

TWINCA

DUMPER



User manual ES-800 F2A

Contents

1. How to use the machine
2. Protection of the environment
3. Technical data
4. Personal safety
5. Emergency stop
6. Break release
7. Transportation of the machine
8. Driving in terrain
9. Puncturing
10. Check before starting
11. How to operate the machine
12. Troubleshooting guide
13. Service and maintenance
14. Pictographs
15. Hydraulic diagram
16. Wiring diagram
17. Warranty
18. A-declaration

Twinca A/S reserves the right to change the specifications of the machine without a prior binding notice

1 How to operate the machine

Twinca mini dumper is for transportation of primarily soil, granulates, stone, concrete and organic materials.

Twinca dumper has a unique ergonomic steering system. It is easy to manoeuvre in a way that hard physical strain during operation of heavy loads is minimised.

Twinca dumper makes the work on the site easier. Can manage anywhere and there is no need for dock plates, not even when driving on uneven terrain.

Twinca dumper is particularly suitable for landscape gardeners, contractors, farmers, sextons, municipal service divisions and rental companies.

2 Environmental protection



For the protection of the environment, it is important that discarded machine parts and accessories be delivered to relevant recycling depots, as the machine contains reusable materials.

Machine parts	Material
Steering wheel	Steel
Frame	Steel
Battery 500383	2 x 12 V / 150 Ah
Hydraulic gear pump	Aluminium and steel
Variable hydraulic pump	Steel and brass
Dump bed	Steel
Other parts	Steel and aluminium

Since the noise level of the machine is less than 70 db(A), the noise level has not been measured.

3 Technical data

	Data
Width (mm)	880
Length (mm)	2270
Height (dump bed)/(control lever) (mm)	1110/1140
Lifting height (mm)	1710/3030
Driving conditions	
Terrain	600 kg
Solid ground	800 kg
Maximum speed - forwards (km/h)	6
Maximum speed - backwards (km/h)	6
Bed capacity - loading volume (l)	385
Bed capacity - maximum volume (kg)	Up to 800
Machine weight (kg)	503
Noise level (dB(A))	<70
IP Code	IP 44
Battery	2 x 12 V / 150 Ah
Hydraulic oil	832 WRHV

4 Personal safety

For your own personal safety and the safety of your surroundings, it is important that you read and understand the user manual. It is the responsibility of the user to perfectly understand the manual to ensure the correct use and safe operation of the machine.

If you feel uncertain as to the correct handling and use of the Twinca dumper, it is important that you get in contact with the seller or Twinca A/S.



Warning Faulty maintenance could be risky. Read and understand this section before carrying out any kind of maintenance, service or repair of the machine.

- This machine is very heavy and should not be lifted without assistance. **Get help** and use a suitable lifting appliance.
- Keep the working area free and make sure that persons without affiliation to the working process are at a safe distance from the machine and the working area.
- The user should wear personal protective equipment when required.
- Be sure that you know how to switch off the machine before you turn it on, in case you get into some kind of trouble during the operation of the machine.
- Always switch off the engine before transportation or servicing/repair of the machine.
- Never modify or remove safety devices which have been mounted in order to ensure your personal safety. It is important that you check the correct functioning of the safety devices. If such devices are defective or missing – **DO NOT OPERATE THE Twinca dumper** until the safety devices have been restored or repaired.
- Do not operate the machine if you are ill, feel tired or are under the influence of alcohol or drugs.
- Never stand on the machine at any time.
- Do not use the Twinca dumper for transportation of people or animals.
- Driving downhill should always be done while reversing.
- Walk carefully around the machine, as the dump bed has sharp edges.
- **Make sure that the dump bed is always in the lowered position when you leave the machine!**

Personal protective equipment

When operating the machine, always wear suitable personal protective equipment such as safety goggles, safety gloves, ear plugs, dust respirator and safety footwear. Wear the personal protective equipment required for the work to be done. Cover and protect long hair and take off all items of jewellery, as they may become stuck in the moving parts of the machine.

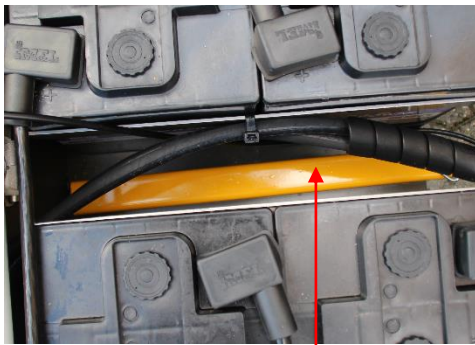
4 Personal safety

Always mount the safety devices in front of the cylinder for the dump bed before working on the engine, hydraulic devices and other types of service of the machine.

How to position safety devices when not in use. (fig. 1 pos. 1)

How to position safety devices when in use. (fig. 2 pos. 1)

FIG. 1



POS. 1

FIG. 2



POS. 1

Parking brakes

The parking brake is released automatically during operation of the machine, and is automatically activated when the machine stops.

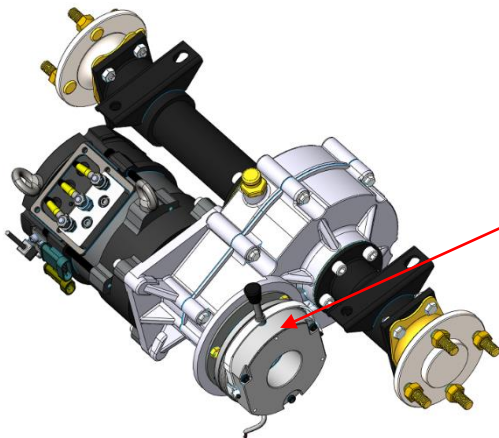
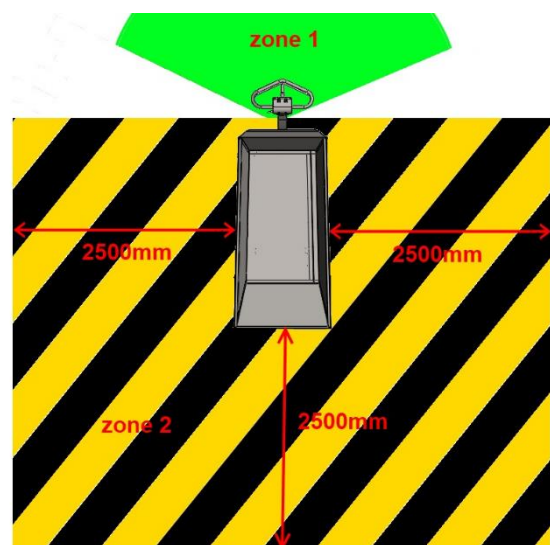


FIG. 3



The user is allowed only to be in zone 1.

Because of the risk of being trapped, the user must make sure that nobody is in zone 2 during operation.



5 Emergency stop

The emergency stop breaks the electric circuit.



6 Break release

By pulling the cable (pos.1) the break will get released, the power have to be off.

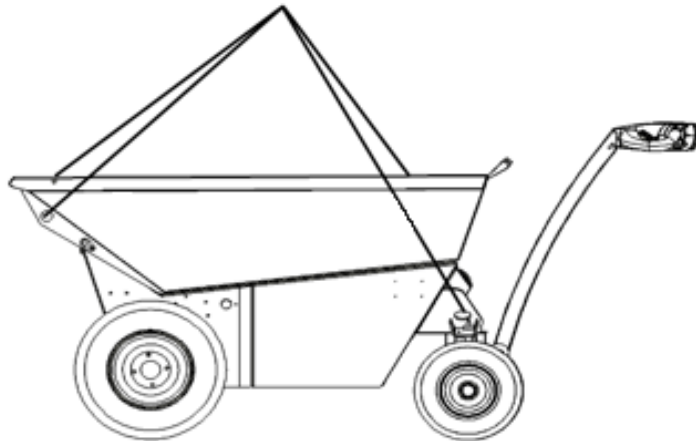


POS.1

7 Transportation of the machine

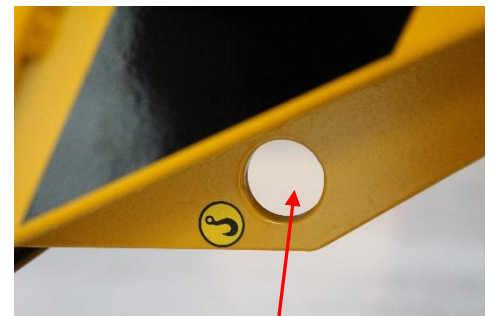
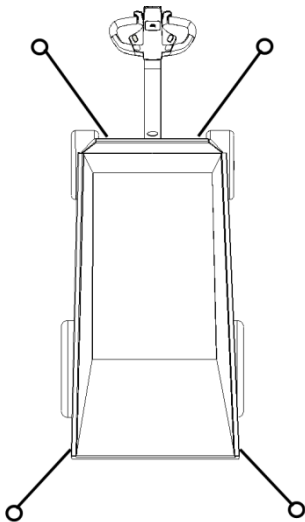
Lifting/transportation of the machine.

When lifting the machine, always mount wires or chains in all four lifting points. In this way, you ensure the most stable lifting.



Lashing the machine.

Secure the machine in each of the four lifting points during transportation.



8 Driving in terrain

The driver always have to be at the highest point when driving downhill.



9 Puncturing

When puncturing bring the machine to stop and be sure the box is completely down



10 Check before starting

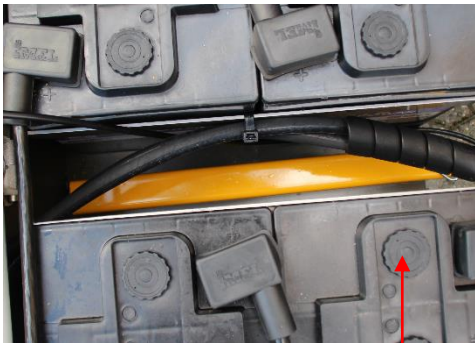


Inspection before starting.

The following inspection before starting describes what is to be checked before starting and what is to be checked after four hours' continuous use. We refer to the service section for a more detailed instruction. In the event of any error, do not use the Twinca dumper until the error has been rectified.

- Check the Twinca dumper thoroughly to locate any sign of faults and imperfections.
- Check that all parts are there and that they function well.
- Check the hydraulic oil level - and fill up if necessary..
- Check the level of acid in the batteries. The liquid should cover all of the cells. Each battery has 3 screw lids for inspection of the acid level. (fig. 1 pos. 1)
- Check the tyre pressures.

FIG. 1



POS. 1

Daily recharging.

Connect to 230V supply.

The machine is inactive as long as the battery charger is activated.

Recharging of the machine is done by connecting a power cable to the connector on the machine.



11 How to operate the machine

The machine is fully electrically powered. When you deactivate the rocker arm, the machine is slowed to a full stop in the course of 3 seconds.

In order to advance, lift the rocker arm upwards (fig. 1 pos. 2) (forwards).

In order to reverse, press the rocker arm down (fig. 1 pos. 2) (backwards).

NOTE! The parking brake is automatically released when the machine is operated.

Activation of the dump bed.

The switch (fig. 1 pos. 3) controls the hydraulic cylinder.

Press the upper part of the switch and the hydraulic cylinder raises.

Press the lower part of the switch and the hydraulic cylinder descends.

"Belly" function.

When you activate the "belly" function (fig. 1 pos. 1) the operating of the machine is changed to forward driving, away from the driver and then it stops.

Display. (fig. 2 pos. 1)

Indication of operating hours and power level of the batteries.

In the event of an error on the machine, an alarm code is displayed.

Key. (fig. 2 pos. 2)

When you turn the key, the controller of the machine is activated. The operating hours counter is started.

Activation of the Scissors lift (fig. 1 pos. 3).

Press the upper part of the switch and the scissors lift raises.

Press the lower part of the switch and the scissors lift descends.

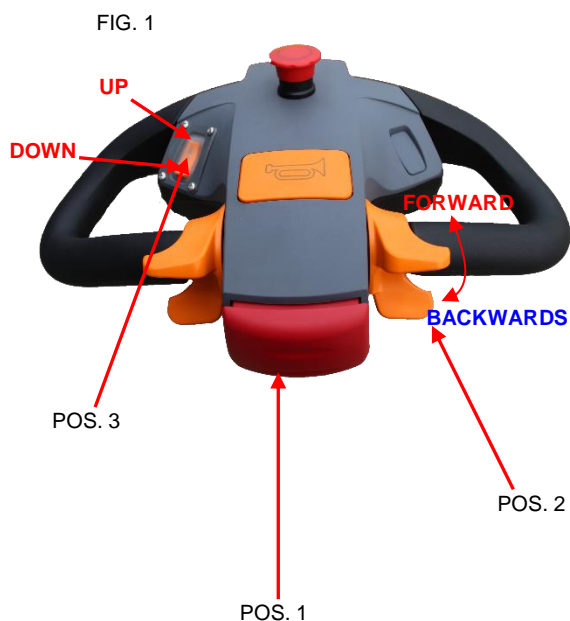
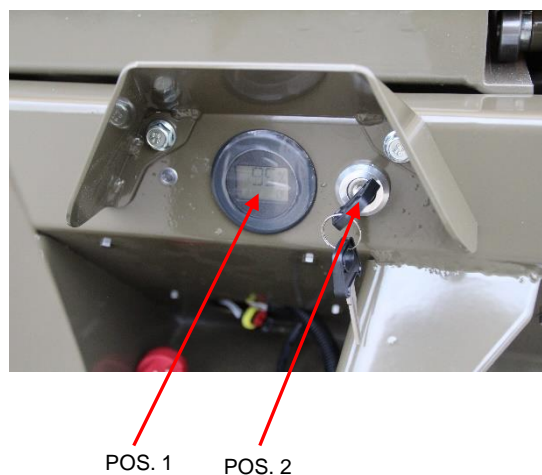


FIG. 2



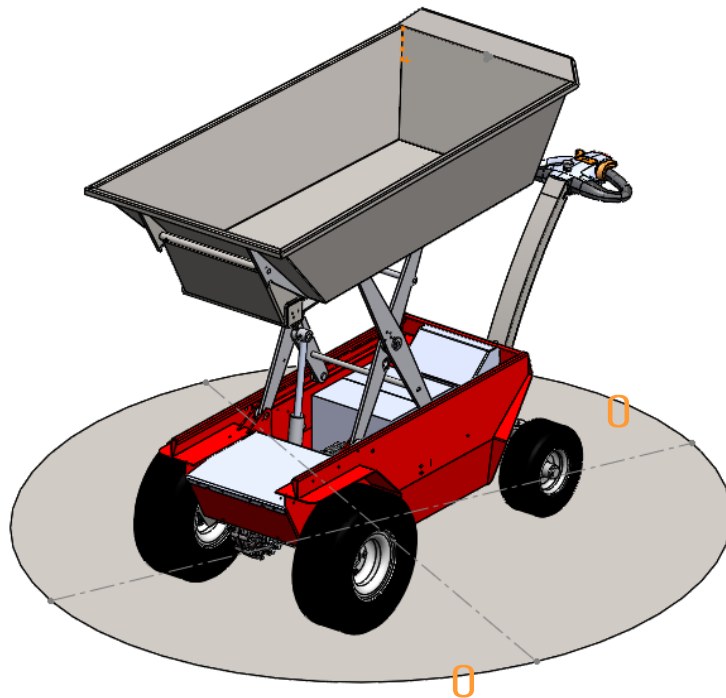
11 How to operate the machine



Warning If it is necessary to drive with a full load down a slope of more than 8% you should turn the machine and reverse down the slope.

How to empty the dump bed

- Stop the machine before you start tipping the dump bed.
- Never lean over the machine when tipping the dump bed.
- Be sure that the contents can slide off easily when the dump bed is tipped.
- Never tip the dump bed when the front of the machine is positioned with the front facing down.
(As a minimum, a Twinca dumper equipped with scissors lift must stand on a horizontal flat surface.)
- Never stand in front of the machine to release what is stuck in the dump bed.
Remove what is stuck only when the dump bed is down.



The above figure shows that the surface on which the machine is positioned should be flat (i.e., at zero degrees) when you tilt the dump bed.

MAKE SURE THAT NOBODY IS BESIDE OR IN FRONT OF THE MACHINE DURING OPERATION.

12 Troubleshooting guide

Problem	Type	Solution
Reduced capacity of the battery.	Battery acid low Battery is worn	Change
The dump bed does not move normally.	Missing hydraulic oil	Fill up hydraulic oil. Type: Hydraulic oil 832 WRHV

13 Service and maintenance

Prior to service. Always position the yellow safety devices on the hydraulic cylinder. (fig. 2 pos. 1)
Switch off the current to the machine.

Note - Even though the main switch is off there is still plenty of energy in the batteries!

Hydraulic oil

Change the hydraulic oil once a year. If there is any sign of leakage, switch off the machine and contact your local dealer or Twinca A/S.

Type: Hydraulic oil 832 WRHV

How to clean the machine

For cleaning - use only a brush and water.

Note Never clean the electrical motor with a high-pressure cleaner or a water hose. Use only a cloth or air hose to clean the motor.

FIG. 1



FIG. 2



13 Service and maintenance

Routine maintenance		Daily	Every 20 hours	Every 50 hours
Greasing points on hydraulic cylinder	To be done		●	
Greasing points on tilting point of the dump bed	To be done		●	
Greasing points on the steering	To be done		●	
Tighten steering bearings	To be done		●	
Check acid in the batteries	To be done			●
Hydraulic oil	Change			once a year
Check tyre pressures	To be done	●		
Safety inspection	To be performed by qualified person			once a year
Gear oil	Change			once a year

Battery.

The machine contains 2 x 12 V / 150 Ah batteries, which contain lead and acid.

Giving a total voltage level of 24 V.

Position the machine in a ventilated room during charging.

The battery has a cycle of 800-1000 chargings.

If the battery discharges faster than usual it means that the battery should be replaced.

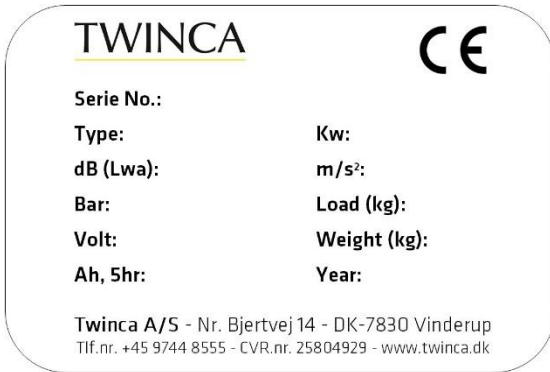
Replace all batteries at the same time.

Charging instructions:

Charge voltage level at 77°F / 25°C	
System voltage	24V
Daily charging	29.6V

14 Pictographs

Name plate



Warning signs:

Danger of being trapped

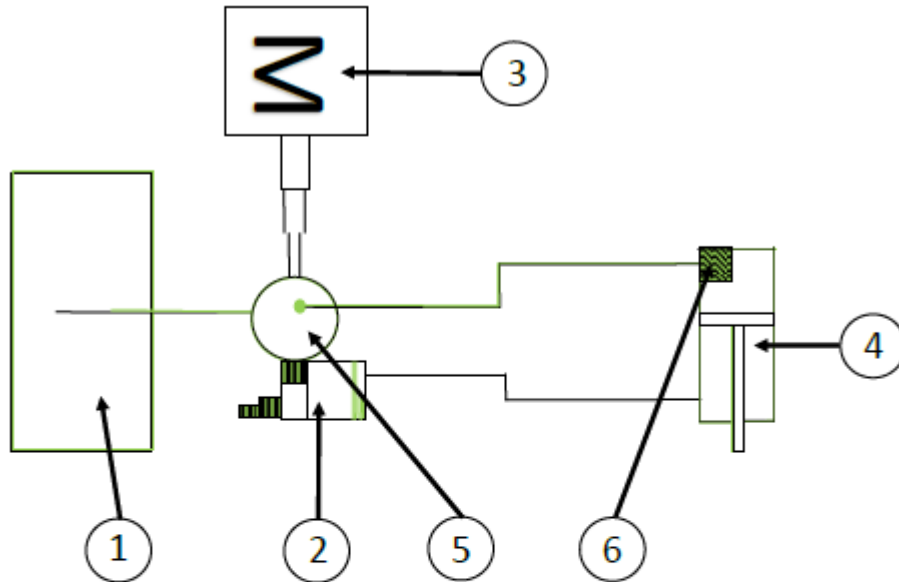


Info signs:

Lashing point

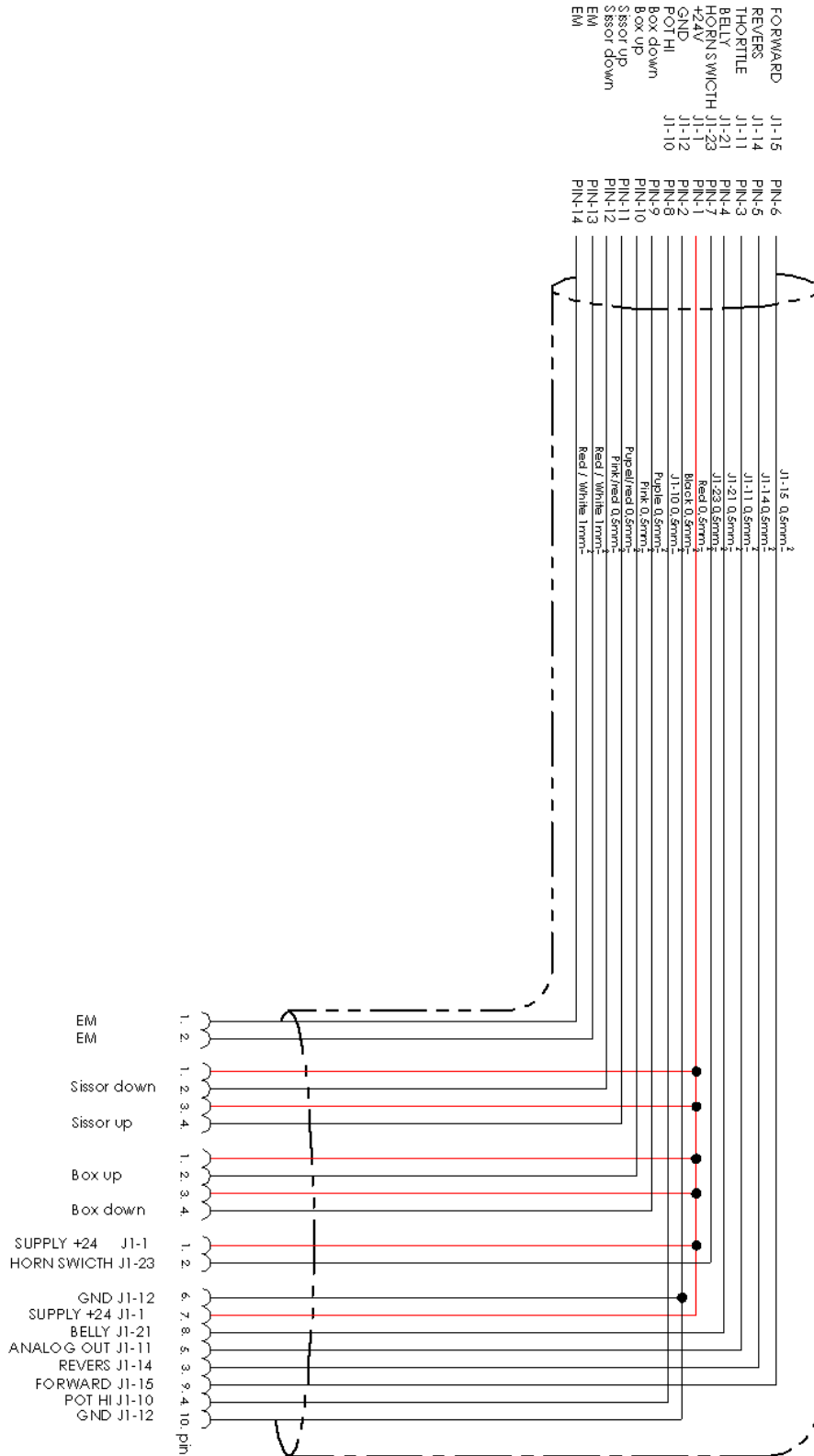


15 Hydraulic diagram

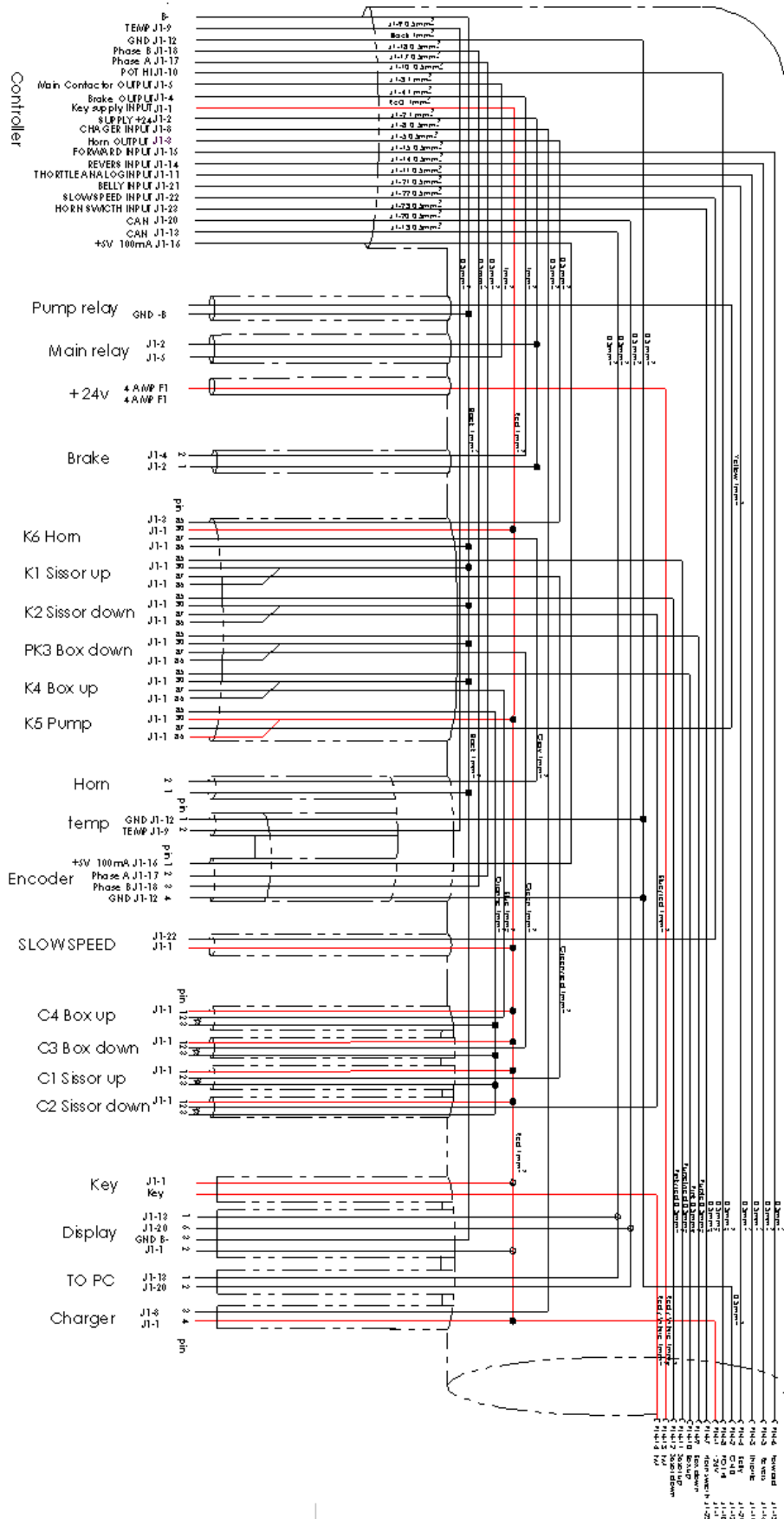


1. Olietank
2. Ventil
3. El-motor
4. Hydraulikcylinder
5. Hydraulikpumpe
6. Slangebrudsventil

16 Wiring diagram



16 Wiring diagram



17 Warranty

The warranty for your new Twinca dumper is valid according to the sales warranty for a period of 1 year (12 months) as from the acceptance of the agreement. The warranty of Twinca A/S includes defects as to construction, materials or installation.

The warranty of Twinca A/S does *not* include the following

- Any damage caused by missing maintenance, incorrect use or as a result of the maintenance instructions not being properly followed.
- Amendments, additions or repairs made by others than Twinca A/S or dealers authorised by Twinca A/S.
- Any damage caused by transportation or shipment to or from Twinca A/S or any dealer authorised by Twinca A/S in case of repair or evaluation of claim for damages within the warranty.
- Lost earnings and consequential damages.
- Driving, bridge and road toll and other expenses as to transportation and persons.

The following parts are not covered by the warranty.

- Hydraulic hoses
- Key ignition

Twinca A/S and / or its authorized agents, managers, employees or insurance companies accept no liability for consequential damage or other kinds of damage, loss or expenses relating to or due to or inability to use the machine for any purpose.

Claim form

All warranty claims must be directed to Twinca A/S by telephone, e-mail or in writing.

Contact in case of claim:

Tel: +45 9744 8555 #5 E-mail: RMA@twinca.dk

Contact:

Twinca A/S
Nr. Bjertvej 14
DK-7830 Vinderup

18 A-declaration:

EU declaration of conformity. appendix II

Manufacturer:

Company name: Twinca A/S
Address : Nr.Bjertvej 14
Postal code/City: 7830 Vinderup
Country : Denmark
Telephone : +45 9744 8555
VAT No. : 2580 4929

In charge of the technical dossier:

Managing Director: : Klaus Strøm Kristensen

hereby declares, that

Machine:

Mark : Twinca Dumper

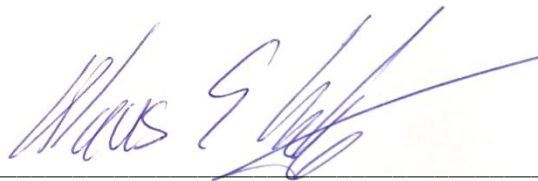
Serial number : _____

Type : Mini dumper ES-800 AC

Was manufactured in accordance with: Maskindirektivet 2006/42/EF

Title : Managing Director
Name : Klaus S. Kristensen
Company : Twinca A/S

Vinderup 1 January 2020



Klaus Strøm Kristensen

TROUBLESHOOTING CHART INDEX

Flash Code		Fault Name	CAN Index	Page
1-2	0x12	Controller Overcurrent	0x2510	133
1-3	0x13	Current Sensor	0x2832	
1-4	0x14	Precharge Failed	0x2223	
1-5	0x15	Controller Severe Undertemperature	0x2141	
1-6	0x16	Controller Severe Overtemperature	0x2142	
1-7	0x17	Severe B+ Undervoltage	0x2120	
1-7	0x17	Severe KSI Undervoltage	0x2122	
1-8	0x18	Severe B+ Overvoltage	0x2130	134
1-8	0x18	Severe KSI Overvoltage	0x2132	
1-9	0x19	Speed Limit Supervision	0x2133	
1-10	0x1A	Travel Control Supervision	0x2134	
2-2	0x22	Controller Overtemperature Cutback	0x2140	
2-3	0x23	Undervoltage Cutback	0x2121	135
2-4	0x24	Overvoltage Cutback	0x2131	
2-5	0x25	Ext 5V Supply Failure	0x2531	
2-6	0x26	Ext 12V Supply Failure	0x2532	
2-8	0x28	Motor Temp Hot Cutback	0x2151	
2-9	0x29	Motor Temp Sensor	0x2150	
3-1	0x31	Main Driver	0x2222	136
3-2	0x32	EM Brake Driver	0x2320	
3-5	0x35	Proportional Driver	0x2440	
3-6	0x36	Encoder Fault	0x2230	
3-7	0x37	Motor Open	0x2240	
3-8	0x38	Main Contactor Welded	0x2220	
3-9	0x39	Main Contactor Did Not Close	0x2221	137
4-2	0x42	Throttle Input	0x2210	
4-6	0x46	NV Memory Failure	0x2830	
4-7	0x47	HPD Sequencing	0x2211	
4-7	0x47	Emer Rev HPD	0x2331	138
4-9	0x49	Parameter Change	0x2813	
4-10	0x4A	EMR Switch Redundancy	0x2817	
5-1	0x51	User 1 Fault thru User 32 Fault	0x2710	

Flash Code		Fault Name	CAN Index	Page
5-2	0x52	User 2 Fault	0x2711	138
5-3	0x53	User 3 Fault	0x2712	
5-4	0x54	User 4 Fault	0x2713	
5-5	0x55	User 5 Fault	0x2720	
5-6	0x56	User 6 Fault	0x2721	
5-7	0x57	User 7 Fault	0x2722	
5-8	0x58	User 8 Fault	0x2723	
5-9	0x59	User 9 Fault	0x2730	
6-1	0x61	User 10 Fault	0x2731	
6-2	0x62	User 11 Fault	0x2732	
6-3	0x63	User 12 Fault	0x2733	139
6-4	0x64	User 13 Fault	0x2740	
6-5	0x65	User 14 Fault	0x2741	
6-6	0x66	User 15 Fault	0x2742	
6-7	0x67	User 16 Fault	0x2743	
5-10	0x5A	User 17 Fault	0x2750	
5-11	0x5B	User 18 Fault	0x2751	
5-12	0x5C	User 19 Fault	0x2752	
5-13	0x5D	User 20 Fault	0x2753	
5-14	0x5E	User 21 Fault	0x2760	
5-15	0x5F	User 22 Fault	0x2761	
6-10	0x6A	User 23 Fault	0x2762	
6-11	0x6B	User 24 Fault	0x2763	
6-12	0x6C	User 25 Fault	0x2770	
6-13	0x6D	User 26 Fault	0x2771	
6-14	0x6E	User 27 Fault	0x2772	
6-15	0x6F	User 28 Fault	0x2773	
7-10	0x7A	User 29 Fault	0x2780	
7-11	0x7B	User 30 Fault	0x2781	
7-12	0x7C	User 31 Fault	0x2782	
7-13	0x7D	User 32 Fault	0x2783	
6-8	0x68	VCL Run Time Error	0x2820	140

Flash Code		Fault Name	CAN Index	Page
7-2	0x72	PDO Timeout	0x2541	140
7-3	0x73	Stall Detected	0x2231	
7-7	0x77	Supervision	0x2840	
7-9	0x79	Supervision Input Check	0x2841	
8-2	0x82	PDO Mapping Error	0x2542	
8-3	0x83	Internal Hardware	0x2835	141
8-7	0x87	Motor Characterization Error	0x2850	
8-8	0x88	Encoder Pulse Error	0x2234	
8-9	0x89	Parameter Out of Range	0x2811	142
9-2	0x92	EM Brake Failed to Set	0x2321	
9-3	0x93	Encoder LOS	0x2233	
9-4	0x94	Emer Rev Timeout	0x2330	
9-9	0x99	Parameter Mismatch	0x2812	
9-10	0x9A	Interlock Braking Supervision	0x2332	143
9-11	0x9B	EMR Supervision	0x2333	
10-1	0xA1	Driver 1 Fault	0x2160	
10-2	0xA2	Driver 2 Fault	0x2161	
10-3	0xA3	Driver 3 Fault	0x2162	
10-4	0xA4	Driver 4 Fault	0x2163	144
10-5	0xA5	Driver 5 Fault	0x2164	
10-8	0xA8	Driver Assignment	0x2632	
11-1	0xB1	Analog 1 Out Of Range	0x2620	
11-2	0xB2	Analog 2 Out Of Range	0x2621	
11-3	0xB3	Analog 3 Out Of Range	0x2622	145
11-4	0xB4	Analog 4 Out Of Range	0x2623	
B-5	0xB5	Analog 5 Out Of Range	0x2624	
11-6	0xB6	Analog 6 Out Of Range	0x2625	
11-7	0xB7	Analog 7 Out Of Range	0x2626	
11-8	0xB8	Analog 8 Out Of Range	0x2627	145
11-11	0xBB	Analog 14 Out Of Range	0x262A	
11-12	0xBC	Analog Assignment	0x2631	
12-1	0xC1	Branding Error	0x2860	

Table 16 AC F2-A Controller Troubleshooting Chart

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
1-2 0x12	Controller Overcurrent <i>Controller_Overcurrent_Active</i> 0x2510 Fault Type(s): 1 = Controller Over Current Phase U 2 = Controller Over Current Phase W 3 = Controller Over Current Phase V 4 = Irms > 135 % Current Limit	<ol style="list-style-type: none"> External short of phase U, V, or W motor connections. Speed encoder noise problems. Motor parameters are mistuned. Controller defective. 	<i>Set:</i> Phase current exceeded the current measurement limit. <i>Clear:</i> Reset Controller	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
1-3 0x13	Current Sensor <i>Current_Sensor_Active</i> 0x2832 Fault Type(s): 1	<ol style="list-style-type: none"> Leakage to vehicle frame from phase U, V, or W (short in motor stator). Controller defective. 	<i>Set:</i> Controller current sensors have invalid offset reading. <i>Clear:</i> Reset Controller	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
1-4 0x14	Precharge Failed <i>Precharge_Failed_Active</i> 0x2223 Fault Type(s): 1 Abort 2 Energy Limit Exceeded 3 Time Limit Exceeded	<ol style="list-style-type: none"> An external load on the capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging. See Programmer » System Monitor menu » Controller » Capacitor Voltage. 	<i>Set:</i> The precharge failed to charge the capacitor bank. <i>Clear:</i> Cycle Interlock or Reset Controller	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
1-5 0x15	Controller Severe Undertemp <i>Controller_Severe_Undertemp_Active</i> 0x2141 Fault Type(s): 1	<ol style="list-style-type: none"> Controller is operating in an extreme environment. See Programmer » System Monitor menu » Controller » Controller Temperature. 	<i>Set:</i> Heatsink temperature below –40 °C. <i>Clear:</i> Bring heatsink temperature above –40 °C. and then Reset Controller	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
1-6 0x16	Controller Severe Overtemp <i>Controller_Severe_Overtemp_Active</i> 0x2142 Fault Type(s): 1	<ol style="list-style-type: none"> Controller is operating in an extreme environment. Excessive load on vehicle. Improper mounting of controller. See Programmer » System Monitor menu » Controller » Controller Temperature. 	<i>Set:</i> Heatsink temperature above +95 °C. <i>Clear:</i> Bring heatsink temperature below +95 °C, and then Reset Controller.	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
1-7 0x17	Severe B+ Undervoltage <i>Severe_B_Plus_Undervoltage_Active</i> 0x2120 Fault Type(s): 1	<ol style="list-style-type: none"> Non-controller system drain on battery. Battery resistance too high. Battery disconnected while driving. Blown B+ fuse or main contactor did not close. Battery parameters are misadjusted. See Programmer » Monitor menu » Controller » Capacitor Voltage. 	<i>Set:</i> When Main is closed and FET Bridge enabled: Either the undervoltage drive current cut back = 0 % for 64 ms or the Brownout Voltage is reached. <i>Clear:</i> Undervoltage drive current cut back > 0 % for 100 ms and capacitor voltage > brownout voltage.	No drive torque
1-7 0x17	Severe KSI Undervoltage <i>Severe_KSI_Undervoltage_Active</i> 0x2122 Fault Type(s): 1	<ol style="list-style-type: none"> Non-controller system drain on battery/keyswitch circuit wiring. Resistance in low power (KSI) circuit is too high. KSI disconnected while driving. Blown fuse. See Programmer » System Monitor menu » Battery » Keyswitch Voltage. 	<i>Set:</i> When below Brownout Voltage for 2 seconds. <i>Clear:</i> Bring KSI voltage above Brownout Voltage.	None, unless a fault action is programmed in VCL.

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
1-8 0x18	Severe B+ Overvoltage <i>Severe_B_Plus_Overvoltage_Active</i> 0x2130 Fault Type(s): 1	<ol style="list-style-type: none"> Battery parameters are misadjusted. Battery resistance too high for given regen current. Battery disconnected while regen braking. See Programmer » System Monitor menu » Controller » Capacitor Voltage. 	<p><i>Set:</i> Capacitor bank voltage exceeded the Severe Overvoltage limit with FET bridge enabled.</p> <p><i>Clear:</i> Bring capacitor voltage below Severe Overvoltage limit, and then <i>Reset Controller</i>.</p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i></p>
1-8 0x18	Severe KSI Overvoltage <i>Severe_KSI_Overvoltage_Active</i> 0x2132 Fault Type(s): 1	<ol style="list-style-type: none"> Battery-voltage applied to KSI (pin 1) exceeds the Severe Overvoltage limit. See Programmer » Monitor menu » Battery » Keyswitch Voltage. 	<p><i>Set:</i> KSI voltage exceeded the Severe Overvoltage limit.</p> <p><i>Clear:</i> Bring KSI voltage below the Severe Overvoltage limit, and then <i>Reset Controller</i>.</p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i></p>
1-9 0x19	Speed Limit Supervision <i>Speed_Limit_Supervision_Active</i> 0x2133 Fault Type(s): 1	<ol style="list-style-type: none"> Motor speed detected exceeding the limit set by the Max Speed Supervision parameter. Misadjusted Max Speed Supervision parameters. See: Programmer » Application Setup » Max Speed Supervision menu. 	<p><i>Set:</i> Motor rpm has exceeded the Max Speed Limit setting for the Max Speed Time Limit setting's duration.</p> <p><i>Clear:</i> <i>Reset Controller</i>.</p>	<p><i>ShutdownInterlock</i> <i>ShutdownEMBrake</i></p>
1-10 0x1A	Travel Control Supervision <i>Travel_Control_Supervision_Active</i> 0x2134 Fault Type(s): 1	<ol style="list-style-type: none"> With the vehicle in the stopped state, the motor frequency and/or phase current detected exceeding the limit set by the Travel Control Supervision parameter. Misadjusted Travel Control Supervision parameters. See: Programmer » Application Setup » Travel Control Supervision menu. 	<p><i>Set:</i> The motor frequency and/or and phase-current are above their Travel Control Supervision settings when in the stopped state.</p> <p><i>Clear:</i> <i>Reset Controller</i>.</p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i></p>
2-2 0x22	Controller Overtemp Cutback <i>Controller_Overtemp_Cutback_Active</i> 0x2140 Fault Type(s):1	<ol style="list-style-type: none"> Controller is operating in an extreme environment. Excessive load on vehicle. Improper mounting of controller which is preventing controller cooling. Controller is performance-limited at this temperature. See Programmer » System Monitor menu » Controller: Temperature. 	<p><i>Set:</i> Controller's Heatsink temperature exceeded 85 °C.</p> <p><i>Clear:</i> Bring heatsink temperature below 85 °C.</p>	<p>Reduced drive torque. Reduced regen braking torque.</p>
2-3 0x23	Undervoltage Cutback <i>Undervoltage_Cutback_Active</i> 0x2121 Fault Type(s): 1	<ol style="list-style-type: none"> Batteries need recharging. Controller is performance limited at this voltage. Battery parameters are misadjusted. Non-controller system-drain on battery. Battery resistance too high. Battery disconnected while driving. Blown B+ fuse or main contactor did not close. See Programmer » System Monitor menu » Controller » Currents » UnderVoltageCutback. See Programmer » System Monitor menu » Controller » Capacitor Voltage. 	<p><i>Set:</i> Capacitor bank voltage dropped below the UnderVoltageCutback limit with the FET bridge enabled.</p> <p><i>Clear:</i> Bring the capacitor voltage above the controller's UnderVoltageCutback limit.</p>	<p>Reduced drive torque.</p>

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
2-4 0x24	Overvoltage Cutback <i>Overvoltage_Cutback_Active</i> 0x2131 Fault Type(s): 1	<ol style="list-style-type: none"> 1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking. 5. See Programmer » System Monitor menu » Controller » Currents » OverVoltageCutback. 6. See Programmer » System Monitor menu » Controller » Capacitor Voltage. 	<p><i>Set:</i> The controller's capacitor bank voltage exceeded the OverVoltageCutback limit with the FET bridge enabled.</p> <p><i>Clear:</i> Bring controller's capacitor voltage below the OverVoltageCutback limit.</p>	Reduced brake torque. Note: This fault is declared only when the controller is running in regen.
2-5 0x25	Ext 5V Supply Failure <i>Ext_5V_Supply_Failure_Active</i> 0x2531 Fault Type(s): 1 = 5 V Supply's voltage is out-of-range 2 = 5 V Supply's current is out-of-range	<ol style="list-style-type: none"> 1. External load impedance on the +5 V supply (pin 16) is too low. 2. See Programmer » System Monitor menu » Outputs: External_5V_Supply, Ext_5V_Current. 	<p><i>Set:</i> (1) The 5 V Supply (pin 16) is outside $5V \pm 10\%$ (2) The current is outside limits defined by: <i>Ext_5V_Supply_Min</i> <i>Ext_5V_Supply_Max</i></p> <p><i>Clear:</i> Reset Controller, or Re-set using VCL variable Ext_5V_Output_Enable</p>	Disables the 5 V Supply
2-6 0x26	Ext 12V Supply Failure <i>Ext_12V_Supply_Failure_Active</i> 0x2532 Fault Type(s): 1 = 12 V Supply's voltage is out-of-range 2 = 12 V Supply's current is out-of-range	<ol style="list-style-type: none"> 1. External load impedance on the +12 V supply (pin 23) is too low. 2. See Programmer » System Monitor menu » Outputs: External_12V_Supply, Ext_12V_Current. 	<p><i>Set:</i> (1) The 12 V supply (pin 23) is outside $12V \pm 15\%$ (2) The current is outside the limits defined by: <i>Ext_12V_Supply_Min</i> <i>Ext_12V_Supply_Max</i></p> <p><i>Clear:</i> Reset Controller. Or Re-set using VCL variable Ext_12V_Output_Enable.</p>	Disables the 12 V Supply None, unless a fault action is programmed in VCL.
2-8 0x28	Motor Temp Hot Cutback <i>Motor_Temp_Hot_Cutback_Active</i> 0x2151 Fault Type(s): 1	<ol style="list-style-type: none"> 1. Motor temperature is at or above the programmed Temperature Hot setting—resulting in a reduction of controller drive current. 2. The motor temperature and sensor control parameters are misadjusted. 3. See Programmer » AC Motor Setup » Temperature Sensor. 	<p><i>Set:</i> Motor temperature is at or above the Temperature Hot parameter setting.</p> <p><i>Clear:</i> Bring the motor temperature within range.</p>	Reduced Drive Torque If MotorBrakingThermalCutBack_Enable = On, then Regen Braking Torque is reduced.
2-9 0x29	Motor Temp Sensor <i>Motor_Temp_Sensor_Active</i> 0x2150 Fault Type(s): 1	<ol style="list-style-type: none"> 1. Motor thermistor is not connected properly. 2. sensor polarity (between Pin 9 and Pin 12) is incorrect. 3. The motor temperature and sensor parameters are misadjusted. 4. See Programmer » System Monitor menu » AC Motor » Temperature. 	<p><i>Set:</i> Motor thermistor input (pin 9) is at the voltage rail.</p> <p><i>Clear:</i> Bring the motor thermistor input voltage within range.</p>	MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback disabled.

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
3-1 0x31	MAIN DRIVER <i>Main_Driver_Fault_Active</i> 0x2222 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Open Wire (at pin)	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring.	<i>Set:</i> Main Contactor driver is either open or shorted. This fault can be set only when Main Enable = On. <i>Clear:</i> Restore/repair any external wiring or device-coil to their correct state, then <i>Reset Controller</i> .	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
3-2 0x32	EM Brake Driver <i>EM_Brake_Driver_fault_Active</i> 0x2320 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Open Wire (at pin)	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring.	<i>Set:</i> Electromagnetic brake driver (pin 4) is either open or shorted. This fault can be set only when EM Brake Type >0. <i>Clear:</i> Restore/repair any external wiring or device-coil to their correct state, then <i>Reset Controller</i> .	<i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
3-5 0x35	Proportional Driver <i>Proportional_Driver_Fault_Active</i> 0x2440	See Driver 1 Fault (page 143)		
3-6 0x36	Encoder Fault <i>Encoder_Fault_Active</i> 0x2230 Fault Type(s): 1 = Loss of regulation 2 = Over Current trips Loss of pulses 3 = Loss of speed signal pulses 4 = Autocharacterization 5 = Encoder supply (voltage) fault	1. Motor encoder failure. 2. Bad crimps or faulty wiring. 3. See Programmer » System Monitor menu » AC Motor: Motor RPM. 4. See Programmer » AC Motor Setup » Quadrature Encoder » Encoder fault Setup.	<i>Set:</i> Motor encoder phase failure detected. <i>Clear:</i> Either <i>Reset Controller</i> , or if parameter LOS Upon Encoder Fault = On and Interlock has been cycled, then the Encoder Fault is cleared and Encoder LOS fault (flash code 9-3) is set, allowing limited motor control.	<i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownMotor</i>
3-7 0x37	Motor Open <i>Motor_Open_Active</i> 0x2240 Fault Type(s): 1	1. Motor phase is open. 2. Bad crimps or faulty wiring.	<i>Set:</i> Motor phase U, V, or W detected open. <i>Clear:</i> Cycle KSI.	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
3-8 0x38	Main Contactor Welded <i>Main_Contactor_Welded_Active</i> 0x2220 Fault Type(s): 1	1. Main contactor tips are welded closed. 2. Motor phase U or V is disconnected or open. 3. An alternate voltage path (such as an external circuit to B+) is providing a current to the capacitor bank (B+ connection terminal).	<i>Set:</i> Just prior to the main contactor closing, the capacitor bank voltage (B+ connection terminal) was loaded (via the motor) for a short time and the voltage did not discharge indicating a direct-contact to the battery (i.e., Main tips are welded closed). <i>Clear:</i> <i>Reset Controller</i>	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
3-9 0x39	Main Contactor Did Not Close <i>Main_Contactor_Did_Not_Close_Active</i> 0x2221 Fault Type(s): 1 = Main did not close when commanded 2 = Main disconnected during operation	Type1: 1. Main contactor did not close. 2. Main contactor tips are oxidized, burned, or not making good contact. 3. An external load on the capacitor bank (B+ connection terminal) is preventing the capacitor bank from charging. 4. Blown B+ fuse. 5. Main Contactor parameters mistuned Main Pull In Voltage, Main Holding Voltage. Type2: 1. Main opened during operation (while commanded closed). 2. Driver wiring to contactor's coil (e.g., pin 3 wiring) removed during operation. 3. Contactor/coil defective.	<i>Set:</i> With the main contactor commanded closed, the capacitor bank voltage (B+ connection terminal) did not charge to B+. <i>Clear: Reset Controller.</i>	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
4-2 0x42	Throttle Input <i>Throttle_Input_Active</i> 0x2210 Fault Type(s): 4 1 = Outside the Low or High parameter.	1. Throttle voltage exceeded the Analog Low or Analog High parameters for the analog input defined for the throttle input. 2. See Programmer » Controller Setup » Analog Inputs » Analog 1 Type. 3. See Programmer » Controller Setup » Analog Inputs » Configure.	<i>Set:</i> Throttle voltage exceeded the <i>Analog Low</i> or <i>Analog High</i> parameters for the analog input defined for the throttle input. <i>Clear:</i> Bring throttle input voltage within the Min and max thresholds. <i>Reset Controller.</i>	ShutdownThrottle
4-6 0x46	NV Memory Failure <i>NV_Memory_Failure_Active</i> 0x2830 Fault Type(s): 1 = Invalid checksum. 2 = NV write failed. 3 = NV read failed. 4 = NV write did not complete during power down.	1. Failure to read or write to nonvolatile (NV) memory. 2. Internal controller fault.	<i>Set:</i> Controller operating system tried to read or write to EEPROM memory and failed. <i>Clear:</i> Download the correct software and matching parameter default settings into the controller and <i>Reset Controller.</i>	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownInterlock</i> <i>ShutdownDriver1</i> <i>ShutdownDriver2</i> <i>ShutdownDriver3</i> <i>ShutdownDriver4</i> <i>ShutdownDriver5</i> <i>ShutdownPD</i> <i>FullBrake</i>
4-7 0x47	HPD Sequencing <i>Hpd_Sequencing_Active</i> 0x2211 Fault Type(s): 1	1. Incorrect sequence in application of Keyswitch, Interlock, Direction, or Throttle. 2. Faulty wiring, crimps, or switches at KSI, Interlock, Direction, or Throttle. 3. Moisture in above-noted digital input switches causing invalid (real) On/Off state. 4. Verify input switch status. See Programmer » System Monitor menu » Inputs » Switch Status. 5. Verify Throttle. See Programmer » System Monitor menu » Inputs » Throttle Command.	<i>Set:</i> HPD (High Pedal Disable) or SRO (Static Return to Off) sequencing fault caused by incorrect sequence of KSI, interlock, direction, and throttle inputs. <i>Clear:</i> Reapply inputs in correct sequence.	ShutdownThrottle

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS															
4-7 0x47	EMER Rev HPD <i>Emer_Rev_Hpd_Active</i> 0x2331 Fault Type(s): 1	1. Emergency Reverse operation has concluded, but the throttle, forward and reverse inputs, and interlock have not been returned to neutral.	<i>Set:</i> At the conclusion of Emergency Reverse, the fault was set because various inputs were not returned to neutral. <i>Clear:</i> If EMR_Interlock = On, clear the interlock, throttle, and direction inputs. If EMR_Interlock = Off, clear the throttle and direction inputs.	ShutdownThrottle ShutdownEMBrake															
4-9 0x49	Parameter Change <i>Parameter_Change_Active</i> 0x2813 Fault Type(s): Reports the CAN Object ID of parameter.	1. When Interlock is On, changing a safety-based parameter. Parameters with this property are marked with a [PCF] (Parameter Change fault) in the Parameter menu listings.	<i>Set:</i> Adjustment of a parameter setting that requires cycling of KSI. <i>Clear: Reset Controller.</i>	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>															
4-10 0x4A	EMR Switch Redundancy <i>Emr_Switch_Redundancy_Active</i> 0x2817 Fault Type(s): 1	1. Either or both Emergency Reverse input switches are inoperative, resulting in an invalid state. <table border="1" style="margin-left: auto; margin-right: auto;"><thead><tr><th>NO</th><th>NC</th><th>State</th></tr></thead><tbody><tr><td>On</td><td>Off</td><td>valid</td></tr><tr><td>Off</td><td>On</td><td>valid</td></tr><tr><td>On</td><td>On</td><td>invalid</td></tr><tr><td>Off</td><td>Off</td><td>invalid</td></tr></tbody></table> 2. Ingress of dirt or moisture in switch(s).	NO	NC	State	On	Off	valid	Off	On	valid	On	On	invalid	Off	Off	invalid	<i>Set:</i> Emer Rev Switch NO input does not agree with the Emer Rev Switch NC input. <i>Clear:</i> Correct switch states. <i>Reset Controller.</i>	ShutdownInterlock ShutdownEMBrake
NO	NC	State																	
On	Off	valid																	
Off	On	valid																	
On	On	invalid																	
Off	Off	invalid																	
5-1 0x51	User 1 Fault <i>User_{1, 2 ... 32}_Fault_Active</i> 0x2710 Fault Type(s): OEM Definable	1. These faults (and fault actions) can be defined by the User/OEM and are implemented in the application-specific VCL software. 2. See User/OEM documentation.	<i>Set:</i> See User/OEM documentation <i>Clear:</i> See User/OEM Documentation	See User/OEM Documentation															
5-2 0x52	User 2 Fault 0x2711	See User 1 fault (above)	<i>Set:</i> See User/OEM documentation <i>Clear:</i> See User/OEM Documentation	See User/OEM Documentation															
5-3 0x53	USER 3 FAULT 0x2712																		
5-4 0x54	USER 4 FAULT 0x2713																		
5-5 0x55	USER 5 FAULT 0x2720																		
5-6 0x56	USER 6 FAULT 0x2721																		
5-7 0x57	USER 7 FAULT 0x2722																		
5-8 0x58	USER 8 FAULT 0x2723																		
5-9 0x59	USER 9 FAULT 0x2730																		
6-1 0x61	USER 10 FAULT 0x2731																		
6-2 0x62	USER 11 FAULT 0x2732																		

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
6-3 0x63	USER 12 FAULT 0x2733	See User 1 fault (above)	<i>Set:</i> See User/OEM documentation <i>Clear:</i> See User/OEM Documentation	See User/OEM Documentation
6-4 0x64	USER 13 FAULT 0x2740			
6-5 0x65	USER 14 FAULT 0x2741			
6-6 0x66	USER 15 FAULT 0x2742			
6-7 0x67	USER 16 FAULT 0x2743			
5-10 0x5A	USER 17 FAULT 0x2750			
5-11 0x5B	USER 18 FAULT 0x2751			
5-12 0x5C	USER 19 FAULT 0x2752			
5-13 0x5D	USER 20 FAULT 0x2753			
5-14 0x5E	USER 21 FAULT 0x2760			
5-15 0x5F	USER 22 FAULT 0x2761			
6-10 0x6A	USER 23 FAULT 0x2762			
6-11 0x6B	USER 24 FAULT 0x2763			
6-12 0x6C	USER 25 FAULT 0x2770			
6-13 0x6D	USER 26 FAULT 0x2771			
6-14 0x6E	USER 27 FAULT 0x2772			
6-15 0x6F	USER 28 FAULT 0x2773			
7-10 0x7A	USER 29 FAULT 0x2780			
7-11 0x7B	USER 30 FAULT 0x2781			
7-12 0x7C	USER 31 FAULT 0x2782			
7-13 0x7D	USER 32 FAULT 0x2783			

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
6-8 0x68	VCL Run Time Error <i>VCL_Run_Time_Error_Active</i> 0x2820 Fault Type(s): 1	<ol style="list-style-type: none"> Runtime errors are defined using the VCL Error Module and VCL Error. See the System Information file: <ul style="list-style-type: none"> Curtis Software Suite™ » VCL Studio » Help Using driver control commands in VCL can lead to VCL runtime errors if the VCL command and the driver assignment do not match. 	<p><i>Set:</i> VCL Run Time Error detected</p> <p><i>Clear:</i> Edit VCL application software to fix this error condition; flash the new compiled software and matching parameter settings; <i>Reset Controller.</i></p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownInterlock</i> <i>ShutdownDriver1</i> <i>ShutdownDriver2</i> <i>ShutdownDriver3</i> <i>ShutdownDriver4</i> <i>ShutdownDriver5</i> <i>ShutdownPD</i> <i>FullBrake</i></p>
7-2 0x72	PDO Timeout <i>PDO_Timeout_Active</i> 0x2541 Fault Type(s): 1	<ol style="list-style-type: none"> The time between CAN PDO messages received exceeded the PDO Timeout Period as defined by the Event Timer parameter. Adjust PDO Settings. See Programmer » Application Setup » CAN Interface » PDO Setups. 	<p><i>Set:</i> Time between CAN PDO messages received exceeded the PDO Timeout Period.</p> <p><i>Clear:</i> Receive CAN NMT message, or <i>Reset Controller.</i></p>	<p><i>ShutdownThrottle</i></p>
7-3 0x73	Stall Detected <i>Stall_Detected_Active</i> 0x2231 Fault Type(s): 1	<ol style="list-style-type: none"> Stalled motor. Motor encoder failure. Bad crimps or faulty wiring. Problems with power supply for the motor encoder. See Programmer » System Monitor menu » AC Motor » Motor RPM. 	<p><i>Set:</i> No motor encoder movement detected.</p> <p><i>Clear:</i> Either <i>Reset Controller</i>, or if parameter LOS Upon Encoder Fault = On and Interlock has been cycled, then the Stall Detected fault is cleared and the Encoder LOS fault (flash code 9-3) is set, allowing limited motor control.</p>	<p><i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownMotor</i> Control Mode changed to LOS (Limited Operating Strategy).</p>
7-7 0x77	Supervision <i>Supervision_Active</i> 0x2840 Fault Type(s): Curtis Supervision Code	<ol style="list-style-type: none"> Internal controller fault. 	<p><i>Set:</i> Internal controller failure</p> <p><i>Clear:</i> <i>Reset Controller.</i></p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownInterlock</i> <i>ShutdownDriver1</i> <i>ShutdownDriver2</i> <i>ShutdownDriver3</i> <i>ShutdownDriver4</i> <i>ShutdownDriver5</i> <i>ShutdownPD</i> <i>FullBrake</i></p>
7-9 0x79	Supervision Input Check <i>Supervision_Input_Check Active</i> 0x2841 Fault Type(s): 1	<ol style="list-style-type: none"> Internal controller fault. 	<p><i>Set:</i> Damaged Controller.</p> <p><i>Clear:</i> <i>Reset Controller.</i></p>	<p><i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>ShutdownInterlock</i> <i>ShutdownDriver1</i> <i>ShutdownDriver2</i> <i>ShutdownDriver3</i> <i>ShutdownDriver4</i> <i>ShutdownDriver5</i> <i>ShutdownPD</i> <i>FullBrake</i></p>
8-2 0x82	PDO Mapping Error <i>PDO_Mapping_Error_Active</i> 0x2542 Fault Type(s): 1	<ol style="list-style-type: none"> The PDO Map has too many data bytes assigned or has objects mapped that are not compatible. Adjust PDO Settings. See Programmer » Application Setup » CAN Interface » PDO Setups. 	<p><i>Set:</i> Incorrect PDO map detected.</p> <p><i>Clear:</i> <i>Reset Controller.</i></p>	<p>PDO message disabled</p>

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
8-3 0x83	Internal Hardware <i>Internal_Hardware_Active</i> 0x2835 Fault Type(s): Curtis hardware code	1. Internal controller fault detected.	<i>Set:</i> Internal controller fault detected. <i>Clear:</i> Reset Controller.	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
8-7 0x87	Motor Characterization Error <i>Motor_Characterization_Active</i> 0x2850 Fault Type(s): 71 Failure to write NV ram 72 Temp sensor fault 73 Motor hot 74 Controller temperature cutback 76 Undervoltage cutback 77 Overvoltage cutback 78 No encoder information 79 Current Regulator Tuning out of range 80 Current Regulator Tuning out of range 81 Encoder signal seen but step size not auto-detected 82 Aborted autocharacterization — 90/98 PMAC Sin/Cos no rotation detected 91 PMAC motor not rotating 92 PMAC Motor not accelerating. Low acceleration 94–97 PMAC lag compensation out of range 99 PMAC Motor rotating at start of characterization 102 PMAC motor temp sensor 103 PMAC motor temp hot cutback 104 PMAC controller temp cutback 106 PMAC Undervoltage cutback 107 PMAC overvoltage cutback	1. Motor characterization failed during characterization process. See fault type for cause.	<i>Set:</i> Motor characterization failed during the motor characterization process. <i>Clear:</i> Reset Controller.	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>
8-8 0x88	Encoder Pulse Error <i>Encoder_Pulse_Error_Active</i> 0x2234 Fault Type(s): 1	1. Encoder Steps parameter does not match the actual motor encoder. 2. Verify parameter settings: AC Motor Setup » Quadrature Encoder » Encoder Steps.	<i>Set:</i> Detected wrong setting of the Encoder Steps parameter. <i>Clear:</i> Ensure the Encoder Steps parameter matches the actual encoder; <i>Reset Controller.</i>	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
8-9 0x89	Parameter Out of Range <i>Parameter_Out_Of_Range_Active</i> 0x2811 Fault Type(s): Reports the CAN Object ID of parameter.	<ol style="list-style-type: none"> Parameter value detected outside of the limits. Use CSS to view and write parameter value and range. 	<p><i>Set:</i> Parameter detected outside of limits</p> <p><i>Clear:</i> Bring parameter within its limits.</p>	<p><i>ShutdownMotor</i></p> <p><i>ShutdownMainContactor</i></p> <p><i>ShutdownEMBrake</i></p> <p><i>ShutdownThrottle</i></p> <p><i>FullBrake</i></p>
9-2 0x92	EM Brake Failed To Set <i>EM_Brake_Failed_to_Set_Active</i> 0x2321 Fault Type(s): 1	<ol style="list-style-type: none"> Vehicle movement sensed after the EM Brake has been commanded to set. EM Brake will not hold the motor from rotating. 	<p><i>Set:</i> After the EM Brake was commanded to set and time has elapsed to allow the brake to fully engage, vehicle movement has been sensed.</p> <p><i>Clear:</i> 1. Activate the Throttle (EM Brake type 2). 2. Activate the Interlock (EM Brake type 1).</p>	<p>ShutdownEMBrake</p> <p>ShutdownThrottle</p> <p>Position Hold is engaged when Interlock = On.</p>
9-3 0x93	Encoder LOS <i>Encoder_LOS_Active</i> 0x2233 Fault Type(s): 1	<ol style="list-style-type: none"> Limited Operating Strategy (LOS) control mode has been activated; as a result of either an Encoder Fault (flash code 3-6) or a Stall Detected fault (flash code 7-3). Motor encoder failure. Bad crimps or faulty wiring. Vehicle is stalled. 	<p><i>Set:</i> Encoder Fault (flash code 3-6) or Stall Detected (flash code 7-3) was activated, if parameter LOS Upon Encoder Fault = On and Interlock has been cycled, then the Encoder LOS (flash code 9-3) control mode is activated, allowing limited motor control.</p> <p><i>Clear:</i> Cycle KSI or, if LOS Mode was activated by the Stall Detected fault, clear by ensuring encoder senses proper operation, Motor RPM = 0, and Throttle Command = 0.</p>	<p>LOS Mode</p>
9-4 0x94	Emer Rev Timeout <i>Emer_Rev_Timeout_Active</i> 0x2330 Fault Type(s): 1	<ol style="list-style-type: none"> Emergency Reverse was activated and concluded because the EMR Timeout timer has expired. The emergency reverse input is stuck On. 	<p><i>Set:</i> Emergency Reverse was activated and ran until the EMR Timeout timer expired.</p> <p><i>Clear:</i> Turn the emergency reverse input (switch) to Off.</p>	<p>ShutdownThrottle</p> <p>ShutdownEMBrake</p>
9-9 0x99	Parameter Mismatch <i>Parameter_Mismatch_Active</i> 0x2812 Fault Type(s): 1 = Dual Drive is enabled in Torque Mode. 2 = Motor Tech = SPMSM, Feedback = Encoder 3 = Motor Tech = ACIM, Feedback = Sin/Cos	<ol style="list-style-type: none"> Incorrect position feedback type chosen for motor technology in use. Dual drive is enabled in torque mode. Dual drive enabled on only one controller. 	<p><i>Set:</i> 1. When the Dual Drive software is enabled, the controller must be set to either Speed Mode Express or Speed Mode; otherwise this fault is set. 2. Motor Technology = 1 must be paired with Feedback Type = 2; otherwise this fault is set. 3. Motor Technology = 0 must be paired with Feedback Type = 1; otherwise this fault is set.</p> <p><i>Clear:</i> Adjust parameters to appropriate values and then Reset Controller.</p>	<p><i>ShutdownMotor</i></p> <p><i>ShutdownMainContactor</i></p> <p><i>ShutdownEMBrake</i></p> <p><i>ShutdownThrottle</i></p> <p><i>FullBrake</i></p>

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSE	SET / CLEAR CONDITIONS	FAULT ACTIONS
9-10 0x9A	Interlock Braking Supervision <i>Interlock_Braking_Supervision_Active</i> 0x2332 Fault Type(s): 1 Motor speed is outside the Interlock Brake Supervision Speed Limit. 2 Interlock is Off and EM Brake not applied within time limit. 3 Interlock is Off and EM Brake not applied, and the rotor position is outside the RPM-position limit.	1. During an interlock braking event, the motor speed exceeded the limit set by the Interlock Braking Supervision parameters. 2. See Programmer » Application Setup » Interlock Braking » Supervision Enable. 3. See Programmer » Application Setup » Interlock Braking » Interlock Braking Supervision.	<i>Set:</i> During an interlock braking event, the motor speed exceeded the limit set by the Interlock Braking Supervision parameters. <i>Clear: Reset Controller.</i>	ShutdownMotor ShutdownEMBrake ShutdownMainContactor
9-11 0x9B	EMR Supervision <i>Emr_Supervision_Active</i> 0x2333 Fault Type(s): 1	1. During an EMR event, the motor speed exceeded the limit set by the Emergency Reverse Supervision parameters. 2. See Programmer » Application Setup » Emergency Reverse » Emergency Reverse Supervision.	<i>Set:</i> During an interlock braking event, the motor speed exceeded the limit set by the Emergency Reverse Supervision parameters. <i>Clear: Reset Controller.</i>	ShutdownMotor ShutdownEMBrake ShutdownMainContactor
10-1 0xA1	Driver 1 Fault <i>Driver_1_Fault_Active</i> 0x2160 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Driver Open	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring. 4. Driver overcurrent, as set by the Driver 1 Overcurrent parameter. 5. See Programmer » Controller Setup » Outputs » Driver 1 » Driver 1 Overcurrent.	<i>Set:</i> Driver 1 is either open or shorted. Or Driver 1 exceeded its overcurrent setting. <i>Clear:</i> Correct open or short, and then <i>Reset Controller.</i>	ShutdownDriver1
10-2 0xA2	Driver 2 Fault <i>Driver_2_Fault_Active</i> 0x2161 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Driver Open	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring. 4. Driver overcurrent, as set by the Driver 2 Overcurrent parameter. 5. See Programmer » Controller Setup » Outputs » Driver 2 » Driver 2 Overcurrent.	<i>Set:</i> Driver 2 is either open or shorted. Or Driver 2 exceeded its overcurrent setting. <i>Clear:</i> Correct open or short, and then <i>Reset Controller.</i>	ShutdownDriver2
10-3 0xA3	Driver 3 Fault <i>Driver_3_Fault_Active</i> 0x2162 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Driver Open	1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring. 4. Driver overcurrent, as set by the Driver 3 Overcurrent parameter. 5. See Programmer » Controller Setup » Outputs » Driver 3 » Driver 3 Overcurrent.	<i>Set:</i> Driver 3 is either open or shorted. Or Driver 3 exceeded its overcurrent setting. <i>Clear:</i> Correct open or short, and then <i>Reset Controller.</i>	ShutdownDriver3

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
10-4 0xA4	Driver 4 Fault <i>Driver_4_Fault_Active</i> 0x2163 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Driver Open	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring. 4. Driver overcurrent, as set by the Driver 4 Overcurrent parameter. 5. See Programmer » Controller Setup » Outputs » Driver 4 » Driver 4 Overcurrent. 	<p><i>Set:</i> Driver 4 is either open or shorted. Or Driver 4 exceeded its overcurrent setting.</p> <p><i>Clear:</i> Correct open or short, and then <i>Reset Controller</i>.</p>	ShutdownDriver4
10-5 0xA5	Driver 5 Fault <i>Driver_5_Fault_Active</i> 0x2164 Fault Type(s): 1 = Driver Short 2 = Driver Overcurrent 3 = Open/Short (High, should be Low) 4 = Open/Short (Low, should be High) 5 = Driver Open	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins at controller or contactor coil. 3. Bad connector crimps or faulty wiring. 4. Driver overcurrent, as set by the Driver 5 Overcurrent parameter. 5. See Programmer » Controller Setup » Outputs » Driver 5 » Driver 5 Overcurrent. 	<p><i>Set:</i> Driver 5 is either open or shorted. Or Driver 5 exceeded its overcurrent setting.</p> <p><i>Clear:</i> Correct open or short, and then <i>Reset Controller</i>.</p>	ShutdownDriver5
10-8 0xA8	Driver Assignment <i>Driver_Assignment_Active</i> 0x2632 Fault Type(s): 5 {X} = Driver number that cause the fault	<ol style="list-style-type: none"> 1. A Driver Output is used for two or more functions. 2. See Programmer » Controller Setup » IO Assignments » Coil Drivers: Main Contactor Driver, EM Brake Driver, Hydraulic Contactor Driver. 	<p><i>Set:</i> Driver assignment conflict</p> <p><i>Clear:</i> Resolve the conflicted driver assignment, then <i>Reset Controller</i>.</p>	ShutdownDriver{X} (Driver in non-operational)
11-1 0xB1	ANALOG 1 OUT OF RANGE <i>Analog_1_Out_Of_Range</i> 0x2620 <i>Analog_X_Out_of_Range</i> Fault Type(s): 1 = above High limit 2 = below Low limit	<ol style="list-style-type: none"> 1. Analog 1 input voltage above the parameter setting of Analog 1 High. 2. Analog 1 input voltage is below the parameter setting of Analog 1 Low. 3. See Programmer » Controller Setup » Analog Inputs » Analog 1. 4. See Programmer » Controller Setup » Analog Inputs » Configure » Analog 1 Low/Analog 1 High. 	<p><i>Set:</i> (1) Input voltage (on pin) is above the parameter's set-point threshold. (2) Input voltage (on pin) is below the parameter's set-point threshold.</p> <p><i>Clear:</i> Return the voltage to within the allowed range, then <i>Reset Controller</i>.</p>	None, unless a fault action is programmed in VCL.
11-2 0xB2	ANALOG 2 OUT OF RANGE <i>Analog_2_Out_Of_Range</i> 0x2621	See Analog 1 Out of Range.	See Analog 1 Out of Range	None, unless a fault action is programmed in VCL.
11-3 0xB3	ANALOG 3 OUT OF RANGE <i>Analog_3_Out_Of_Range</i> 0x2622	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.
11-4 0xB4	ANALOG 4 OUT OF RANGE <i>Analog_4_Out_Of_Range</i> 0x2623	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.
B-5 0xB5	ANALOG 5 OUT OF RANGE <i>Analog_5_Out_Of_Range</i> 0x2624	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.

Table 16 AC F2-A Controller Troubleshooting Chart, cont'd

FLASH CODE	FAULT NAME (Curtis Software Suite™)	POSSIBLE CAUSES	SET/CLEAR CONDITIONS	FAULT ACTIONS
11-6 0xB6	ANALOG 6 OUT OF RANGE <i>Analog_6_Out_Of_Range</i> 0x2625	See Analog 1 Out of Range.	See Analog 1 Out of Range	None, unless a fault action is programmed in VCL.
11-7 0xB7	ANALOG 7 OUT OF RANGE <i>Analog_7_Out_Of_Range</i> 0x2626	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.
11-8 0xB8	ANALOG 8 OUT OF RANGE <i>Analog_8_Out_Of_Range</i> 0x2627	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.
11-11 0xBB	ANALOG 14 OUT OF RANGE <i>Analog_14_Out_Of_Range</i> 0x262A	See Analog 1 Out of Range.	See Analog 1 Out of Range.	None, unless a fault action is programmed in VCL.
11-12 0xBC	Analog Assignment <i>Analog_Assignmnt_Active</i> 0x2631 Fault Type(s): 9 {X = 1–8, 14} X = Analog Input number that caused the fault	<ol style="list-style-type: none"> 1. An Analog Input is used for two or more functions. 2. An Analog Input is outside the range of analog inputs. 3. See Programmer » Controller Setup » IO Assignments » Controls. 	<i>Set:</i> An Analog Input is used for two or more functions or is outside the range of analog inputs <i>Clear:</i> Resolve assignment conflict, and then <i>Reset Controller</i> .	None, unless a fault action is programmed in VCL.
12-1 0xC1	Branding Error <i>Branding_Error_Active</i> 0x2860 Fault Type(s): 1	<ol style="list-style-type: none"> 1. Software and hardware branding mismatch. 2. For technical support on this fault, contact the Curtis distributor where you obtained your controller or the Curtis sales-support office in your region. 	<i>Set:</i> Software/Hardware incompatibly. <i>Clear:</i> As applicable: Load Branded software, or use Branded controller with the correct device profile and the correct Curtis Software Suite toolkit key.	<i>ShutdownMotor</i> <i>ShutdownMainContactor</i> <i>ShutdownEMBrake</i> <i>ShutdownThrottle</i> <i>FullBrake</i>