# Startup guide for Pluto Safety PLC, connected in a bus system

1. Check the bus cable

- How many meters of bus cable have been used?
- Is the system connected with stub cables?
- How long is each stub?
- What is the total length of stub cables?
- Resistors for end termination must only be connected in the beginning and the end of the system.
- When measuring the resistance between CH and CL at one Pluto (all units shall be dead) the resistance shall be somewhat under 60 Ω.
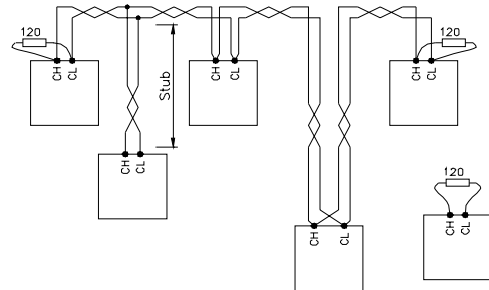
The following data are necessary to select the correct communication speed in the system. A lower speed gives the possibility to communicate over a longer distance, but it results in that somewhat fewer Pluto's can be connected. A more detailed description can be found in the Pluto Hardware Manual, chapter Bus communication.

Bus speed	Cable length	Stub length	Total stub length
100 kbit/s	600 m	25 m	120 m
125 kbit/s	500 m	20 m	100 m
200 kbit/s	300 m	13 m	70 m
250 kbit/s	250 m	10 m	50 m
400 kbit/s	150 m	6 m	30 m
500 kbit/s	100 m	5 m	25 m
800 kbit/s	60 m	3 m	15 m
1 Mbit/s	< 20 m	1 m	5 m

Communication speed for the project is set in the Pluto Manager. Open the window Project NoName, open the pop-up menu under Baudrate Pluto Canbus and select the correct speed.
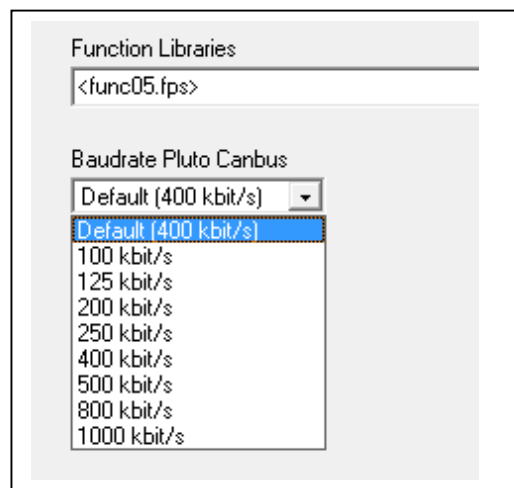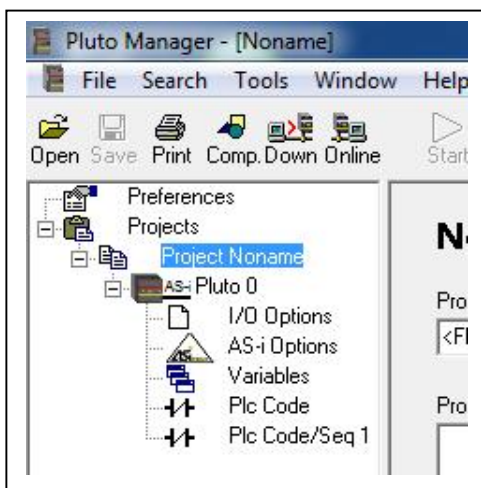
2. Read the IDFIX number

- Must be performed before the program is downloaded to any of the units.
- The programming cable must be connected to each Pluto when reading that particular Pluto's IDFIX.
- Read IDFIX numbers to all Pluto's using the command "Copy online IDFIX to clipboard" under the menu "Tools". Paste the number to the corresponding Pluto.

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3. Check the Operating System version

- To avoid problems with different OS versions in the Pluto system, it is a good idea to check that the correct version of the OS is downloaded to all Pluto units. The most convenient way to do this is with "OnlineInfo →Pluto connected to PC" under the "Tools" menu.
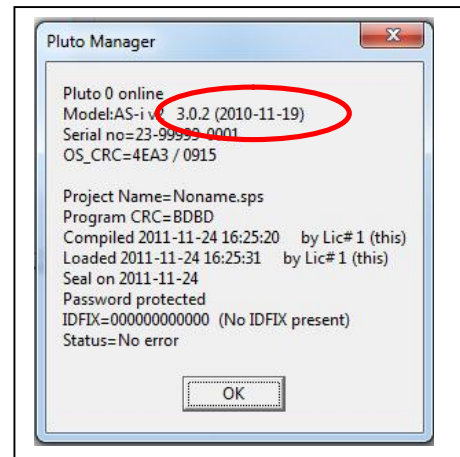

The latest version of OS can be obtained by contacting support.jokabsafety@se.abb.com or your local ABB Jokab support.

4. Check that Er20 is shown in the Pluto display window

- If another fault code is shown in the display window; the program shall be erased from the unit, resulting in Er20 shown on the display. If another fault code is shown, the Pluto can be restarted with voltage off/on or with the command "Reset all Pluto's" under the "Tools" menu.
- Repeat the procedure for all units in the system.

5. Download the program

- Compile and download the project file in one of the Pluto units. Check that all units have the program downloaded in the window that is shown. Pay attention to the units that eventually have not been correctly loaded. Select "Start PLC program".
- Fault code Er26 is going to be shown in the Pluto display. This is normal and is acknowledged with the "Reset all Pluto's" command under the "Tools" menu or with voltage off/on at all units.
- Check the system with the "Bus Status" command under the "Tools" menu. All units shall be green/OK. If there are fault codes, check in the manual and perform necessary measures.

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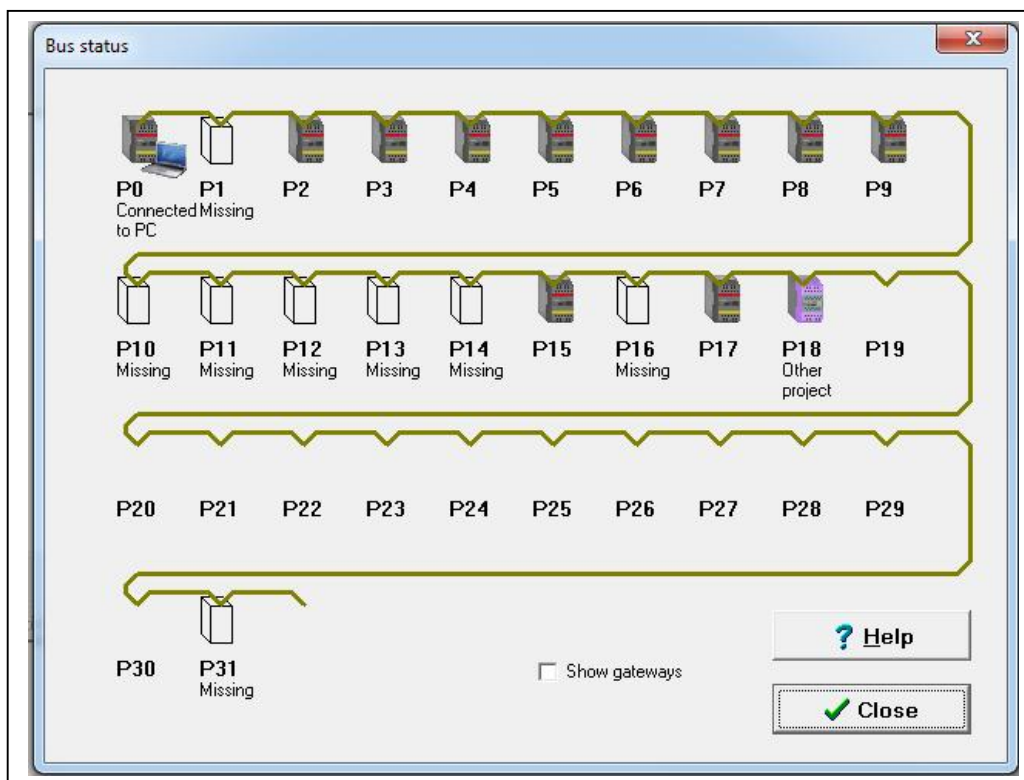
Problems due to communication and downloading of programs in the network

- If the Pluto units in the "Bus Status" window is flashing red/green and showing the fault code Er18 and some other fault codes (among others Er24, Er27 and Er60) it is probable that the bus cable is not correctly connected/installed or that a Pluto unit is causing disturbances on the bus.

- Start by disconnecting the upper left connection block at all Pluto units (put a screwdriver in the slot on the contact block and lift the block upwards). For each and every of the units, switch off and on the voltage and download the program again without connecting the Pluto to the bus. Check that the correct station number is shown on all units. **N.B.!** Make no changes in the program and no compilations in this stage. All units must be loaded with exactly the same project.

- Check the connections of the bus cable to the Pluto units. All CH shall be connected to each other and all CL shall be connected to each other. The ends of the cable shall be equipped with termination resistors of 120Ω each.

- If the length of the bus cable is not possible to read/estimate it is possible to measure the bus cable with a multimeter. Create a short circuit at one end of the bus cable and measure the resistance between the two conductors for CH and CL without a termination resistor in the other end. When performing the measurement all Pluto's must be powered off and the terminal block for the bus connection shall be disconnected.

  Total resistance = resistivity * total cable length * 2/ cable area

  For copper with the area 0,5 mm^2 the resistivity is 0,0172 mm^2/m.

  Example:
  With a total resistance of 10,3Ω the cable length will be approximately 150m.

  $$\frac{10,3*0,5}{0,0172*2} = 149,7$$

- Now reconnect one Pluto at a time and check in the "Bus Status" window that the units are shown and are OK. The fault code Er18 can be shown; try to reset by pressing the button "K" at the Pluto or make a "Reset all Pluto's" to get started again. If this doesn't help; replace the last Pluto that was connected with another unit, which must have the program downloaded before being connected.

- All Pluto units in a project are loaded with the same program. The IDFIX number determines which part of the project that is being executed for the particular Pluto. This can be a help for troubleshooting: Pluto units can be changed around to see if the fault follows a particular Pluto or not.