Tektronix®

EA 10000 Series Power Supplies and Electronic Loads Transition to Digital Share Bus for Enhanced Parallel Operation

What Is Changing and How it Affects Parallel-System Users

TECHNICAL BRIEF

Elektro-Automatik

Introduction

Elektro-Automatik's power supplies and electronic loads support parallel operation using a master/auxiliary configuration where the master sets the operating points and the auxiliary devices follow the master to increase current and power capability. Multiple EA power supplies or electronic loads can be connected in parallel when the required current or power exceeds the capability of a single device. EA's 10000 series devices include a galvanically isolated share bus that supports parallel connections of up to 64 devices.

In a recent 10000 series firmware update, the Share Bus (**Figure 1**) signaling method changed from PWM (Pulse-Width Modulation) to PCM (Pulse-Code Modulation). This change improves the dynamic behavior, determinism, and robustness of Share Bus communication. As a result of this change, **users will need to verify that all devices in a parallel configuration have the same firmware versions**. Configurations with a mix of PWM based and PCM based share buses are not compatible and will not operate correctly. This application note explains the changes, the benefits, compatibility implications, and recommended firmware update practices.

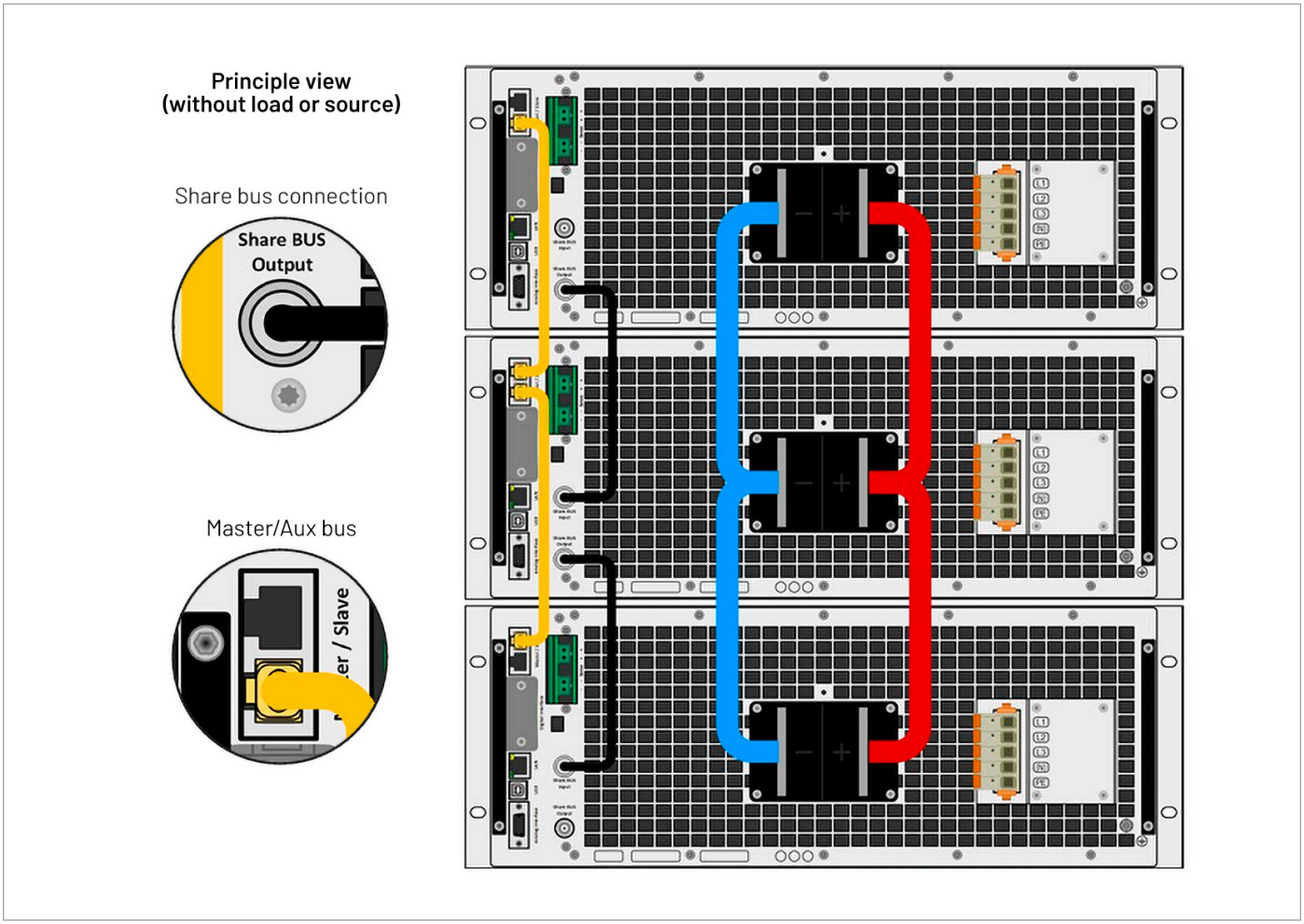

Figure 1. Three EA 10000 Series supplies configured for parallel operation with connections on DC terminals, Share Bus and Master-Aux bus.

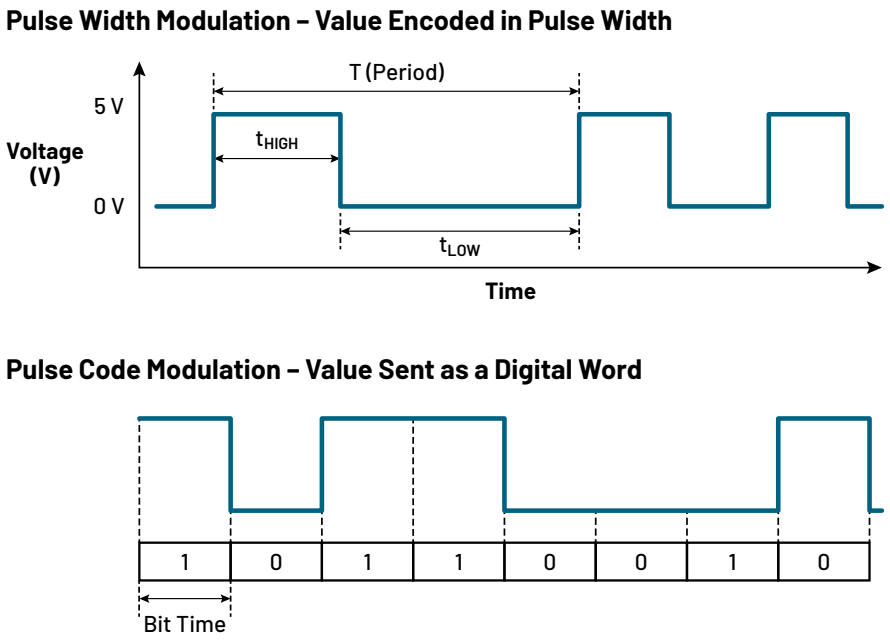

Figure 2. A comparison of PWM in which information is conveyed through duty cycle, and PCM in which digital words are used for inter-chassis signaling.

What is changing? PWM vs PCM

Historically, the Share Bus value was communicated using PWM, with the information encoded in the pulse width and duty cycle. Interpreting a PWM signal requires careful measurement of edge timing over a set interval of time as well as some filtering to suppress ripple or noise. In the new 10000 series firmware release, the Share Bus moves to a PCM-based approach, where the shared values are sent as a discrete digital value. **Figure 2** shows a conceptual comparison of these two signaling methods.

Advantages of Using PCM:

1. Improved dynamic behavior

The Share Bus makes a parallel system react as dynamically as possible, but a system with multiple instruments connected in parallel is less dynamic than a single instrument.

When the setpoint is changed in a parallel system, a PWM-based share method sends the data as the width of the pulse. The receiving unit depends on timing of the pulse and averaging of the duty cycle to translate the new set point. This adds a delay and slows how quickly each unit in the group can react to what the other devices are doing, so the group may rebalance in small visible increments instead of moving cleanly to the new operating point.

By contrast, a PCM-based share method sends share information as framed digital values at a regular, fixed update rate, giving the controller a cleaner, more predictable stream of share data.

This improved dynamic behavior means the parallel system can share current more smoothly and predictably during setpoint changes and transient events, reducing step-like behavior and helping the system settle faster.

2. Higher transmitted-value resolution

The second reason for the change is improved effective resolution of the transmitted share value. In a PWM method, since the value is encoded in a pulse width, the receiving unit has to estimate the new value by measuring how long the signal is high versus low. Small differences in pulse timing, ripple or filtering can make very small changes difficult to distinguish cleanly. While in a PCM scheme, the value is shared as a digital word rather than relying on duty-cycle interpretation, so smaller increments can be communicated across the bus, allowing the system to make smaller and smoother corrections which leads to more precise balancing between each unit in the parallel system.

3. Time-deterministic processing

Another major benefit of PCM signaling is that the processing time can be made fixed and predictable. Under the previous method, processing time varied with the transmitted value. In a PWM method, the receiving unit must interpret pulse timing and often smooth the result, which leads to variable delays. In a control loop, these small timing variations can make the system seem less smooth or predictable.

With a PCM method, since the share value is transmitted in a regular digital format, each unit receives a regularly timed digital update, allowing the control loop to respond with more consistency.

This matters in large master-auxiliary systems because consistent timing helps the paralleled system respond more consistently during dynamic operating changes leading to more predictable and repeatable behavior.

4. Greater robustness against disturbances

Noise can distort an edge of a PWM signal, or it can add ripple causing the receiver to decode a less clean value. Even small disturbances can matter because the receiver is trying to interpret the timing very precisely. This is one reason PWM systems usually rely on filtering which helps with immunity, but as already mentioned, can add a delay.

PCM improves robustness because the Share Bus signal is represented as a structured digital value rather than as pulse width. This makes it easier to distinguish valid share messages from noise more reliably than a duty cycle-based PWM signal.

Disturbances on the share bus can lead to corrupt balancing information. One unit may over-correct or under-correct contributing to instability in the system. Making the bus more tolerant to disturbances improves the overall system robustness.

Customer Impact and Firmware Update Support

This change affects customers who operate EA 10000 Series units in parallel. Because the Share Bus signaling is changing from PWM to PCM, units with different DR (controller board) firmware generations cannot be mixed within the same master-auxiliary group. In practical terms, all units in a parallel system must be updated to the same DR firmware version before they are returned to operation together.

This change does not affect customers using the instruments as standalone devices. The main consideration applies to installations where multiple units are connected through the Share Bus for current balancing and coordinated parallel operation. In those systems, updating only part of the group can prevent correct operation until the remaining units are updated as well.

To avoid update conflicts and ensure correct recommissioning, it is recommended that instruments be taken out of master-auxiliary mode before any firmware update is performed. Each instrument should be updated individually and verified independently. Once all instruments have been updated to the same firmware version, the master-auxiliary configuration can be restored. This helps ensure proper Share Bus communication and avoids unnecessary troubleshooting during recommissioning.

If assistance is needed, customers are encouraged to contact the EA support team before or during the update process. The support team can help confirm the correct update approach, answer questions about mixed-firmware compatibility, and provide guidance for updating all units in a master- auxiliary system safely and efficiently.

Conclusion

The transition of the EA 10000 Series Share Bus from PWM to PCM represents more than a firmware-level protocol change. It is a meaningful improvement to the way paralleled instruments communicate and coordinate current sharing in dynamic operating conditions. By moving to PCM-based signaling, EA enhances the quality of the transmitted share information, improves timing predictability, and increases robustness against disturbances on the bus. The result is smoother current balancing, more consistent system response during setpoint changes, and improved stability in demanding multi-instrument applications.

As with any significant control-system improvement, these benefits come with an important implementation requirement. **Because PWM- and PCM-based Share Bus signaling are not backward compatible, all instruments operating together in one master-auxiliary system must run the same DR firmware version**. Customers should therefore approach this as a coordinated system update, not a partial firmware refresh. Removing instruments from master-auxiliary mode, updating each unit individually, and restoring the system configuration only after all instruments are on the same required firmware version is the recommended path to a smooth transition.

This update is designed to deliver stronger parallel-system performance and reliability, but realizing those advantages depends on updating the complete system correctly. Customers who would like assistance planning or executing the firmware update are encouraged to contact the EA support team for guidance.

Contact Information:

Australia 1 800 709 465
Austria* 00800 2255 4835
Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
Belgium* 00800 2255 4835
Brazil +55 (11) 3530-8901
Canada 1 800 833 9200
Central East Europe / Baltics +41 52 675 3777
Central Europe / Greece +41 52 675 3777
Denmark +45 80 88 1401
Finland +41 52 675 3777
France* 00800 2255 4835
Germany* 00800 2255 4835
Hong Kong 400 820 5835
India 000 800 650 1835
Indonesia 007 803 601 5249
Italy 00800 2255 4835
Japan 81 (3) 6714 3086
Luxembourg +41 52 675 3777
Malaysia 1 800 22 55835
Mexico, Central/South America and Caribbean 52 (55) 88 69 35 25
Middle East, Asia, and North Africa +41 52 675 3777
The Netherlands* 00800 2255 4835
New Zealand 0800 800 238
Norway 800 16098
People's Republic of China 400 820 5835
Philippines 1 800 1601 0077
Poland +41 52 675 3777
Portugal 80 08 12370
Republic of Korea +82 2 565 1455
Russia / CIS +7 (495) 6647564
Singapore 800 6011 473
South Africa +41 52 675 3777
Spain* 00800 2255 4835
Sweden* 00800 2255 4835
Switzerland* 00800 2255 4835
Taiwan 886 (2) 2656 6688
Thailand 1 800 011 931
United Kingdom / Ireland* 00800 2255 4835
USA 1 800 833 9200
Vietnam 12060128
* European toll-free number. If not accessible, call: +41 52 675 3777

Rev. 02.2022

Elektro-Automatik

Find more valuable resources at TEK.COM

062226 SBG 1EW-74274-0