrows (10 to 100 %)
5. Press PROG to confirm.



10 : Start button mode

When LFS is on AUTOMATIC, pressing the START button starts the free stall cleaner for a preset number of stroke. The parameter 10 sets the number of stroke.

1. Press MENU to choose Parameter
2. Select parameter 10 using the arrows
3. Press PROG
4. Set the number of stroke using the arrows (1 to 10 strokes)
5. Press PROG to confirm.



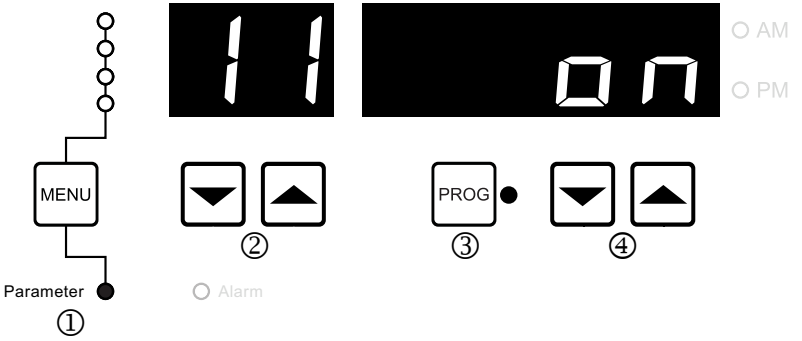
*Note: When pressing START, the LFS replaces the **No. of stroke / cleaning** by the value of the parameter 10.*

Scrapers stop for 10 seconds between each stroke.

11 : LFS on / off

This parameter sets the operating mode of the LFS sensor.

1. Press MENU to choose Parameter
2. Select parameter 11 using the arrows
3. Press PROG
4. Set the mode of the LFS sensor using the arrows
   on = on , normal setting
5. Press PROG to confirm.



Advanced user

If your familiar with the operation of the LFS and the free stall cleaner, the parameter 11 allows various settings of the LFS sensor in order to help troubleshooting:

OFF = LFS sensor off, the LFS sensor must be disconnected inside the control panel

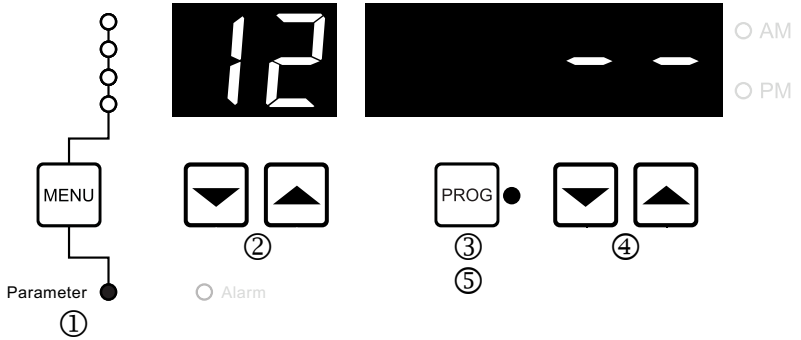
PF_F = the load (HP) is calculated with reference to a fixed power factor, as per the motor specifications, see 09 : P.F. (%)

cur = the LFS sensor monitors the motor amperage only.

12 : Scraper parking

Depending on manure alley layout, it can be convenient to park the scrapers at a specific end of the manure alleys (i.e. FORWARD or REVERSE).

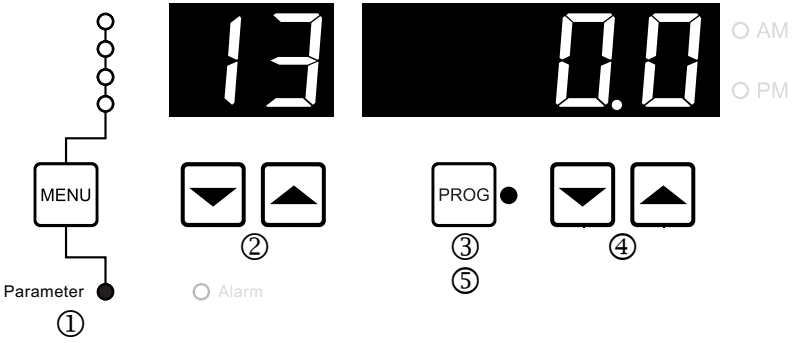
1. Press MENU to choose Parameter
2. Select parameter 12 using the arrows
3. Press PROG
4. Set the parking position using the arrows:
   - -- = no effect
   - F0 = scrapers will park at the FORWARD end of manure alley
   - rE = scrapers will park at the REVERSE end of manure alley
5. Press PROG to confirm.



13 : Scraper withdrawal (min.)

Depending on manure alley layout, it may be convenient to move scrapers backward at the end of stroke in order to clear the passageway.

1. Press MENU to choose Parameter
2. Select parameter 13 using the arrows
3. Press PROG
4. Set the scraper withdrawal time using the arrows
   (0.0 to 5.0 minutes)
   - - - = no scraper withdrawal
5. Press PROG to confirm.



14 : Pump start signal

The parameter 14 allows 4 different settings:

1 = **Pump start signal** A remote switch is connected to the PUMP SWITCH terminals (see page 30). When the switch is activated, the PUMP SIGNAL OUTPUT (see page 30) is activated.

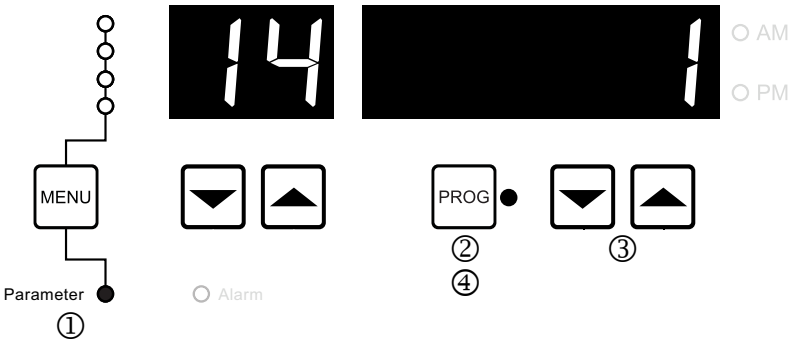
2 = **Remote start** A remote switch is connected to the PUMP SWITCH terminals (see page 30). When the switch is activated, the LFS starts the free stall cleaner.

3 = **Manure apron** A remote switch is connected to the PUMP SWITCH terminals (see page 30). When the switch is activated, the control deactivates the LFS sensor and the parameter *Maximum load* until the end of stroke. The LFS sensor and the parameter *Maximum load* resume normal operation at the beginning of the next stroke.

4 = **Gradual discharge** A remote switch is connected to the PUMP SWITCH terminals (see page 30). When the switch is activated, scrapers operate as per OFF & ON cycle until the end of stroke.

Note: The remote switch is optional, available at your GEA distributor.

1. Press and hold MENU **for 5 seconds**
2. Press PROG
3. Choose a setting using the arrows (1 to 4)
4. Press PROG to confirm.

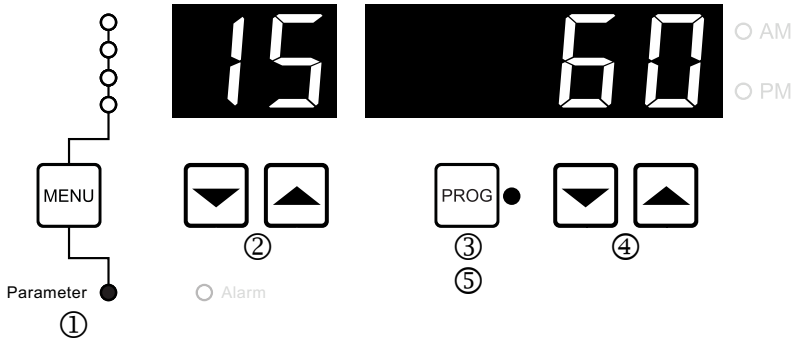


Note: If you choose setting #4 (gradual discharge), you must set the parameters 15 and 16 in order to set running and waiting times (see 15 : Running time and 16 : Waiting time).

15 : Running time (sec.)

If you chose **gradual discharge** (see 14 : Pump start signal), scrapers operate as per an OFF & ON cycle, at the end of stroke. Set the running time:

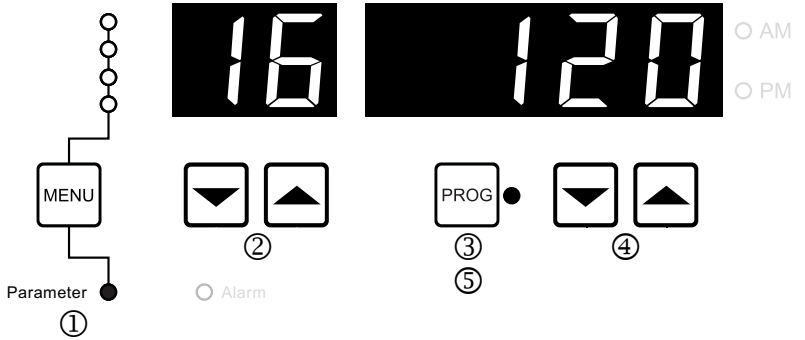
1. Press and hold MENU **for 5 seconds**
2. Choose parameter 15 using the arrows
3. Press PROG
4. Set the running time using the arrows (1 to 250 seconds)
5. Press PROG to confirm.



16 : Waiting time (sec.)

If you chose **gradual discharge** (see 14 : Pump start signal), scrapers operate as per an OFF & ON cycle, at the end of stroke. Set the waiting time:

1. Press and hold MENU **for 5 seconds**
2. Choose parameter 16 using the arrows
3. Press PROG
4. Set the waiting time using the arrows (1 to 250 seconds)
5. Press PROG to confirm.

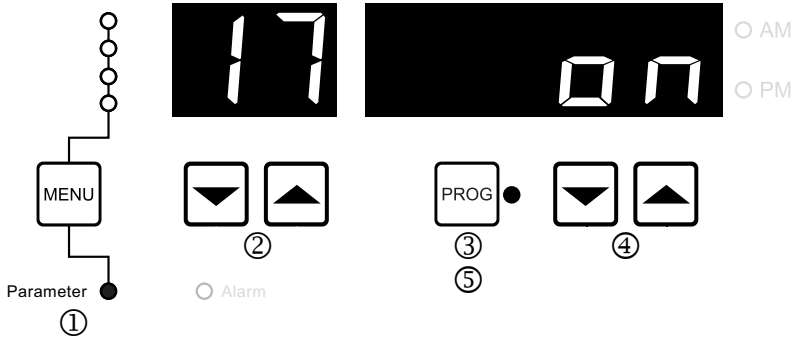


17 : Defrost

Some cold barns require the free stall cleaner to operate frequently in order to prevent freezing. When defrost is ON, the cleaner operates for short periods, 24 hours a day.

Note: Specific starting times have priority over defrost cycles.

1. Press and hold MENU **for 5 seconds**
2. Choose parameter 17 using the arrows
3. Press PROG
4. Set the defrost parameter using the arrows
   OFF = defrost inactive
   on = defrost active
5. Press PROG to confirm.

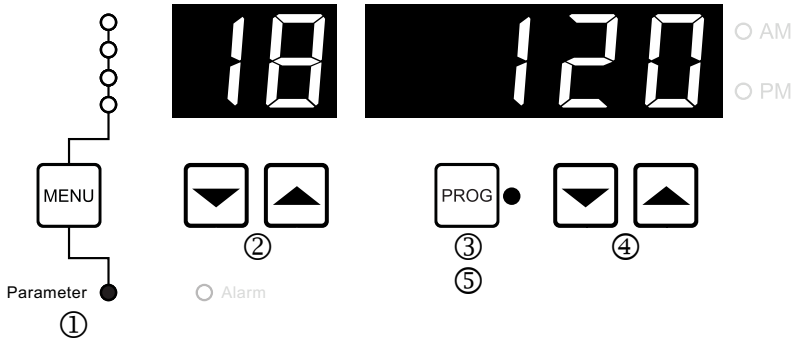


Note: If defrost is ON, you must set the parameters 18 and 19 in order to set running and waiting times
(see 18 : Defrost running time and 19 : Defrost waiting time).

18 : Defrost running time (sec.)

If **defrost** is ON (see 17 : Defrost), scrapers operate as per OFF & ON cycles, 24 hours a day. Set the running time:

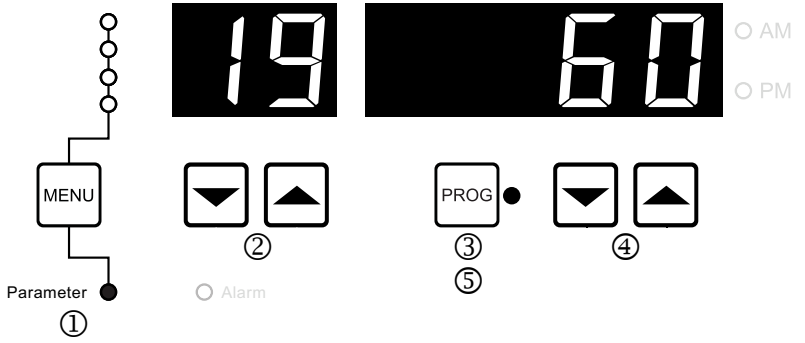
1. Press and hold MENU **for 5 seconds**
2. Choose parameter 18 using the arrows
3. Press PROG
4. Set the running time using the arrows (1 to 250 seconds)
5. Press PROG to confirm.



19 : Defrost waiting time (min.)

If **defrost** is ON (see 17 : Defrost), scrapers operate as per OFF & ON cycles, 24 hours a day. Set the waiting time:

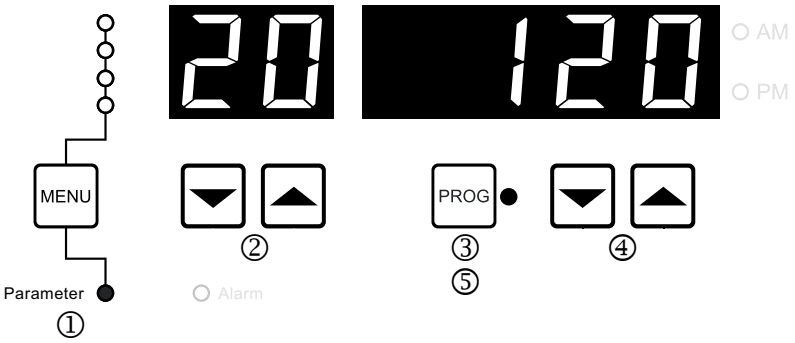
1. Press and hold MENU **for 5 seconds**
2. Choose parameter 19 using the arrows
3. Press PROG
4. Set the running time using the arrows (1 to 1000 minutes)
5. Press PROG to confirm.



20 : Dripping time (min.)

If you chose **manure apron** (see 14 : Pump start signal), scrapers will pause before passing in manure apron mode. Set the dripping time:

1. Press and hold MENU **for 5 seconds**
2. Choose parameter 20 using the arrows
3. Press PROG
4. Set the waiting time using the arrows
   (1 to 1000 minutes)
5. Press PROG to confirm.



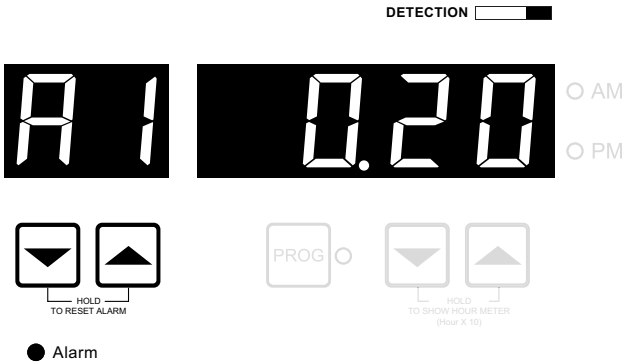
ALARMS AND ERRORS

A1 : Overload detected

Alarm A1 is caused by an obstacle in the manure alley or an improper setting of the parameters «Fluctuation» and «Detection time».
See 01 : Fluctuation (HP) and 02 : Detection time (sec).
Alarm A1 is shown if:

a) the number of re-start is reached
   or
b) scrapers have been in operation for less than than 40 seconds since the beginning of the stroke.

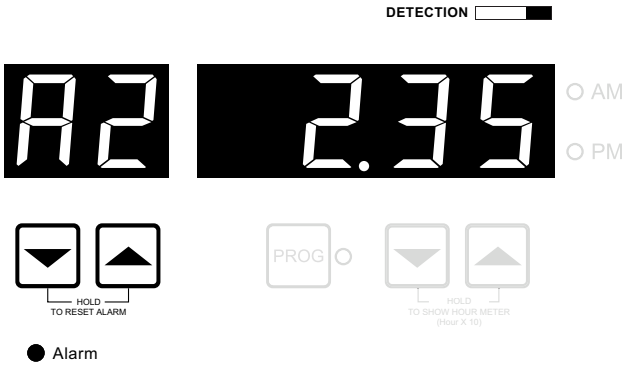
Note: The last load fluctuation is displayed



A2 : Maximum load exceeded

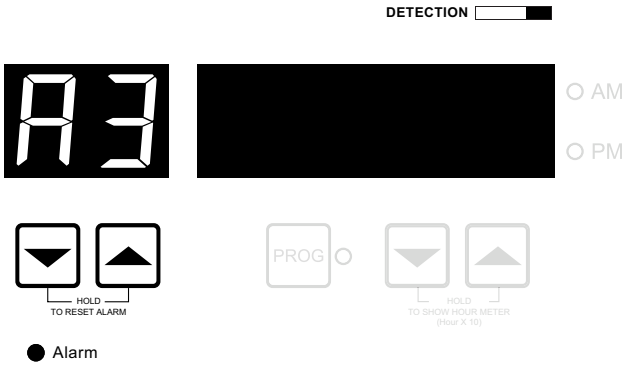
Alarm A2 is caused by an excessive load in front of the scrapers or an improper setting of the «Maximum load» parameter.
See 04 : Maximum load (HP).

Note: The last load fluctuation is displayed



A3 : No load detected

Alarm A3 is caused by a mechanical failure (belt, cable, chain, gearbox, shear bolt) or an improper setting of the parameter «Minimum load».
See 05 : Minimum load (HP).



A4 : Check switches on drive unit

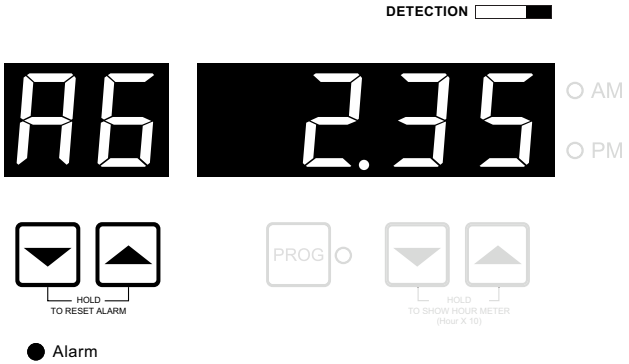
Alarm A4 is caused by a faulty limit switch, misrolled cable switch (cleaner with cable) or wiring between the LFS and the drive unit switches.

A5 : Remote emergency stop signal

The remote emergency stop signal comes from another LFS control panel. Alarm A5 is displayed if the safety signal is shut off more than 10 seconds.

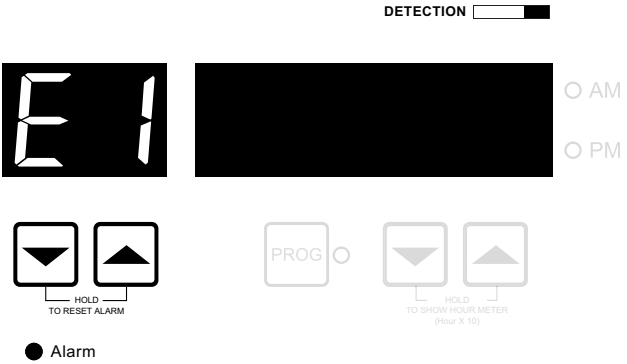
A6 : Overload detected at the end of stroke

An overload is detected when scrapers were close to the end of stroke. This alarm can be caused by a buildup of manure at the end of stroke or by a faulty adjustment of the stroke limit switch.



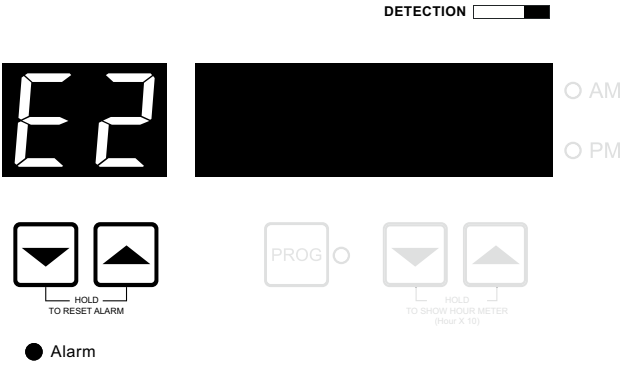
E1 : No communication between motherboard and LFS sensor

Alarm E1 indicates a faulty connection between the motherboard and the LFS sensor, or a faulty motherboard, or a faulty LFS sensor.



E2 : Bad communication between motherboard and LFS sensor

Alarm E2 indicates that the motherboard receive a weak signal from the LFS sensor. Possible cause: faulty connection, corroded terminals, faulty LFS sensor, faulty motherboard.



REAL-TIME READING

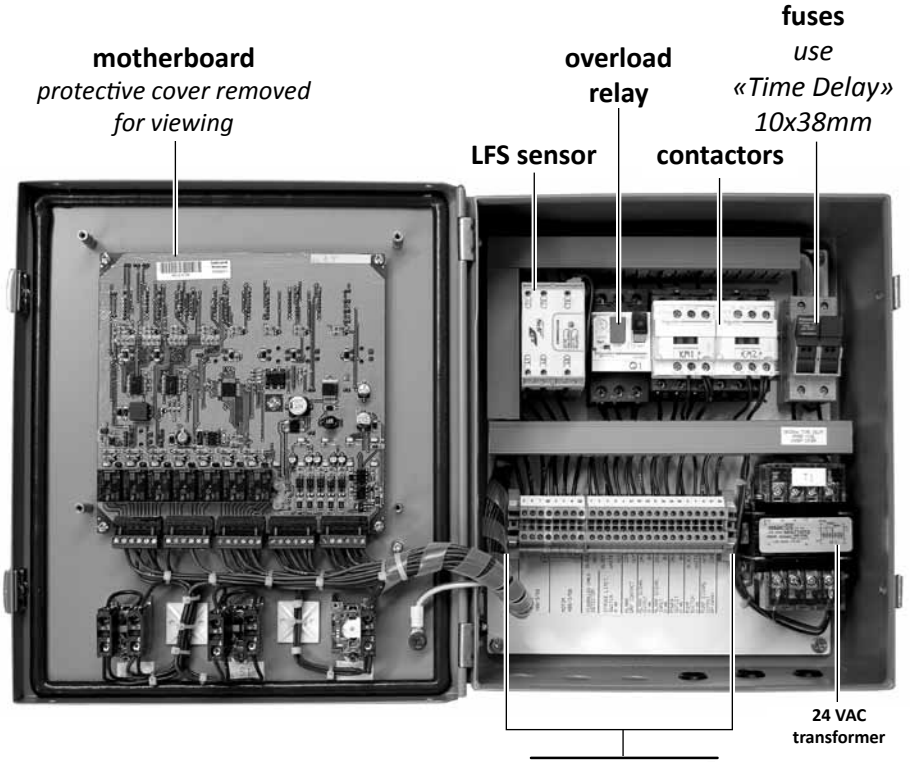
While cleaning, the control can display 8 different values that are monitored by the LFS sensor. These values are useful to watch the operation of the LFS, the motor and the electrical power when scrapers are operating. Data appears 15 seconds after the beginning of the stroke:

- F1 = load fluctuation (HP), default display
- F2 = free stall cleaner load (HP)
- F3 = power line voltage (V)
- F4 = motor amperage (A)
- F5 = motor power factor (%)
- F6 = power line frequency (Hz)
- F7 = constant used by the LFS sensor
- F8 = voltage on the 3rd phase of the power line (V)

1. Select the display using the arrows

INSTALLATION AND WIRING

INSIDE VIEW OF THE LFS CONTROL PANEL



⚠ ELECTRIC SHOCK HAZARD

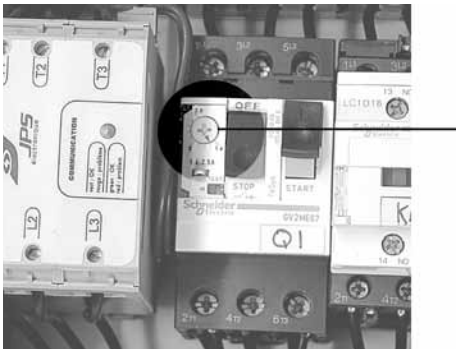
Electrical connection and wiring must be done by a certified electrician in accordance with local regulation.

A disconnect switch must be installed to turn off the power to the LFS control.

The LFS control and the motor of the drive unit must be connected to earth ground ⏚

Disconnect and lock electrical power before connecting the LFS control panel.

1. Install the control panel on the wall
2. Connect the motor
3. Connect the switches and the low voltage terminals
4. Adjust the overload relay according to the AMPERAGE written on the motor



Setting of the overload relay

5. Connect the LFS control to the disconnect switch
6. Close the door of the control panel and turn the power on
7. Set parameters 1 to 19 , see PROGRAMMING THE PARAMETERS

MAN-TEC-LFS-EN
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