Introduction to data acquisition with Rigol's M300

The M300 Data Acquisition System is designed for automated multichannel measurement and switch applications. This includes environmental measurements like temperature for burn in tests as well as voltage, frequency, or resistance measurements from a wide variety of sensors used from research to production test. These applications are actually very common across a number of industries from electronics to research including a large component of environmental applications.

Rigol's M300 system will cover many of these applications at a considerable price/performance advantage versus traditional solutions. Keys to successful system implementation for your application revolve around proper upfront design and planning. These questions include:

What modules and accessories do I need?

How fast will the system go?

What accuracy should I expect on my measurements?

Rigol's solution provides a production quality alternative at an impressive performance and value. Our large format display and advanced software capabilities allow users from technician level to test engineer get the most out of the system with ease.

Key Applications

CJC Compensated Temperature

Temperature measurements is one of the most common configurations for M300 systems. Large channel count temperature measurements are used in research to industrial settings wherever environmental chambers are used or any kind of lifetime/burn in testing is done. Using 64 channel MUX modules, a single M300 mainframe can scan up to 256 channels (4 64 channel modules and 1 DMM module in a system). For temperature measurements, make sure to get the terminal block accessories since they have the CJC reference that will improve accuracy.

Mainframe	M301
Modules to use	MC3120, MC3132, MC3164, MC3324
Modules to avoid	MC3416, MC3534, MC3648
Accessories	• Users should definitely get terminal blocks. They have CJC references on them.
Best usage mode	Easy scan to configure from the front panel or through UltraAcquire. Advanced Driver operation not needed.

Voltage and 2-Wire Resistance

Voltage and 2-Wire Resistance will usually follow the same configuration as a basic temperature scan. The 64 channel cards only switch the high signals. Some systems may require switched LOs if the signals cannot be all ground or common referenced. For these cases, select the 32 channel MUX module (MC3132) or the 20 channel MC3120.

Mainframe	M301
Modules to use	MC3120, MC3132, MC3164, MC3324
Modules to avoid	MC3416, MC3534, MC3648
Accessories	Terminal blocks are a nice convenience, but not needed
Best usage mode	Easy scan to configure from the front panel or through UltraAcquire. Advanced Driver operation not needed.

4 Wire Resistance Measurements

4 Wire Resistance Measurements are for higher accuracy and precision. They are more common in scientific and research communities, but can also be used for very sensitive temperature measurements with RTDs. Use either the MC3120, MC3132, or MC3224. The MC3324 adds 4 current measurement channels, but the MC3120 or MC3132 is more cost effective if only 4 wire measurements are required.

Mainframe	M301
Modules to use	MC3120, MC3132, MC3324
Modules to avoid	MC3416, MC3534, MC3648 , MC3164
Accessories	Terminal blocks are a nice convenience, but not needed
Best usage mode	Easy scan to configure from the front panel or through UltraAcquire. Advanced Driver operation not needed.

Current Measurements

Large systems of current measurement are not very common, but current measurements are an important part of many test systems. The MC3324 has 4 current channels mixed with 20 voltage channels in a normal configuration. Current measurements are shunted when not connected to the DMM so that the source does not see an open circuit.

Mainframe	M301
Modules to use	MC3324
Modules to avoid	MC3120, MC3132, MC3416, MC3534, MC3648 , MC3164
Accessories	Terminal blocks should be used. Channel count is low, so no reason to use DSUB connectors.
Best usage mode	Because of small channel count we'd recommend configuration from the front panel, but UltraAcquire will work as well.

Matrix Applications

Matrix applications are all about signal routing as there are no measurements. The signal in one column can get routed to any row with one switch. It is also possible to connect one column to multiple rows or even to another column if needed using multiple switches. Configuration on these systems is usually tougher because of their general size and the complexity of connecting between cards using the backplane or external jumpering. Accuracy is the key for these systems. Often, the customer will be interested in low voltage offset, high voltage, high current, or even bandwidth. Refer to the module specifications for these – remember the matrix card does not connect to the DMM, so those specifications are not relevant.

Mainframe	M300 (No DMM included)
Modules to use	MC3648
Modules to avoid	MC3120, MC3132, MC3416, MC3534, MC3324, MC3164
Accessories	Terminal blocks can be used for convenience, but can be a hindrance once the system gets too big.
Best usage mode	Best to configure via UltraAcquire as for most matrix systems the wiring and debugging can be difficult to visualize.

Mixed and Multifunction Applications

These applications require a mix of the capabilities above or some of the more specialized DAC, Totalizer, DIO, or actuator functions. Most applications will not be that varied, but some will be largely multiplexer systems with a few DACs or current measurements mixed in. Simply make sure you have the right number of channels for each capability and consult with applications support to be sure.

Mainframe	M301 (if there are any DMM measurements needed) otherwise M300 is fine
Modules to use	MC3416 (actuators), MC3534 (multifunction), or any others needed
Modules to avoid	
Accessories	Consider terminal blocks based on the usage of each module
Best usage mode	Best to configure via UltraAcquire due to the complexity. Can be done from the front panel as well.

Actuator Systems

These applications usually require higher voltage, current, or power to external systems so they use the Actuator module MC3416 instead of more standard modules. Each card has 16 SPDT channels that do not get connected to the DMM. Each channel is set to connect the COM to the NO or NC position. One of them is always connected to the COM.

Mainframe	M300
Modules to use	MC3416
Modules to avoid	All others
Accessories	Consider terminal blocks based on what you need to connect to
Best usage mode	Best to configure via UltraAcquire due to the complexity. Can be done from the front panel as well.

Rigol's M300 Provides all the necessary tools for configuring your automated acquisition system for performance and accuracy at an unprecedented value.

For more information on data acquisition please go to *rigolna.com* or contact us directly at:

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