



User Guide

Power Loop Driver BSD-340

SW version 1.1.0 or later
AutroSafe Interactive Fire Detection System



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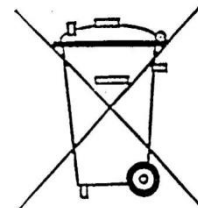


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1. Preface

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1.3 Target audience

This user guide is intended for use by experienced professionals with extensive knowledge about the AutoSafe IFG solution and PowerLoop Drivers.

1.4 Changes

Software version 1.1.0 for BSD-340 improves safety and fault handling by introducing several new features.

1.4.1 Stored loop topology

Loop topology must be saved to the EEPROM during commissioning of the loop. Saving the loop topology to the EEPROM improves control of the loop content, i.e. unit type w/serial number and LSI (Loop Sequence Index).

1.4.2 New fault message: “Memory fault”

A fault message will be reported in the AutoSafe IFG system in the

- Loop topology is not saved
- Loop is changed
- Content in EEPROM is corrupted

The fault message will have two different data types depending on the fault reason:

- Data field 32: Topology missing (missing device, new device, loop break etc)
or
- Data field 16: corrupted content

1.4.3 Other changes

In an operational system the BSD-340 will raise the loop automatically in the following situations:

- First loop break
- Short-circuit
- Restart message from a loop unit

During loop raise the loop will be indicated as disabled on the AutoSafe Panel.

Loops will no longer be raised on reset. Any break or short will be present until next manual disable/enable, or any restart on loop is detected.

Automatic disable/enable not followed by any fault message is an indication of intermittent cable problems on the loop. Wirings should be checked.

In an open loop situation, a second loop break (multiple loop breaks) will not be reported as a loop break, but by loop units not responding.

1.5 Safety

“Memory fault” is a warning meaning that the loop is not running normally. The actual loop must be checked and verified for correct cabling and content.

1.6 Compatibility

1.6.1 AutoSafe IFG

BSD-340 PowerLoop Driver software version 1.1.0 is only compatible with AutoSafe software version 4.3.1 or later.

If your installation uses subscription of analog values from BN-342 or HC-300, using AutoSafe 4.8.1 or newer will give the best PowerLoop crosstalk performance. Using older AutoSafe versions will work correctly, but the PowerLoop data traffic is higher.

1.6.2 Loop units

BSD-340 PowerLoop Driver software version 1.1.0 is only compatible with loop unit software as listed below:

- BSD-340 Version 1.0.7.0 or later
- BN-342 Version 1.4 or later
- X33 Version 1.5 or later
- HC300 Version 1.2 or later

All loop units delivered since 2009 have the latest software version. The above software versions are available in:

- PowerloopUpgradeTool_3_8
- IFG_UpgradeTool_3_8

1.7 Tools

- PC with serial port (or USB to serial converter)
- Serial cable male and female 9 pin D-Sub
- IFG Service Tool (PC application - see chapter 7)
- BSD-340 upgrade files (available to download from the Autronica Product Web).

2. PowerLoop – how it works.

NOTE: This chapter is intended for experienced professionals with knowledge about AutoSafe, AL_Com, loops and LoopDrivers. Please refer to the following documentation for more information:

- *System Design and Engineering- 116-P-SYSDEENGIN-IFG/XGB*
- *System Description - 116-P-ASAFE-SYSTEMD/EGB*

2.1 Powerloops versus normal detector loops

PowerLoop was designed as part of the «Integrated Fire and Gas» functionality for AutoSafe. The BSD-340 PowerLoop Driver communicates with Powerloop units through AL_Com, the same way regular loop drivers (BSD_310) communicate with regular loop units. However, unlike the BSD-310 Loop Driver, the BSD-340 PowerLoop driver handles the loop locally, and reports to the system operator without involving AutoSafe's loop handling module.

2.2 PowerLoop

2.2.1 Electric properties

The PowerLoop, is a two-wire loop that can distribute power to gas detectors, up to 30V DC, 100W (3A). The maximum capacity of detectors or other loops units is 15. Each detector has an internal loop switch, just like regular loop units.

Data signalling uses a “power line modem”, which is a radio signal transmitted over the loop wires. This gives 1200 baud transmission, just like AL_Com loops. Similar to wireless radio signals, PowerLoops may experience reflections and cancellations depending on the cable length and layout – which means that transmitters must be powerful and receivers must be sensitive.

2.2.2 Software handling

A PowerLoop is “raised” the same way an AL_Com loop is raised:

1. BSD-340 powers the first detector from the A side
2. The detector sends a Restart message (serial number, detector type)
3. BSD-340 orders the detector to close its loop switch, powering the next detector
4. The procedure in point 2. and 3. repeats until the loop is closed

Some special cases:

1. If the BSD-340's B terminal is reached, there is a “closed loop”
2. If no Restart message is received, there is a “loop break”
3. If two Restart messages are received, there is a “branch” (which is illegal on PowerLoop)
4. If loop power disappears immediately after a loop switch is closed, there is a “short-circuit”.
This is noticed by the detector, which opens the switch again and sends a short-circuit message to the BSD-340
5. After a loop break or a short circuit BSD-340 starts raising from the B side.
This will in most cases bring all detectors to live

When the PowerLoop is up and running, some issues may occur:

1. Periodic loop measurement detects a loop wire break
2. Periodic loop measurement detects a loop short-circuit

3. A detector has restarted, in which case it opens its loop switch and sends a Restart message

Due to the electric properties and signalling type of the PowerLoop, the only way BSD-340 can investigate and repair such problems is to power down the loop and raise it again. This is very different from AL_Com loops, where AutoSafe can do all sorts of “troubleshooting” while the loop is in normal operation. The AutoSafe will indicate ‘loop disabled’ during any loop raises initiated by the system after a fault is detected.

2.2.3 Loop wiring

Due to the high current consumed by the loop units on a PowerLoop, it is vital that the wiring length is checked with the PowerLoop Calculator in the Autosafe Configuration Tool. This tool ensures that the power loss in the cables does not exceed the operational parameters of the loop.

The system is designed to have BSD_340 PowerLoop Drivers distributed around the site, using AutoFieldBus communication (maximum 1000+ meters cable length). BSD-340 PowerLoop Drivers should be located as close to the connected loop as possible to reduce cable length.

Because of radio communication, whenever more than one BSD-340 is mounted together in a cabinet, and loops are wired together, the system is more likely to have crosstalk issues (see chapter 2.4).

2.3 Loop handling

2.3.1 Reporting topology to AutoSafe

During AutoSafe INIT the PowerLoop handling goes like this:

- Phase 1 of AutoSafe INIT: BSD-340 power-up/close-switch raise of its PowerLoop. This takes approx. 50 seconds for a 15-unit loop.
Note! The BSD-340 knows how many detectors there are on the loop (see chapter 2.2.2 above). This means that after commissioning procedure has been run loop-by-loop, later INITs will have much greater chance to succeed even with a lot of crosstalk.
- Phase 2 of AutoSafe INIT: BSD-340 reports the PowerLoop to the panel.
Note! *If there are any missing detectors on the loop, the BSD-340 will first report the whole loop topology to the panel. Next, the BSD-340 will report the missing detector. Timing between these two reports is so short that the operator will immediately get the report of a missing detector on the loop.*
- Phase 3 AutoSafe INIT: When AutoSafe sends parameters to detectors, BSD-340 is transparent to these messages.

2.3.2 Loop handling / RESET

As described in chapter 2.2.2, BSD-340 must use loop raise to evaluate and/or fix fault situations. If BSD-340 detects a loop problem, it sends a RESTART message for itself to AutoSafe. AutoSafe then executes general LoopDriver handling, which is:

1. Send a message to BSD-340 to power down the loop.
The loop is marked Disabled in the panel.
A disabled loop is not polled.
2. Send a message to BSD-340 to power up the loop.
At this point, BSD-340 does the power-up/close-switch sequence (see chapter 2.3.1).
When finished, it sends an “answer” to the power command back to AutoSafe.

3. AutoSafe now continues as described in chapter 2.3.1 above.
4. When the loop raise is complete, AutoSafe sets state Enabled on the loop, and loop polling starts again.

Note! RESET does not cause a loop raise. The operator must disable, then enable a loop to raise it manually.

2.3.3 Loop Polling

According to EN-54, AutoSafe must report missing detectors within 100 seconds. AutoSafe sends a POLL message to all detectors and requires an Acknowledge in return as proof of life.

1. BSD-340 divides polls over time based on the number of detectors so that one complete loop scan takes 60 seconds.
BSD-340 updates an internal table indicating if a detector is alive or not. This scanning is independent from AutoSafe's polling.
2. AutoSafe polls BSD-340 every 20 seconds (to keep total time under 100).
BSD-340 then reports "Point Not Responding" for all detectors that does not answer with acknowledge message.

2.4 Crosstalk

Crosstalk, or cross loop communication, occurs when radio signals transmitted in one loop is received by the BSD-340 controlling another loop. This happens because the loop cables work like antennas and may occur when cables for multiple PowerLoops are run in parallel or when BSD-340 LoopDrivers are installed close to each other. In general, PowerLoops should not be pulled in parallel, and BSD-340 PowerLoop Drivers should be distributed around the site using AutoFieldBus, and be located as close to the PowerLoop as possible.

Crosstalk is electric noise, and can be divided into two degrees of severity:

- Crosstalk/Full Crosstalk:
A complete message is transmitted between PowerLoops without errors, lost or ruined bits.
Note! The PowerLoop can, to some extent work fairly good when there is error free crosstalk, however this is not an acceptable situation and needs to be fixed.
- Noise/Partial Crosstalk
Weak reception causes a message to be partially transmitted between PowerLoops or has bit errors when received by another loop.
Note! Noise causes retransmissions, which in turn may ruin messages on other loops, so this is the worst situation.

2.4.1 Possible crosstalk issues

When crosstalk occurs, the system may experience several issues:

1. Restart messages from one loop received by another loop.
 - During loop raise: Faults could be new branches or wrong detector type compared to configuration. INIT could often end with loops disabled automatically and fault messages.
 - During operation: Loop would be powered down and raised, making Restart messages that would disturb other loops.

2. Traffic like alarms or analogue values received by another loop
 - Wrong detector reported.
 - Traffic in one loop could ruin traffic in another loop, this would cause excessive retransmissions which in turn could disturb other loops.

2.4.2 Crosstalk countermeasures

The BSD-340 software has some countermeasures to handle crosstalk.

Note! *The wiring of the loops (see chapter 2.4) are very important to follow to minimize the occurrence of crosstalk.*

1. Loop ID

Each PowerLoop includes a “loop ID” in every restart message. The BSD-340 can then ignore restarts from other loops. The “loop ID” is normally the BSD-340’s address on the AutoFieldBus.

Note! *There must be a way to accept wrong IDs so that new detectors and moved detectors can be accepted.*

2. Checksum seeded with LoopID

All PowerLoop messages have a 16-bit CRC (checksum) so that the receiver can ignore messages ruined by noise. Each loop calculates CRC differently by seeding the CRC algorithm with the LoopID. This means that all units on a PowerLoop can ignore messages from other loops, even if they are influenced by crosstalk. The BSD-340 can also determine what loop a crosstalk message comes from.

3. Timeslots

A PowerLoop unit always listens to the loop and avoids transmitting if someone else is transmitting, but if two starts simultaneously there will be a collision, and both stop sending. This problem, due to collisions, is solved by a “timeslot” system, and starting transmission in a random timeslot. This strategy increases the chance to get a message through.

Note! *Crosstalk messages will reduce capacity from neighbour loops.*

4. Slow retransmissions

The BSD-340 SW version 1.1.0, or later, no longer has a time delay in retransmissions of messages, which was used for avoiding mutual jamming. The high number of timeslots available for retransmissions makes a better use of bandwidth and assures that messages get through.

5. Fault message “crosstalk”

When crosstalk is detected the BSD-340 will report a fault message to the AutoSafe panel. This can be used during commissioning to reduce crosstalk.

6. Crosstalk “mode” of BSD-340

There is a “crosstalk mode” in the BSD-340. This is done by setting the address switches to +40 (see chapter 5.4.1).

- No crosstalk fault messages (as they would become very annoying in systems with continuous crosstalk)
- Ignore RESTART messages from other loops

Note! Regarding timeslots and retransmissions: There are some situations where responses must occur within fixed time limits, where crosstalk may slow things down to a point where faults occur. (1) Loop Raise, where BSD-340 waits for a few seconds for RESTART messages. Failure to meet a time requirement here may cause Loop-Break fault, and if that happens from both A and B side, one or more detectors may be "lost" from the loop. (2) Parameter setting from AutoSafe, which is used during INIT/Enable phase 3; AutoSafe has a hard timeout of 6 seconds waiting for an answer. Failure to meet a time requirement causes a Parameter fault. (3) Command from AutoSafe, typically setting up subscription to analogue values. Slow response causes a Point-Not-Responding fault. In these situations, the software is not able to adjust for crosstalk, and loop wiring must be reconsidered (see chapter 2.4).

2.5 Duplicate messages

All messages on the PowerLoop are sent with ACK (acknowledgement), which means that the receiver must send an ACK message back to the sender. If the sender does not receive the ACK within a time limit, it will re-send the message. If for some reason the ACK is lost, this could be a problem for some messages from detectors to BSD-340/AutoSafe.

- A RESTART duplicate during loop raise is handled as a branch
- A Parameter ANSWER duplicate confuses AutoSafe's parameter sending, it expects one answer and gets another, so it terminates parameter handling for that detector.

The BSD-340 sw version 1.1.0, or later, has an elaborate duplicate handling, with more RESTART situations and all parameter handling during INIT.

3. Upgrading BSD-340 PowerLoop Drivers

3.1 Before you start

Download etvc files from the Product Web.

Note! Check offset before upgrade (Refer to chapter 0). Check the configuration for system number (offset) or, on a running system type #SetSysNo0. in the IFG Service tool when connected to the BSD-340 loop driver. Terminal will either return old system number or nothing (nothing = system number 0). Note this for later use if it is different from 0 as you will have to set it manually later. All loop drivers on the same AutoFieldBus will have the same System ID.

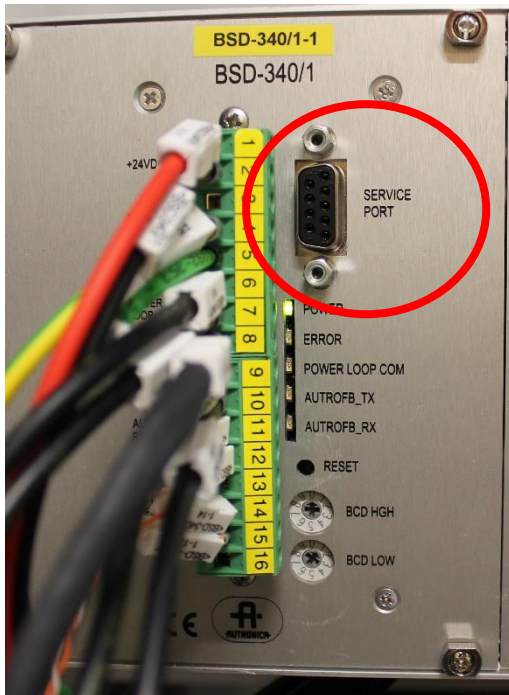
Note! Ensure that all loop devices have been upgraded to the 2009 version of the software. This can be checked by means of an older version of IFG Service tool. Without the latest software (2009 revision) in the loop devices (detectors) the end result will not be optimal!

3.2 Label the BSD-340 board to identify the SW version

Apply a label to the BSD-340 board which states the SW version that is to be downloaded (refer to chapter 3.6).

3.3 Connect PC to loop driver

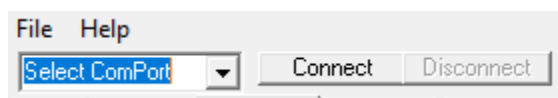
Connect your PC to the BSD-340 PowerLoop Driver service port using a RS232 serial cable.



Check IFG Service tool user interface for help (see chapter 7).

3.4 Start IFG Service tool and connect to loop driver

- Open IFG Service Tool on your computer (see chapter 7)
- Click the drop-down menu for **Select ComPort**, select the port in use for connection with the BSD340 and press **Connect**



- Select **Start Log to File** to save progress and topology to PC file for documentation



Note! When the IFG service tool is running and connected to a loop driver, wait a minute to check for any crosstalk¹ messages in the "Output window". Any loops listed here for crosstalk should be disabled before you proceed. This to ensure the best possible outcome of the upgrade.

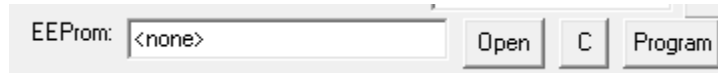
¹ See chapter 2.4

3.5 Disable loop

From the Autosafe panel, disable the loop which you are about to upgrade.

3.6 Download software to BSD-340

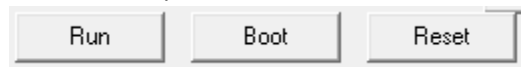
- a. Press **Open** to the right of "EEProm". Go to the folder where you have stored the new software files. Select *.EEP file from folder



- b. Press **Open** to the right of "Application". Go to the folder where you have stored the new software files. Select *.hex file from folder



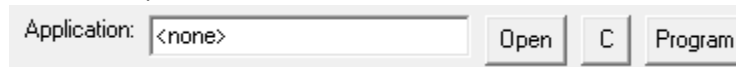
- c. Press **Boot** to set loop driver in boot loader mode



- d. Verify Bootloader loaded (Bootloader BSD340 June 9 2004 10:54:54) in the "output window" in IFG service tool.
- e. Upgrade EEPROM by clicking **Program** on the right-hand side - wait for completed confirmation in the Command Input window



- f. Upgrade hex by clicking **Program** on the right-hand side - wait for completed confirmation in the Command Input window



- g. Press **Run** – loop driver will start
- h. Type #? followed by Enter in the **Command input window** to verify correct version Notice that **AFB Switch addr** will change according to the set address on the loop driver.

```
BSD-340 PowerLoop Controller
SW Version : 1.1.0.0
Compiled at: 12:52:48 Dec 16 2019
(C) 2019 Autronica AFS
```

```
AFB Switch addr : 01
Powerloop LoopID: 01
HW Revision      : 5
```

- i. If system number noted in step 3.1 (Before you start) is different from 0: Type #SetSysNoX (X = earlier system number) and enter in the **Command input window**

3.7 Raise loop and store topology in loop driver

- a. Type #si and enter in the **Command input window** to raise loop and save topology to EEPROM

- b. The loop raise should end with a message like this

```
== Last saved EEPROM:|
```

```
..Save loop in EEPROM
```

If loop is successfully saved to EEPROM, proceed to step d.

- c. Resolving failed save of topology

- i. If there are devices on the loop which fail to start, or that there are loop breaks on the loop, a fail message is reported: "Loop Not saved in EEPROM this time" will be printed in terminal (see figure below)

```
== Last saved EEPROM:
```

```
Loop NOT saved in EEPROM this time
```

- ii. Since the powerloop requires to have a saved topology to work, use the print topology #prntop command to get a printout of the topology and fault messages to help resolve any faults.

	Type	Loop:LSI	Serial..../Ty/MC	Png	Sw	Typ	Year	Day	Count
[01]	HC-300	09:01	07-FF-A8-93/44/00/	N	X	068.2009.337.65287			
[09]	BN-342	09:09	07-D5-90-9B/CD/00/	N	S	205.2017.289.54535			
[0A]	HC-300	09:0A	07-E9-98-12/44/00/	N		068.2008.304.59655			
[0B]	BN-342	09:0B	07-D6-38-14/CD/00/	N		205.2010.112.54791			
[0C]	HC-300	09:0C	07-E1-89-12/44/00/	N		068.2008.274.57607			
[0D]	BN-342	09:0D	07-D4-38-14/CD/00/	N		205.2010.112.54279			
[0E]	HC-300	09:0E	07-D1-87-92/44/00/	N		068.2008.271.53511			
[0F]	BN-342	09:0F	07-F0-3B-13/CD/00/	N		205.2009.118.61447			

- iii. Note the symbol | in the Sw column. Different symbols may be used:

| = closed switch, X = open switch, ? = unit missing, S = Short circuit

In the example above there is a short between detector 1 and 2. In the SW column the first detector states an X, which means that it has not been able to close the loop switch. On detector 2 it is stated an S for short (towards detector 1)

- iv. Investigate the loop and connections and resolve any faulty wiring or connections.
- v. Type #si and enter in the **Command Input Window** to try a loop raise again after you have investigated faults indicated on the topology after the last run of "si".
- d. After loop has been successfully saved you can verify the saved loop, Type #prntop and enter in the **Command input window** to list saved topology (output as in figure below)

== Current loop:

	Type	Loop:LSI	Serial...../Ty/MC	Png	Sw	Typ	Year	Day	Count
[01]	HC-300	09:01	07-FF-A8-93/44/00/	A		068.2009.337.65287			
[02]	BN-342	09:02	07-D5-90-9B/CD/00/	A		205.2017.289.54535			
[03]	HC-300	09:03	07-E9-98-12/44/00/	A		068.2008.304.59655			
[04]	BN-342	09:04	07-D6-38-14/CD/00/	A		205.2010.112.54791			
[05]	HC-300	09:05	07-E1-89-12/44/00/	A		068.2008.274.57607			
[06]	BN-342	09:06	07-D4-38-14/CD/00/	A		205.2010.112.54279			
[07]	HC-300	09:07	07-D1-87-92/44/00/	A		068.2008.271.53511			
[08]	BN-342	09:08	07-F0-3B-13/CD/00/	A		205.2009.118.61447			

- The same loop as the example above, but now without the short between detector one and two in it.
- e. Press **Reset** on the Autosafe panel to clear AutoFieldBus faults caused by the upgrade of the loop driver.
- f. Enable loop on the Autosafe panel
- g. Enable any other loops which were disabled to remove crosstalk before the upgrade was started.
- h. Continue with the next loop driver (if any)

4. Service operations

4.1 Delete and save topology

Saving a new topology requires no existing topology in loop driver.

4.1.1 Delete topology

Topology may be deleted by two different procedures:

- By PC and IFG service tool using command #eraseEE
- Set address switches on loop driver to 97 (High:9, low7), press the reset button on loop driver – then wait 5 seconds to complete. Set address switches back to correct values and press the reset button on loop driver.

4.1.2 Save topology

Saving topology may be done by two different procedures:

Note! *If there is any known crosstalk involved in current loop, any conflict loop should be disabled before proceeding*

- By PC and IFG service tool using command #SI
 - Type #prntop to list saved topology
- By manually disable/enable loop (loop driver without existing topology)

Note! *A loop with faults (short, break and such) will not be stored. Only a loop which is complete throughout will be stored in the system*

4.2 Replace PowerLoop driver (BSD-340)

4.2.1 Without PC and IFG service tool

Note! *If there is any known crosstalk involved in current loop, any conflict loop should be disabled before proceeding*

1. Disable loop
2. Remove old loop driver and replace with a new one
3. Disable other loops which you know have crosstalk with the loop you are working on.
4. Set switches to 97 (High:9, low7) and press reset button on loop driver to erase any topology
5. Set address on loop driver back to correct address and press reset button on loop driver
6. Press reset on panel/top system to re-establish Autrofieldbus
7. Loop will automatically be enabled
8. Memory fault will be issued
9. Disable/Enable loop to save topology
10. Enable loop(s) disabled in step 3.

4.2.2 With PC and IFG service tool

Note! *If there is any known crosstalk involved in current loop, any conflict loop should be disabled before proceeding*

1. Disable loop
2. Set correct address on loop driver
3. Remove old loop driver and replace with a new one
4. Connect laptop to new driver
5. Verify address by typing #? and enter
6. Disable other loops which you know have crosstalk with the loop you are working on.
7. From IFG service tool
 - a. Erase topology from EEPROM with using command #eraseEE and enter
8. From IFG service tool
 - a. Type #si and enter to raise loop and save topology to EEPROM
 - b. Type #prntop and enter to list saved topology
9. Set Systemnumber if different from 0: Type #SetSysNoX (X = earlier system number) and enter in the **Command input window**
10. Press reset on panel/top system to re-establish Autrofieldbus
11. Loop will automatically be enabled
12. Disable/Enable loop.
13. Enable loop(s) disabled in step 6.

4.3 Replace loop unit

4.3.1 Without PC and IFG service tool

Note! *If there is any known crosstalk involved in current loop, any conflict loop should be disabled before proceeding*

1. Disable loop
2. Remove old loop unit and replace with a new one
3. Disable other loops which you know have crosstalk with the loop you are working on.

4. Set address switches on loop driver to 97 (High:9, low7) and press reset button on loop driver to erase any topology (wait 5-10 seconds after you have pressed reset button on driver)
5. Set correct address and driver press reset button on loop driver
6. Press reset on panel/top system to re-establish Autrofieldbus
7. Loop will automatically be enabled
8. Memory fault will be displayed
9. Disable/Enable loop to save topology
10. Enable loop(s) disabled in step 3

4.3.2 With PC and IFG service tool

Note! *If there is any known crosstalk involved in current loop, any conflict loop should be disabled before proceeding*

1. Disable loop
2. Remove old loop unit and replace with a new one
3. Verify address by typing #? and enter
4. Disable other loops which you know have crosstalk with the loop you are working on.
5. From IFG service tool
 - a. Type #si and enter to raise loop and save topology to EEPROM
 - b. Type #prntop and enter to list saved topology
6. Press reset on panel/top system to re-establish Autrofieldbus
7. Loop will automatically be enabled
8. Enable loop(s) disabled in step 4

5. Commissioning operations

The content of this chapter must be considered as useful tips. None of these actions are mandatory

5.1 Useful commands

Command	Parms	Description	Example
#?	0	List Device Status	
#rt		Reset	
#Login	1	Login to device P1 (PowerLoop LoopID)	#Login1
#Logout	1	Logout from device P1	#Logout1
#SetSysNo	1	Set PL Systemnumber	#SetSysNo5
#ping_ctrl	1	Stop/Start ping P1=0/1	#ping_ctrl0
#PL_Stat	0	Print PL stat	
#PL_Clear	0	Clear PL stat	
#PrnTop	0	Print Topology (PT_DB)	
#si	0	Start Init	
#EraseEE		Erase saved PTs (erase saved topology)	
#TraceAL	1	Trace AL_Com 0=Off, 1=On. No print of standard protocols	#TraceAL1
#PrintCross	0	Prints crosstalk statistics	
#ZeroCross	0	Reset crosstalk statistics	

5.2 Establish AutoFieldBus communication

AutoFieldBus communication is up running on a panel already in commissioning mode. On a running AutoFieldBus it is possible to remotely access PowerLoop drivers from another PowerLoop driver with a PC connected. Use command #LoginX, where X = address on AFB (exclude +40 settings and system number). This is useful to fetch crosstalk statistics and PL_stats (see chapter 5.4.2 Discover crosstalk). In addition, you may fetch the topology. Avoid using other commands as this will cause too high load on the PowerLoop driver you are connected to with a PC.

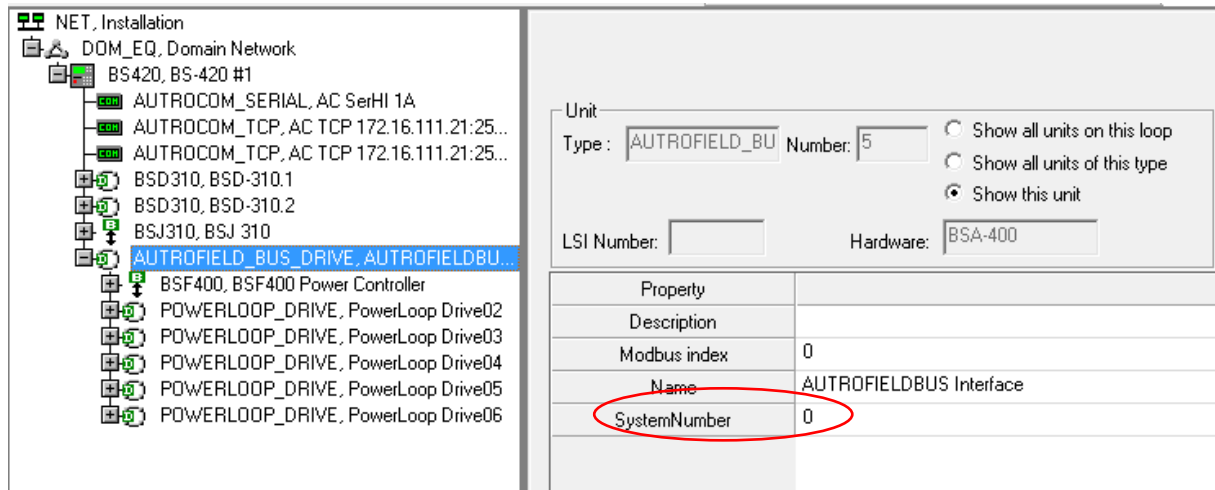
Recommended procedure:

1. Start log to file (easy to read when finished)
2. #LoginX
3. #? (to have reference to loop driver in log file)
4. #Printcross
5. #PL_stat
6. #prntop (list existing topology as well as saved)
7. #LogoutX (important)

5.3 De-conflict systems

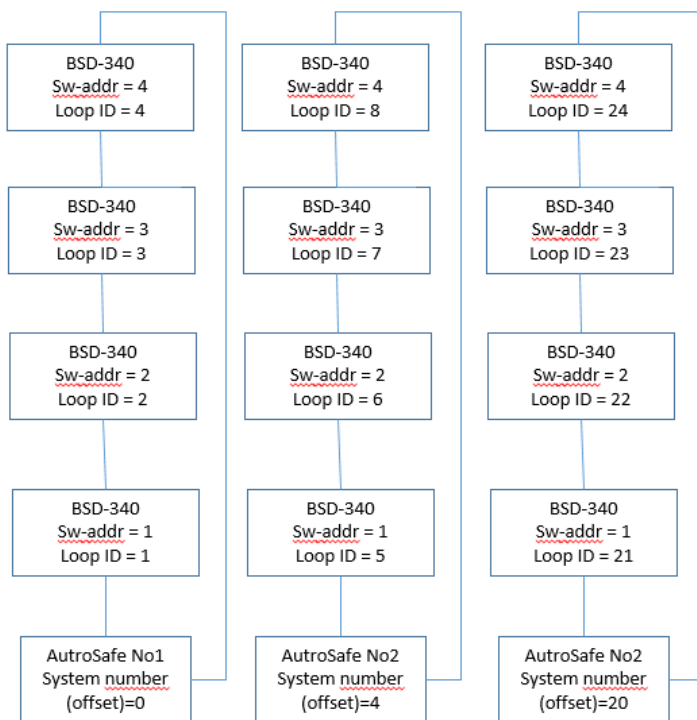
If more than one panel has an Autrofieldbus with PowerLoop in the same installation, PowerLoops need unique system numbers as well. This number is an offset of address switch setting on BSD-340. This is to de-conflict PowerLoops with same loop IDs so that the crosstalk algorithm is not compromised.

System number is selected in configuration file at the AutoFieldBus interface. The lowest number to use is equal to the number of PowerLoops on the other Autrofieldbus. For convenience it is recommended to use a higher number so that adding more PowerLoops to an AutoFieldBus does not imply changing the System Number on the other AutoFieldBus.



Note! Due to limited memory available, crosstalk statistics only presents loopID 1 -50. Any loops with ID exceeding this will not be listed.

The loop ID is the sum of the AFB-switch address and an offset. The following figure explains this:



5.3.1 Changing system number

When starting a system, the first time after changing system number all loop units on PowerLoops will be “Not responding” and loop breaks will be presented as well. All loops have to be manually disabled/enabled to reprogram loop id in all loop units.

1. First initialization sets offset (system number) in BSD-340 – all loop units will have an old loop ID
2. Topology has to be deleted (see chapter 4.1.1)
3. Manual disable/enable allows reprogramming of new loop ID in loop units

5.4 Crosstalk

The PowerLoop loop driver, BSD-340, uses radio frequencies to communicate with the loop units. This signal is an amplitude modulated digital signal, transmitted on the power line. Because of potential long cables, up to 1km, and heavy load, the PowerLoop modem needs to have a large dynamic range and high sensitivity. Because of this it is quite possible for the data signals to travel from one loop to another due to capacitive and inductive coupling between the wires or through the ground system. This means that the PowerLoop systems must be wired properly (see chapter 2.2.3).

Some measures have been implemented in PowerLoop equipment to reduce the effect of crosstalk. BSD-340 and loop units will operate with a unique loop ID in communication frames which makes it possible to discriminate between frames from different loops. However, to establish a loop with unique loop ID, the PowerLoop driver and PowerLoop units need a session where different loop IDs are accepted. This is to establish a new loop where loop IDs do not exist or when loop units have a different loop ID than required. This will occur when installing loop units which already have another loop ID, or when a complete loop is moved to another loop ID (Changing address switch on loop driver or changing system number, see chapter 0 above). No topology may exist in loop driver (see chapter 4.1.1) during these sessions, and any loop that is source to crosstalk to actual loop must be disabled.

5.4.1 +40 setting

The +40 setting is adding 40 to the address switches on BSD-340. This will not change the address but turn off sending fault message “crosstalk detected” to panel.

Example: switch address 45 equals address 5.

5.4.2 Discover crosstalk

PowerLoop drivers without +40 setting will issue a fault message “Crosstalk detected” with Data 3, 5 (example values).

These numbers refer to:

- Before comma: AFB address of reporting loop (add system number if different from 0)
- After comma: Loop ID of source of crosstalk.

The reporting loop’s tag will be presented in fault messages heading

5.4.3 Crosstalk map

This map is developed based on “Crosstalk detected” faults, crosstalk statistics and #PL_Stat from all PowerLoop drivers.

		Source				
		PL02	PL03	PL04	PL05	PL06
Victim	PL02					
	PL03				p/w	p
	PL04					
	PL05		p			p/w
	PL06				p/s	
		p= pure crosstalk/complete messages				
		w=some noise				
		s=much noise				

5.4.4 List crosstalk statistics

#printcross command will show statistics for crosstalk seen from one PowerLoop driver. Each PowerLoop driver has to be checked.

```
07:44:33:886 Crosstalk from: My LoopID=15
07:44:33:902 LoopID=13, LD= 23, PT= 0
07:44:33:910 LoopID=16, LD=8661, PT= 0
```

This is measured over 900 minutes. Although crosstalk between “My LoopID=15” and “LoopID=16” is high it is not a severe problem since it is between two loops. If there were high crosstalk numbers with three or more loops involved, cabling had to be checked.

5.4.5 PowerLoop statistics (#PL_Stat)

#PL_Stat will show a printout like this:

```
-----
07:49:48:299 #PL Frames : 0x00002625
07:49:48:323 #Collisions: 0x000000ad
07:49:48:346 #Frame err : 0x00000405
07:49:48:355 #CRC errors: 0x00001648
07:49:48:366 #UART stuck: 0x00000007
07:49:48:375 #Crosstalkm: 0x0000221d
07:49:48:386 #ByteTimeout: 0x00000000
07:49:48:395 #Retrans : 0x0000003f
07:49:48:405 #AckFailed : 0x00000000
07:49:48:415 #AckOK : 0x000025f4
```

5.4.5-1 Frame err: 405 = 1029 (measured over approx. 15 hours)

Notice: Numbers are presented in hexadecimal values and can easily be translated to decimal values using Windows` built in calculator in programmer`s mode (Due to limitations in in BSD-340 internal memory no conversion to decimal numbers is available).

Frame errors may be a reference to crosstalk (source not defined) seen as noise. Some noise is normal, even within own loop – especially in loop raise. The example above is measured over about 900 minutes, which in average is just above one frame error per minute - frame error rate is

low. In addition; this measurement was made on an open loop. Open loop is more exposed to crosstalk/noise than a closed loop.

Source may be found this way:

1. Select a loop which has crosstalk and/or has problem with loop raise
2. Disable suspected source loops
3. Do #PL_Clear to set counters to zero
4. Wait 5 minutes
5. Check #PL_stat to see any increase in frame errors (if increase is high source might be a loop not disabled)
6. Enable a loop
7. Wait 5 minutes
8. Check #PL_stat to see any increase in frame errors

Repeat for all loops.

5.5 Serial numbers for verification (Recommended)

#prntop will list actual content as well as last saved topology. In case of “memory fault detected (16) this command may be used to discover conflicts. Also, save the topology list for reference.

OK topology:

```
07:55:58:139 == Current loop:
07:55:58:152      Type Loop:LSI Serial...../Ty/MC Png Sw Typ Year Day Count
07:55:58:162 [01] BN-342 03:01 07-D5-0D-8E/CD/00/ A | 205.2004.027.54535
07:55:58:170 [02] BN-342 03:02 19-00-00-01/CD/00/ A | 205.1991.000.00025
07:55:58:180 [03] HC-300 03:03 00-04-21-0F/44/00/ A | 068.2005.066.01024
07:55:58:194 [04] BN-342 03:04 05-03-05-01/CD/00/ A | 205.1991.010.00773
07:55:58:204
07:55:58:214      C-addr LSI
07:55:58:222 [01] L=01 C=01
07:55:58:231 [02] L=02 C=02
07:55:58:239 [03] L=03 C=03
07:55:58:248 [04] L=04 C=04
07:55:58:256
07:55:58:265 == Last saved EEPROM:
07:55:58:273 [01] BN-342 03:01 07-D5-0D-8E/CD/00/          205.2004.027.54535
07:55:58:281 [02] BN-342 03:02 19-00-00-01/CD/00/          205.1991.000.00025
07:55:58:289 [03] HC-300 03:03 00-04-21-0F/44/00/          068.2005.066.01024
07:55:58:298 [04] BN-342 03:04 05-03-05-01/CD/00/          205.1991.010.00773
07:55:58:306
```

Wrong topology (Memory fault (16):

```

10:29:01:108      Type Loop:LSI Serial..../Ty/MC Png Sw Typ Year Day Count
10:29:01:118 [01] BN-342 05:01 17-00-00-01/CD/00/ A | 205.1991.000.00023
10:29:01:124 [02] BN-342 05:02 16-00-00-01/CD/00/ N | 205.1991.000.00022
10:29:01:131 [03] BN-342 05:03 13-00-00-01/CD/00/ N | 205.1991.000.00019
10:29:01:138 [04] BN-342 05:04 10-00-00-01/CD/00/ N | 205.1991.000.00016
10:29:01:150 [05] BN-342 05:05 11-00-00-01/CD/00/ N | 205.1991.000.00017
10:29:01:156 [06] BN-342 05:06 0F-00-00-01/CD/00/ N | 205.1991.000.00015
10:29:01:163 [07] BN-342 05:07 63-63-63-01/CD/00/ N | 205.1991.198.25443
10:29:01:169 [08] BN-342 05:08 63-63-63-02/CD/00/ N | 205.1992.198.25443
10:29:01:176 [09] BN-342 05:09 63-63-63-03/CD/00/ N | 205.1993.198.25443
10:29:01:182
10:29:01:189      C-addr LSI
10:29:01:195 [01] L=01 C=01
10:29:01:201 [02] L=02 C=02
10:29:01:207 [03] L=03 C=03
10:29:01:213 [04] L=04 C=04
10:29:01:219 [6] L=06 C=06
10:29:01:225 [07] L=07 C=07
10:29:01:231 [08] L=08 C=08
10:29:01:237 [09] L=09 C=09
10:29:01:243 :01 17-00-00-01/CD/00/      205.1991.000.00023
10:29:01:248 [02] BN-342 05:02 16-00-00-01/CD/00/      205.1991.000.00022
10:29:01:255 [03] BN-342 05:03 13-00-00-01/CD/00/      205.1991.000.00019
10:29:01:261 [04] BN-342 05:04 10-00-00-01/CD/00/      205.1991.000.00016
10:29:01:267 [05] BN-342 05:05 11-00-00-01/CD/00/      205.1991.000.00017
10:29:01:273 [06] BN-342 05:06 0C-00-00-01/CD/00/      205.1991.000.00012
10:29:01:280 [07] BN-342 05:07 63-63-63-01/CD/00/      205.1991.198.25443
10:29:01:287 [08] BN-342 05:08 63-63-63-02/CD/00/      205.1992.198.25443
10:29:01:294 [09] BN-342 05:09 63-63-63-03/CD/00/      205.1993.198.25443

```

Note the symbol | in the Sw column. Different symbols may be used:
| = closed switch, X = open switch, ? = unit missing (ref saved topology)

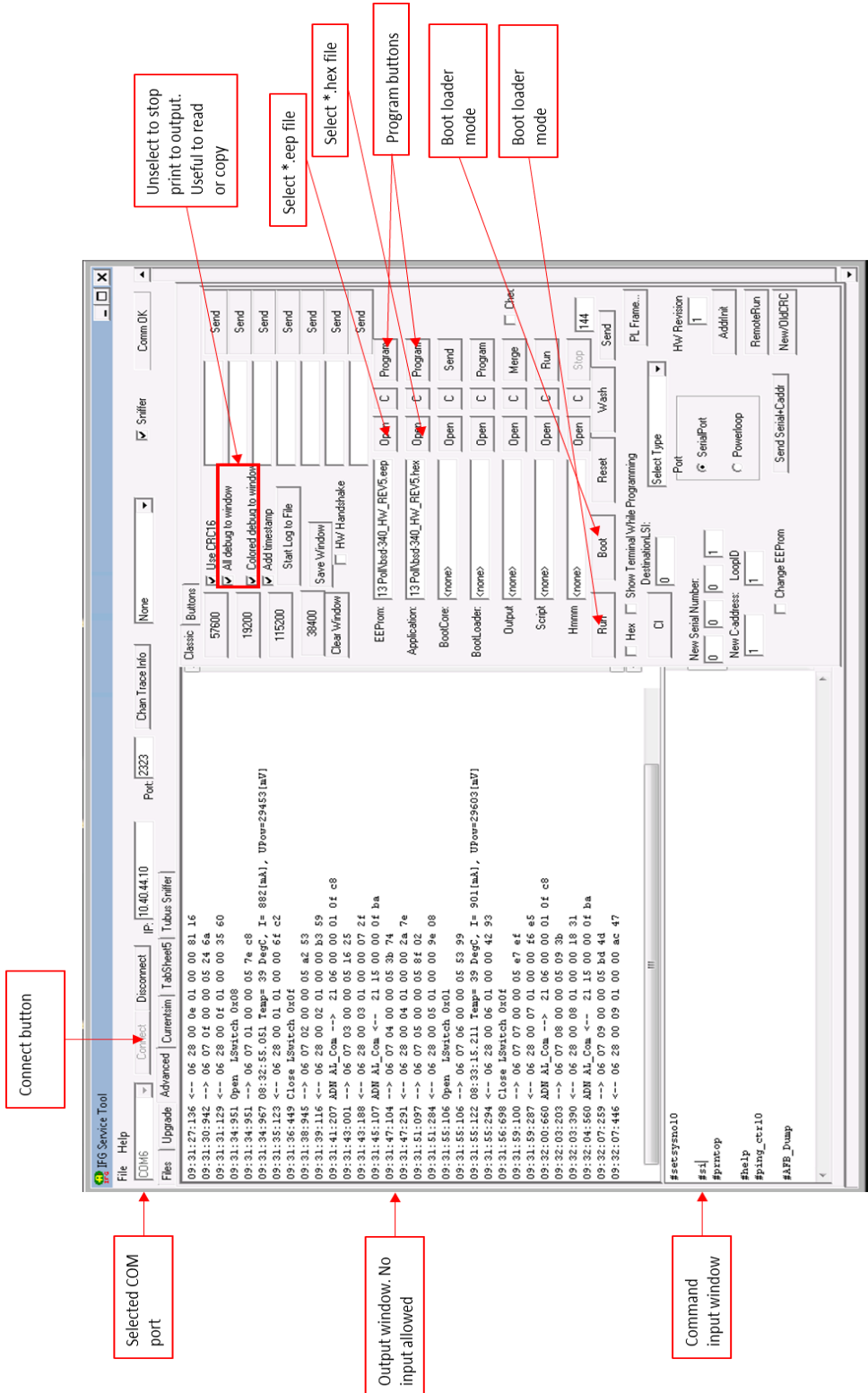
6. External protocols

Depending on the top level system, the detail level of faults may vary.

Modbus will only present general faults on PowerLoop driver. Panel must be checked for details.

7. IFG service tool- user interface

Connect a serial cable from PC to loop driver. Select correct COM port and press connect button. Type #? and enter to verify connection.



8. Troubleshooting

8.1 Open loop and short circuit on the same loop may end up in infinite disable/enable.

In this situation, open the loop at one end. Raise loop to isolate break/SC. Reconnect the first and disconnect the other end, and raise loop to isolate break/SC. Disconnect cabling before SC. Reconnect both ends and raise loop. Detectors between the two breaks in loop will be unavailable.

8.2 Parameter fault on loop unit

Parameter fault on loop unit after initialization/loop enable: Disable/enable loop unit. It is not necessary to disable/enable loop.

8.3 Enable loop without saved topology

Since manual enable of a loop, without a saved topology, implies acceptance of start-up message from loop units with a different loop ID, enabling loops with crosstalk between them may give open loop, illegal topology, branch on loop, etc. Hence enabling such loops at the same time is not recommended.

8.4 Memory fault after initialization

Memory fault may occur if no topology is saved (Memory fault (32)) or if crosstalk level is so high that loop raise has been destroyed. In both situations, try manual disable/enable of actual loop.

8.5 Open loop after initialization

Open loop after initialization may a result of crosstalk. Try manual disable/enable of actual loop

