



# Small Boards / Big Panels

*Solving the Multi-Board  
On-board Programming Problem*





## Microcontrollers everywhere

Microcontroller chips with embedded flash memory mounted on small printed circuit boards provide more product features and capabilities than ever before.

High-volume products such as automotive powertrain and sensor applications, entertainment, informatics and industrial control means ever-growing numbers of microcontroller printed circuit board assemblies (PCBAs).

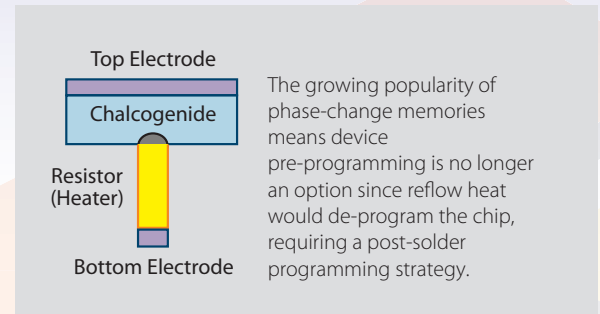
## The reality:

*More applications are using microcontrollers that incorporate serial flash memory on small circuit boards manufactured in multi-board panels.*

Shrinking device footprints enable these PCBAs to be physically smaller than ever, and building them in multi-board panels improves manufacturing productivity.

The manufacturing process for these panels is all the more complex because the software that enables this capability and variety has to be programmed into the memory of each microcontroller. Often there is unique code for each chip because variables such as serial numbers and date codes must be included.

For maximum efficiency these boards need to be built, tested and programmed while the individual board is still part of a large multi-board panel.



### Phase Change Memory Ready

With 10, 20 or more boards per panel, it can be challenging to program that many devices without adversely slowing panel throughput and line productivity.

Programming the chips with in-circuit or functional testers is expensive and slow, and they can rarely program more than three or four devices at a time. This means multiple programming passes on a single panel are required, leading to unacceptably slow throughput.

The alternative programming option — on-board “dongle” programmers — have been designed primarily for the lab, not the production floor. And they’re capable of programming just four or five devices at a time. Once again: multiple programming passes on a single panel decimate throughput.

Both of these conventional approaches lead to just one thing: a programming and productivity bottleneck.

What’s needed: An unconventional on-board programming solution that can program every chip on the panel simultaneously.

## It's challenging to test and program microcontroller multi-board panels as memory size and board count per panel keep increasing

- Board count per panel is increasing and memories are getting larger, requiring faster programming of more chips at a single pass.
- On-board programming is the best strategy for memory heat-sensitivity and simplified inventory control in an environment where there are often multiple versions and frequent software changes.
- Panels are built in high volumes so high-throughput to maintain productivity is mandatory.
- Individual chips often require unique programming code.

## The on-board programming system every manufacturer of multi-board panels needs

- Able to achieve high throughput by programming and verifying multiple devices at once — in parallel. Not just three or four at a time, but ten, twenty or even more at a time.
- Able to program the same part type or many different part types — at once.
- A programming system designed for the rigors of the production floor, especially when it comes to noise immunity.
- Able to easily program chip-specific data (serial numbers, MAC addresses, date code, calibration data, etc).
- Able to program encrypted code to protect intellectual property (IP).

- An extensive algorithm library from all the popular device suppliers.
- A robust production system designed from the ground up, not adapted from the development lab.
- Provides the resources needed for easy integration into a factory environment (reporting, error handling, etc).
- MultiWriter is available on CheckSum ICT systems or as a stand-alone programming system, the MultiWriter pps (shown below).

## The challenge:

*Implement cost-effective, high throughput on-board programming of the microcontroller's memory after soldering but before de-paneling.*



  
**MultiWriter**  
PRODUCTION PROGRAMMING SYSTEM  
MultiWriter pps

## Real World MultiWriter applications:

### From 4 minutes to 10 seconds

The production rate of this 40-board panel built in Hungary was stuck at four minutes per panel using a programming "dongle" on an Agilent 3070. MultiWriter pps slashed total programming time for the entire panel to just 10 seconds. And unlike the dongle-based programmer, MultiWriter delivered reliable, noise-free programming. Result: an order of magnitude increase in overall throughput.

### Better assurance through encryption and verification

A multi-national OEM building boards in China needed to ensure that the intellectual property contained in the device programming code was fully protected. CheckSum's MultiWriter provided complete encryption of all programming code, delivering the assurance the OEM needed that the IP was safe. The OEM also ensures control over the quantity of boards being built by the contract manufacturer by matching the number of programmed assemblies to the received shipments thereby eliminating any black market boards.

### Bottleneck removed

By installing a MultiWriter pps on-board programming system, this Canadian manufacturer, building a wide variety of multi-board panels (16 to 40 boards per panel), eliminated one-at-a-time device programming, speeding throughput. And CheckSum's comprehensive algorithm library delivered efficient programming with fast setup across a wide range of programmable chips.

## MultiWriter multiplies productivity where it's needed most.

Available as a stand-alone system (MultiWriter pps) or installed into a CheckSum Analyst in-circuit tester, MultiWriter is the first on-board part programming system integrated right into the bed-of-nails fixture.

### MultiWriter installed in an Analyst series in circuit tester:

- Simultaneous programming ability means faster programming times, which means faster throughput.
- Eliminates expensive channel cards required by traditional in-circuit solutions.
- No costly retrofit required to ICT system for hardware/software specific to part programming applications.

### MultiWriter pps used following the traditional in circuit tester:

- High signal integrity via short wire lengths is well-suited to today's higher programming speeds.
- Unified hardware architecture eliminates problems with multi-vendor dongle-type solutions.
- Simultaneous Programming means faster programming times; part programming will never again become a manufacturing process bottleneck.



*Fully Tested*

**CheckSum LLC**  
6120 195th Street NE  
Arlington, WA 98223  
Tel: 1-877-CHECKSUM  
+1.360.435.5510  
Fax: +1.360.435.5535  
[www.checksum.com](http://www.checksum.com)