The Application Note is pertinent to the Mentor II/Quantum III Family

**MD21 to MD29 Migration**

**Introduction**

Occasionally, the need or request comes in from customers that use MD21 coprocessors on their Drives, to migrate to the MD29 (the current coprocessor option). This article is intended to give a brief historical background on the MD21 and discuss such migration.

**MD21**

The MD21 was a predecessor coprocessor to MD29, primarily used to extend the functionality of both the Mentor I (Quantum II) and Mentor II (Quantum III) DC Drives. At times it was also used with the Vector and CDE drives series but to a lesser degree.

The MD21 used the Intel 8032 or 8052 microprocessor. An MD21 always contained a program in the EPROM located in the left socket. There was always a rudimentary communication program residing in this EPROM that permitted programs like CTFile, Mentor View, Mentor Access or DriveView to be used to extract Drive parameter data or assist with configuration. In addition to this communication facility, a few so called *"Standard Apps"* (Standard Applications) were created by Control Techniques such as a general purpose PID Loop, S-Ramp Accel/Decel, Digital Lock w/Adjustable Ratio, Spindle Orientation, Constant Tension Center Winder.
These applications were created using assembly language and compiled for speed of execution reasons. These applications were not modifiable by others. A rather unique capability of the MD21 coprocessors was their ability to run the Intel BASIC 52 programming language. This would permit Drive Integrators or even End User's to write BASIC programs to influence the way a drive would work to accomplish some particular application.

This BASIC code could be used by it’s self or could supplement an existing Standard Application in some manner. The beauty of the BASIC was that it was resident within the MD21. One would only need a dumb terminal or laptop running a communication program such as ProComm or HyperTerminal in order to begin programming. A drawback of this internal BASIC however was that it was a line numbered Interpreted BASIC. Besides having to deal with the nuisances associated with program line numbers, it also was limited by the inherent slowness associated with Interpreted code execution. The MD21 would allow one to develop code using RAM and then use on-board facilities to “burn the code” into resident EPROM. To enable this EPROM programming or “burning”, the 8052 processor would need to be used. Up to 5 programs or burns could be accommodated. EPROM’s were socketed and easily replaced. If the EPROM programming facility was not needed, the 8032 processor was typically installed instead of the 8052.

**Migration to MD29**

First of all, it is only possible to replace an MD21 on a Mentor II or Quantum III ( not Vector, CDE’s nor Mentor I or Quantum II drives ).

Migration is a straightforward, but not a simple or easy thing to do. Most things that were accomplished in the MD21 can be done on the MD29 but may require other measures as well. For instance, some applications performed with the MD21 utilized a parallel I/O port that the MD21 board possessed. This I/O port was typically used to read thumbwheel numeric data and possibly write information to a 7-segment display. These applications were rare but do exist. The MD29 does not posses such a port. It would be possible to duplicate such applications however one may need to employ the Remote I/O Box ( another Control Techniques option ). The Remote I/O unit has a similar parallel port. As a more contemporary solution, one would probably opt to employ a CTIU keypad display unit rather than mess around with mechanically troublesome thumbwheels and limited 7-segment displays.

All of the original MD21 standard apps were re-written in DPL and are available as discrete MD29 applications.

For example:

- S-Ramp Profiling is 9729-9001
- Digital Lock w/Ratio is 9729-9002
- Spindle Orientation is 9729-9003
- Constant Tension CW 9729-9004
- General PID 9729-9005

They all use the same setup parameters and flow diagrams as were typically supplied with the MD21 versions.
The problem is that a number of these apps were sometimes augmented with a mix of standard app code (like the PID app) and some Basic Code fragment to complete an actual Drive application. You have to know what compiled CT standard apps are present in the left hand socket of the MD21 and what ones are actually running to completely understand custom programs from this era. So at a minimum, we would need the information from all stickers on the EPROM(s) on the MD21. We would need to know whether there was an EPROM in the right socket and a copy of the BASIC program contained within.

Any BASIC code within the MD21 can be extracted and printed for examination. There is an Application Note CTAN 133, or [CTAN133.pdf](http://www.emersonct.com/download_usa/appNotes/CTAN133.pdf) that describes how one might pull the present User Basic Program out of a USER EPROM (the right hand chip). One would need a working knowledge of BASIC and the drive in order to “psych out” what the BASIC program was doing. From that point one could create a similar program using our DPL (Drive Programming Language) or SyPT (IEC1131 Graphical Programming Toolkit) to emulate what was being done with the BASIC program. This may be a simple thing or could be a major effort depending on the complexity of the original program and lack of comments or supporting documentation.

We also offer this kind of programming effort as an “Engineered Service”.

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For an MD29 to replace an MD21 on a Mentor II, the MDA-2 card that the MD21 co-processor plugs into, must be changed to an MDA2B. The MD29 has more pins on its connector that are not present on the MDA-2. These boards are available from the Service Center in Grand Island, NY. 1-800-367-8067

For further information on converting a MD21 to a MD29 you can consult the link CTAN 263 or http://www.emersonct.com/download_usa/appNotes/ctan263.pdf

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