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ABB LV DRIVES

# Communication fail functionality ACS/ACH/ACQ580 and ACS/ACH480

This guide assists with the set up and use of the communication fail functionality in the ABB LV drives ACS/ACH/ACQ580 and ACS/ACH480.



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# Introduction

In case a drive is controlled over fieldbus or other communication protocol it must be decided in the system design phase, what to do in case the communication signal gets lost. In many cases it is safest to stop the drive with a fault, however there are several applications, where a controlled continuation of running the motor is the best alternative. In ABB low voltage drives there are several actions available to choose from in case communication is lost:

Par 50.02/ Par 58.14 FBA/EFB Comm loss func *	Drive's reaction to communication loss, when the control word or reference signals are transferred via the communication bus	Drive's reaction to communication loss, when the control word and reference signals are <u>NOT</u> transferred via the communication bus
No action / Ignore	Drive follows the last good reference. No faults or warnings are given.	Drive continues to follow I/O or control panel control signals. No faults or warnings are given.
Fault	Drive trips to fault <i>Communication loss</i> . Drive stops.	Drive continues to follow I/O or control panel control signals. No faults or warnings are given. See Fault always.
Last speed	Drive follows the last good reference. Warning <i>Communication loss</i> is given.	Drive continues to follow I/O or control panel control signals. No faults or warnings are given.
Speed ref safe	Drive starts to follow <i>Safe speed/frequency reference</i> . Warning <i>Communication loss</i> is given. Par 22.41 Speed ref safe Par 28.41 Frequency ref safe	Drive continues to follow I/O or control panel control signals. No faults or warnings are given.
Fault al- ways	Drive trips to fault <i>Communication loss</i> . Drive stops.	Drive trips to fault <i>Communication loss</i> . Drive stops.
Warning	Drive follows the last good reference. Warning <i>Communication loss</i> is given.	Drive continues to follow I/O or control panel control signals.  Warning <i>Communication loss</i> is given.

\* Par 50.02 for Fieldbus adapter (FBA), Par 58.14 for Embedded fieldbus (EFB)

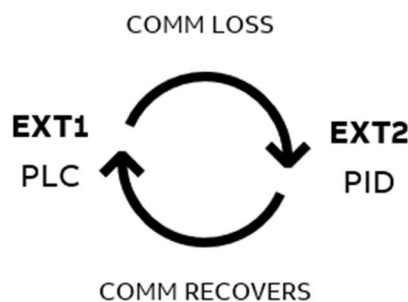
*Communication loss time* defines how long a loss of communication is required before the action selected above is performed.

*Communication loss mode* (EFB only) allows one to select if only the control word and references sent to drive reset this timeout counter, or if any message sent from the controller to drive resets this timeout counter.

In addition to these relatively static actions performed after the communication is lost, there exists a more sophisticated feature. We call it *Communication fail functionality*.

Depending on the drive type, the drive needs to be in Auto (Remote) mode to allow an external controller to control the drive. This remote mode has two control locations, External 1 and External 2 (EXT1/EXT2). EXT1 is normally used when both speed and start/stop signals are coming from the external controller, EXT2 is used when start/stop is from e.g. separate switch or internal timer and drive's internal PID loop controller gives the speed reference to realize e.g. static pressure or static temperature control.

Communication fail functionality is used together with the communication loss actions described above. In the EXT1/EXT2 selection parameter 19.11 you may choose FBA A connection loss or EFB connection loss. When choosing one of these settings, the drive runs normally on EXT1 (thus fully under external controller control), but if the communication breaks, the drive does not fault, but after the comm loss time delay changes automatically to EXT2 and continues to run with the speed reference given by the drive's internal PID controller (or however EXT2 is set up for its reference). Once the communication resumes, the drive changes back to EXT1 and continues to follow the reference from the controller. This *Communication fail functionality* adds redundancy as the speed of the drive always stays under dynamic control.



To allow the PID loop controller to work during the communication loss, the PID controller needs to be fully commissioned. You need to wire the analog feedback signal from the actual process to AI2 (remember, this feature is needed only when the communication is lost thus you cannot use the feedback over fieldbus) and you need to set the setpoint source as either constant, control panel or via analog input (normally AI1) as well. The settings may be adjusted very easily via the Primary settings.

# Primary settings and parameters

Commissioning Communication fail -functionality

	Primary settings	Parameters
Comm fail actions	Menu → Primary settings →	50.02 FBA A comm loss func
	Communication/Fieldbus →	50.03 FBA A comm loss t out
	EFB/FBA → Communication setup:	58.14 Communication loss action
	- If communication fails	58.15 Communication loss mode
	- Communication under monitoring	58.16 Communication loss time
	- Ignore failure shorter than	22.41 Speed ref safe
	- Safe speed/freq reference (if needed)	28.41 Frequency ref safe
Ext 1 / Ext 2 selection based on Communication status	N/A	19.11 Ext1/Ext2 selection

# Step-by-step instructions

For commissioning ACQ580 to use fieldbus control for EXT1, PID loop control for EXT2 and automatic Communication fail functionality to be able to change between EXT1 and EXT2. Instructions are for commissioning with ACH-AP-H or ACH-AP-W Hand-Off-Auto control panels:

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Collect the following data:

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What will be drive's name?	e.g. Pump 1?
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Motor data	asynchronous, permanent magnet or synchronous reluctance motor, current, voltage, frequency, nominal speed, power
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Maximum and minimum speeds allowed for the driven load	e.g. 20...50 Hz or 1000 to 3000 rpm
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Maximum allowed acceleration ramp from zero to nominal speed, in seconds	default is 5 seconds
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Analog feedback sensor's range and electrical data	e.g. 0 to 10 V equals 0 to 10 bars
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Connect the sensor to Analog input 2

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Fieldbus and communication data

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Baud rate	e.g. 115200 baud
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Node number	unique number for each device in the communication network
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Other protocol specific data	e.g. parity, communication profile, IP address etc.
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Choose which action discussed above you want to take in case communication signal is lost. Communication fail functionality will work regardless of the action chosen.	No action, Fault, Fault always, Safe speed/freq ref, Last good speed, warning only
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Power up the drive

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Choose language if you are prompted to choose the language. If you are not, navigate to Menu → Assistants → First start assistant

Make sure you are in OFF-mode

("OFF" reads at top left corner of the control panel screen. If not, press OFF button.)

Set date and time

Off	Pump 3	18.5 Hz
<b>Date &amp; time</b>		
Please enter the current date and time.		
Date	08.07.2021 ▶	
Time	12:57:50 ▶	
Show date as	day.month.year ▶	
Show time as	24-hour ▶	
Back	11:52	Next

Select units

Off	Pump 3	18.5 Hz
<b>Display units</b>		
Power: kW ▶		
Temperature:	°C ▶	
Currency:	€ ▶	
Back	12:57	Next

Enter drive name (1.a above)

Off	Pump 1	18.5 Hz
<b>Naming the drive</b>		
The name will show at the top of the panel screen, making it easier to see which motor this drive controls.		
Drive name	Pump 1 ▶	
Back	12:58	Next

Set motor data (1.b)

Off	Pump 1	18.5 Hz
<b>Motor nominal values</b>		
Find the values on the motor's nameplate, and enter them here:		
Type:	Asynchronous motor ▶	
Current:	136.0 A ▶	
Voltage:	400.0 V ▶	
Back	12:58	Next

Run ID-run if prompted

Set minimum and maximum frequencies or speeds (1.c)

Off	Pump 1	18.5 Hz
<b>Limits</b>		
Check the allowed operation range:		
Minimum frequency	0.00 Hz	▶
Maximum frequency	50.00 Hz	▶
<b>Back</b>	12:58	<b>Next</b>

Enter the *Process settings* assistant by choosing *Yes*

Off	Pump 1	18.5 Hz
<b>Set up process?</b>		
Do you want to set up the process settings now?		
Yes		
No		
<b>Back</b>	12:58	<b>Next</b>

Choose your application: pump, blower or other

Off	Pump 1	18.5 Hz
<b>Equipment type?</b>		
Please select the type of used equipment:		
Blower		
Pump		
Other		
<b>Back</b>	12:58	<b>Next</b>

Choose whether you would like to use quick ramps or not. Quick ramps are used with some submersible and vertical turbine pumps.

Off	Pump 1	18.5 Hz
<b>Submersible/turbine?</b>		
For a submersible or turbine pump, use the three stage quick ramps.		
Yes, set up quick ramps		
No, just normal ramps		
<b>Back</b>	12:58	<b>Next</b>



If you chose not to use quick ramps, set the normal acceleration and deceleration ramps (1.d)

Off	Pump 1	18.5 Hz
<b>Ramps</b>		
How fast the drive speeds up and slows down. Press [?] for help:		
Acceleration time:	5.000 s	▶
Deceleration time:	5.000 s	▶
<b>Back</b>	12:58	<b>Next</b>

Enter the *Control settings* assistant by choosing *Yes*

Off	Pump 1	18.5 Hz
<b>Control setup?</b>		
Do you want to set up control settings now?		
Yes		
No		
<b>Back</b>	12:59	<b>Next</b>

Select *PID control, single motor*

Off	Pump 1	18.5 Hz
<b>How do you control?</b>		
Press [?] for help.		
SCADA		
Direct control via I/O		
Direct control via fieldbus comm.		
PID control, single motor		
<b>Back</b>	12:59	<b>Next</b>

Set feedback (1.e) and setpoint data

Off	Pump 1	18.5 Hz
<b>Feedback (AI2) scaling</b>		
Adjust the scaling of feedback signal if required:		
AI2 input range:	0.10 V	
Unit:	bar	
Feedback when AI2 at ...:	0.000 bar	
Back	12:59	Next
Off	Pump 1	18.5 Hz
<b>Setpoint source</b>		
Use a constant value		
Control panel		
AI1		
Back	13:00	Next
Off	Pump 1	18.5 Hz
<b>Constant setpoint</b>		
Set the fixed value to be used as the setpoint:		
Setpoint:	5.00 bar	
Back	13:00	Next

Press *Done*

Off	Pump 1	18.5 Hz
<b>Setup complete</b>		
The drive is ready to run the motor in PID control.		
Start/stop:	DI1	
Constant setpoint:	5.00 bar	
Feedback:	AI2	
Back	13:00	Done

Navigate to *Primary settings* → *Fieldbus*

Off	Pump 1	18.5 Hz
<b>Primary settings</b>		
Limits	▶	
Fieldbus	Off ▶	
Fault functions	▶	
Security	▶	
Advanced functions	▶	
Back	13:03	Select

Choose *Embedded fieldbus* OR *Fieldbus adapter* depending on which you are using for communication

Off	Pump 1	18.5 Hz
<b>Fieldbus</b>		
Embedded fieldbus	Off	
Fieldbus adapter	Not used	
<b>Back</b>	13:03	<b>Select</b>

Navigate to *Communication setup*

Set the settings (1.f)

Select desired Communication fail actions and other settings related to comm fail (1.f)

Off	Pump 1	18.5 Hz
<b>If communication fails:</b>		
Ignore		
Fault		
Last speed		
Custom safe reference		
Fault always		
<b>Cancel</b>	13:04	<b>Save</b>

Set the time-out time, the time from loss of communication to action

Off	Pump 1	0.0 Hz
<b>Communication setup</b>		
Profile:	ABB Drives	
If communication fails:	Ignore	
Communication unde...	CW / Ref1 ...	
Ignore failures shorter than:	10.0 s	
Apply settings to embedded fieldb...		
<b>Back</b>	13:23	<b>Edit</b>

Remember to select the last row *Apply settings to...*

Off	Pump 1	18.5 Hz
<b>Communication setup</b>		
Profile:	ABB Drives	
If communication fails:	Last speed	
Communication unde...	CW / Ref1 ...	
Ignore failures shorter than:	10.0 s	
Apply settings to embedded fieldb...		
<b>Back</b>	13:04	<b>Select</b>

Choose *Drive control setup*

Off	Pump 1	18.5 Hz
<b>Embedded fieldbus</b>		
Communication setup		►
Diagnostics	No Packets	►
<b>Drive control setup</b>		►
<b>Back</b> 13:04 <b>Select</b>		

Select *Use fieldbus control word*, if you want to start the drive the over fieldbus

Select *Bit 11 activates secondary control* (this setting will be changed later)

Select *Use fieldbus reference as freq/speed*

Select *Apply settings to...*

Off	Pump 1	18.5 Hz
<b>Drive control setup</b>		
<input checked="" type="checkbox"/> Use fieldbus control word		
<input checked="" type="checkbox"/> Bit 11 activates secondary control		
<input checked="" type="checkbox"/> Use fieldbus reference as freq		
<b>Apply settings to embedded fieldb...</b>		
<b>Back</b> 13:05 <b>Select</b>		

Go back to Primary settings and make other settings (e.g. pump cleaning, quick ramps), if required.

Note! If using Quick ramps, the ramps set in 0. above will be omitted and the operational ramps will be set in Quick ramps menu

Once you have commissioned other settings, go to *Primary settings* → *Start, stop, reference*

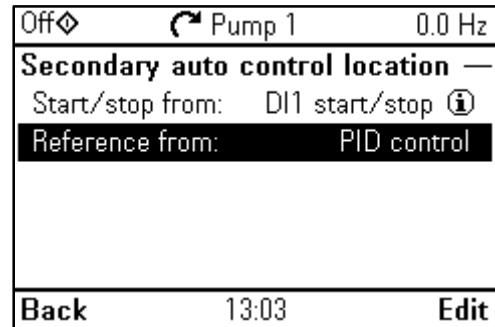
Off	Pump 1	18.5 Hz
<b>Start, stop, reference</b>		
✱ Basic operation setup		
✱ Basic control setup		
Auto control selection: Embedded fi...		
<b>Primary auto control location</b>		►
Secondary auto control location		►
<b>Back</b> 13:08 <b>Select</b>		

Check that on Primary auto control location ( = EXT1)

reference source is either Fieldbus or Embedded fieldbus

Off	Pump 1	0.0 Hz
<b>Primary auto control location</b>		
Start/stop from: DI1 start/stop ⓘ		
<b>Reference from: Embedded fieldbus</b>		
<b>Back</b> 13:03 <b>Edit</b>		

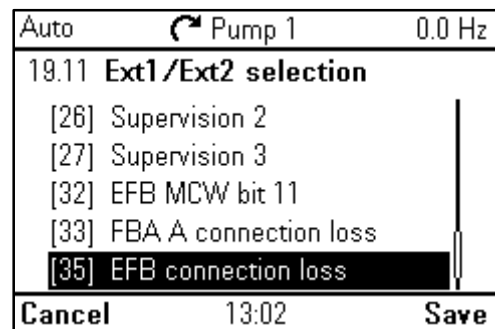
Check that on Secondary auto control location (= EXT2) the reference source is PID control. This is used when the communication is down.



Note! Pay attention to start/stop signal sources on both control locations. It is normally good to have the same source for both, for Primary auto control location and for Secondary auto control location. Normally either Embedded fieldbus, Fieldbus or Digital input 1, DI1.

Navigate to *Menu → Parameters → Complete list → Group 19 Operation mode → 19.11 Ext 1 / Ext 2 selection*.

Choose [33] FBA A connection loss or [35] EFB connection loss depending on if you are using Fieldbus adapter or Embedded fieldbus Modbus RTU for communication



Navigate back to Home screen

Now the drive is commissioned to run on fieldbus control (EXT1) when everything works normally and in case the communication is lost, the drive switches automatically to EXT2 so to PID loop control. After communication recovers back, the drive switches back to fieldbus control (EXT1).

Make sure that it is safe to start the system.

Press Auto-button to start operation.

This guide is designed to help assist with using the communication fail functionality that is available in the ACS580/ACH580/ACQ580 and ACS480/ACH480 VFD.

Please consult your local ABB for additional assistance.