

Statement of changes in the microcontrollers of ConveyLinx family

1. Introduction

The ongoing global Covid pandemic has affected every industry globally in one way or another. The effects on the various sectors vary from extremely negative for the Automotive industry to very positive for the Logistics and IT sector. One major effect, which began to accelerate towards the end of 2020, was a shortage in semiconductor elements. This shortage would then grow to be called the ongoing Chip crisis. Even very major companies, which have a lot of leverage over the semiconductor suppliers, face significant delays and subsequent slowdown of production. Most lead times have grown to be longer than six months with many critical components having lead times in excess of one year. The chip crisis was also accompanied by a significant increase in demand for semiconductor chips and elements.

Industrial Software was also affected by this storm – significant delays in deliveries coupled with an increased demand. Even though we had material and chip stocks exceeding the 2021 forecasts, those were wiped out. New orders made by us for the semiconductor parts were met with non-committing answers, sometimes lies and scams (people will always try to exploit such situations) or 6 months or longer lead times. The price of the semiconductor elements also skyrocketed. In such a unique situation Industrial Software had no choice, but to begin a redesign of the affected control cards with a new CPU.

2. Affected control cards

- a. ConveyLinx-Ai
- b. ConveyLinx-Ai2
- c. ConveyLinx-A3 RC/FC
- d. ConveyLinx-ECO
- e. MotionLinx-Ai
- f. ConveyLinx2-JST-Brake
- g. ConveyLinx-IO
- h. MotionLinx-IO

3. What has been done?

The control cards cited above use a microcontroller manufactured by NXP Semiconductors (formerly Freescale). The chip, which is used is called *MK52DN512xxxx* (will be called MK52 for the purposes of this document) and currently has 52+ weeks of lead time, which basically makes it impossible to be sourced anymore. Because of this, Industrial Software made the decision to activate one of the backup prototypes for the ConveyLinx-Ai2 made with an *Atmel ATSAME70Q* (ATSAM from now on) microcontroller and begin a redesign of the affected cards. While such a redesign in a limited time was a massive undertaking, Industrial Software had no other real choice. It was either redesign or close for at least one year. The time frame for the redesign was around 4 months if the devices with the highest volumes can be completed faster, so that some MK52 chips can be spared for the lower volume cards.

4. What was changed in the hardware of the cards?

The main hardware change is the new ATSAM microcontroller. And because its periphery differs from the MK52, some PCB lines and elements had to be rerouted and replaced. The new boards were made to accommodate all chips from ATSAM family – 100/144 pins, BGA or LQFP packaging, 2 versions of the core, 2 versions of the periphery – all with the same firmware. The dimensions are the same between the cards with MK52 and ATSAM. The FW functionality is the same between the cards with MK52 and ATSAM.

The hardware version of the cards with MK52 would have number below 20(1-19).

The cards with ATSAM have hardware revisions 20 and above (20+).

5. What tests have been done to ensure that the cards with ATSAM provide the same reliability as the ones with MK52?

The cards with ATSAM go through the same quality tests as the ones with MK52 do.

In addition, the resistance of the ATSAM cards to ESD was extensively tested and is on the same level as the cards with MK52.

6. Can the ATSAM cards work alongside the cards with MK52?

Yes. The ATSAM cards can be used for replacements for existing systems. There is no issue with mixed system consisting of ATSAM and MK52 cards. There is no need to track what cards are ordered or supplied.

7. What differences will be seen with the ATSAM cards?

- ≠ EasyRoll with versions below 4.22 will not be able to upgrade the ATSAM modules. All other functions will be available.
- ≠ As mentioned above, ATSAM cards will have HW revisions 20 and higher.
- ≠ During module replacement via button, the FW of the neighbor modules will not be sent to the ATSAM card, which is being replaced. If neighbors are also ATSAM cards, replacement process work as before.
- ≠ The size of the FW binary file will be doubled, as it will contain the FWs for MK52 and ATSAM cards. EasyRoll will internally split the FWs and send the appropriate FW to each card type.
- ≠ ATSAM cards cannot be downgraded below FW 6.1.0.

8. Would the MK52 cards still receive development and FW updates?

Yes. When a new FW is released it will apply for both ATSAM and MK52 cards, even though the MK52 cards may not be produced anymore.

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