



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3000 Family Of Data Acquisition and Analysis Workstation Products

Configurations And Options

This document contains specifications and information that are subject to change without notice. This guide is intended to assist buyers in the selection of product configurations that best meet their needs for measurement systems based on the MI-3000 series Workstations and the MI-3000 Family of Data Acquisition and Analysis Software.

Buyers should consult with MI Technologies to confirm system configuration selections and obtain written quotations for the desired equipment.

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MI-3000 Family of Data Acquisition and Analysis Workstation Products

Table of Contents

Title

Page

| | |
|---|----|
| Cover Page | |
| Table of Contents | 2 |
| Product Overview | 3 |
| Standard MI-3000 Family Workstation Models: | |
| MI-3001 Data Acquisition and Analysis Workstation | 5 |
| MI-3002 Data Acquisition and Analysis Workstation | 7 |
| MI-3003 Data Acquisition and Analysis Workstation | 9 |
| MI-3010 Analysis Only Workstation | 11 |
| Workstation Hardware Options | 12 |
| MI-3000 Series Instrument Drivers | 13 |
| MI-3000 Family of Software | |
| MI-3040 Core Capabilities | 16 |
| MI-3041 Data Acquisition | 18 |
| MI-3042 Antenna Analysis | 20 |
| MI-3043 Advanced Antenna Pattern Correction | 22 |
| MI-3044 Planar Near-field Analysis | 22 |
| MI-3045 Cylindrical Near-field Analysis | 23 |
| MI-3046 Spherical Near-field Analysis | 23 |
| MI-3047 Radome Analysis | 23 |
| MI-3048 RCS Analysis | 24 |
| MI-3060 EIRP Analysis | 24 |
| MI-3061 Antenna Gain Calibration | 24 |
| MI-3062 Ground Plane Data Simulator | 25 |
| MI-3063 Antenna Reflectivity Analysis | 25 |
| MI-3064 Time Domain Analysis | 26 |
| Custom Software | 27 |
| MI-3000 Family Workstation and Software Configuration Guide | 27 |
| MI-3000 Configuration Summary Sheet | 28 |
| Notes | 32 |



MI-3000 Family of Data Acquisition and Analysis Workstation Products Product Overview

The MI-3000 Family of Data Acquisition and Analysis Workstation products provide state of the art control of antenna, microwave component, radome and RCS measurement equipment. The MI-3000 Family of Software packages support highly efficient range operations, data management, data presentation and analysis. The MI-3000 series of pre-configured workstations are designed to operate with the MI-2097 Automated Microwave Measurement Systems, prior generation MI Technologies instrumentation and many third party instruments and position control systems.

MI-3000 products offer the user an extensive array of features and options that provide solutions for the most demanding measurement requirements. MI Technologies has over 50 years of experience in antenna measurement equipment design and manufacture, as well as an extensive software library of automated measurement applications. The MI-3000 Family enables users to fully automate the antenna measurement process from setup to analysis to reports. Productivity improvement solutions are more important in today's business than ever before. Combined with the MI-2097 AMMS, the MI-3000 provides the user the ability to take 10,000 quality measurements per second, which can provide tremendous productivity gains from as recently as a few years ago. From engineering design to production testing, the MI-3000 will provide the results oriented test and measurement solutions needed to test the products we use today and those we are designing for tomorrow.

FAST - Built for Data Acquisition Speed

When coupled with the MI-2097 AMMS and the optional Data Acquisition Co-processor, an MI-3000 series workstation can collect single frequency measurements at up to 10,000 measurements per second and can change frequencies at up to 1,000 frequencies per second. For instrument configurations that are GPIB or Ethernet based, the MI-3000 provides efficient operations in this traditional instrumentation mode. In addition, the MI-788 Networked Acquisition Controller provides fast real time control of external multiplexers and beam steering computers when a Vector Network Analyzer is used as the system receiver.

CONFIGURABLE - Built for Data Acquisition Flexibility

The MI-3000 Arena™ data acquisition software controls and collects data from a wide variety of MI Technologies and third party instruments. A common user interface and separate software drivers for each model of instrument supported provide a flexible platform to construct the desired instrumentation system. The software can also support up to three position controllers simultaneously, controlling up to 16 axes of motion. The acquisition software can also operate in a single frequency mode with a manual signal source. Multiple equipment complements and default configurations can be maintained, any of which can be selected for use by the operator.

In addition, the Arena user interface provides four different working environments that can be selected by the user to optimize efficiency. The four environments are:

- Standard - All software functions can be accessed from the main screen, with many common operations such as plotting and analysis always available on the main working screen. The Standard environment recognizes what optional software is loaded and presents access to those options in an integrated fashion. The user can perform functions in any order desired.

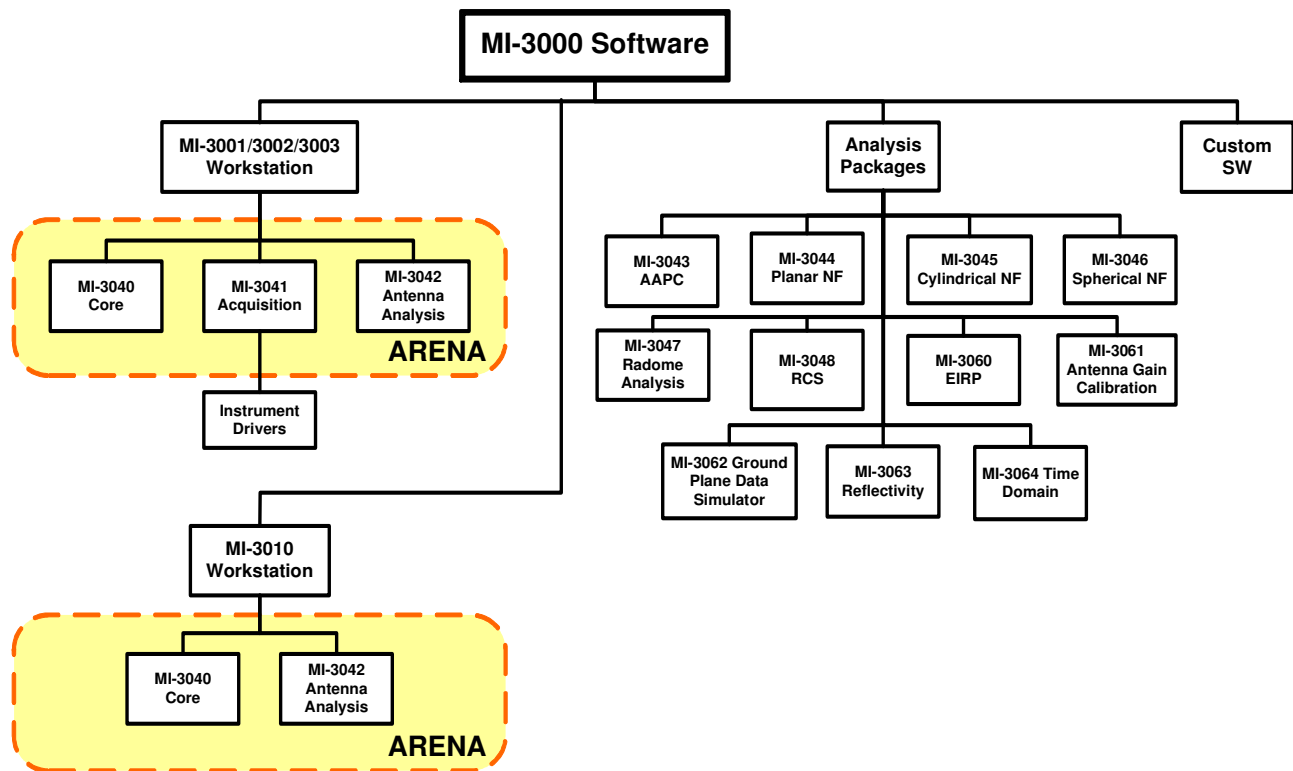
MI-3000 Family of Data Acquisition and Analysis Workstation Products

- **Toolkit** – In the Toolkit environment, the user can select any combination of software functions into a toolkit and then run the toolkit repetitively with a single mouse click. Toolkits can be saved and recalled, edited and copied at will. In this way, the user can perform very complex acquisition, analysis and plot sequences without programming or scripting.
- **Quick Pattern** – In the Quick Pattern environment, the user does not have to leave the main screen to take antenna patterns. All instrument configuration parameters are accessible as well as plotting and simple pattern analysis. The plotting function can be configured to accumulate traces as data is collected to provide quick pattern comparisons.
- **Classic** – The Classic environment is the tried and true MI-3000 user interface for those users who are familiar and comfortable with that interface.

The user can stay in one environment or can change environments at will depending on range operations and personal preference.

MODULAR - Built for Operational Flexibility

The MI-3000 Family of Software is designed as a modular suite of components. The user only needs to purchase the components required for their application or environment. Additional instrument drivers and software applications can be added as needed, with compatibility assured. The figure below shows the MI-3000 Family of Software products.



The operational concept of the MI-3000 Family of Software is to provide single function building blocks along with a means to tie them together into complex data acquisition and analysis sequences. For example, simple measurements, plots and analyses can be configured, tested and used within minutes. For more complex operations, the MI-3000 Arena™ supports Visual Basic scripting operations, which can be tied together, to automate end-to-end acquisition,



MI-3000 Family of Data Acquisition and Analysis Workstation Products

analysis and display operations with a single user selection. The Arena Toolkit mode allows the user to collect a set of standard functions that can be performed as a single operation without scripting or programming. MI Technologies has produced many custom software suites that provide production or depot level test and verification of antennas and radomes. These custom applications use the MI-3000 components as their basis.

Built for the Evolution of Technology

The MI-3000 family of workstations integrates the Windows™ operating systems and MI-3000 software interfaces with commonly employed software tools such as Microsoft Office and MatLab. MI-3000 configuration, data and output files are in the Microsoft Access format. The MI-3000 Family of Software does not depend on any modifications to the operating environment. The MI-3000 software is supported on the Windows XP™ Professional operating system for data acquisition operations and off line analysis operations. Operation under the Microsoft VISTA™ is pending as of the date of this guide.

Support Programs

Software Maintenance programs are a valuable additions to many customers' orders. Software maintenance programs include access to upgrades of the basic MI-3000 Arena™ Software and its optional components. Phone support is included.

Legacy Support

The MI-3000 Classic software shipped prior to the release of the MI-3000 Arena™ software is included with Arena and is not available for standalone purchases. The MI-3000 Classic software will continue to be supported under the S-WareCare program until the end of year 2011. Support under the S-WareCare program includes periodic updates and service packs as required along with pricing discounts on additional software and telephone technical support.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3000 Workstations

The MI-3000 series of workstations are built around a common core of industrial quality computer equipment and software. Each workstation is configured to optimize performance with a specific family of instrumentation.

MI-3001 Data Acquisition and Analysis Workstation

The baseline MI-3001 Data Acquisition and Analysis Workstation combines physical computer components with the MI-3000 series software to provide control and analysis for an MI-2097 AMMS. This includes the MI-31XX series Sources, the MI-1797 Microwave Receiver, the MI-4190 series of Position Controllers and the MI Data Acquisition Co-Processor. Instruments are configured using the GPIB interface; with data collected from the receiver and optionally from the MI-4190 Position Controller High Speed BCD interface over the Data Acquisition Co-Processor link. Selected instruments with Ethernet interfaces are also supported.

The following products are included with the standard **MI-3001 Workstation**:

Industrial quality Personal Computer with the following specifications:

CPU 3.0 GHz minimum

2 GB RAM minimum

20" LCD Monitor

Keyboard, Mouse and Mouse Pad

200 GB Disk Drive minimum in a removable carrier

48x20x40 R/W CD-ROM & R/W DVD Combo Drive

3.5" Floppy Drive

Windows™ XP Professional Operating System

Microsoft Office™ Professional

10/100BaseT LAN interface

Large format (up to 11 x 17 in.) color printer with parallel port cable

National Instruments GPIB Controller Interface and software

MI-3040 Core Capabilities Software

MI-3041 Acquisition Software

MI-3042 Antenna Analysis software

MI-3022-RCV-1797 Software Driver for the MI-1797 Receiver

MI-3030-SRC-31XX Software Driver for the MI-31XX Family of Sources

MI-3024-POS-419X Software Driver for the MI-419X Position Controller

MI-3028-AUX-DAC Software Driver for the Data Acquisition Co-Processor



MI-3000 Family of Data Acquisition and Analysis Workstation Products

The following manuals are supplied in Adobe Acrobat (pdf) format:

- MI-3000 Operator Manual
- MI-3001 Administrator Manual
- MI-3042 Analysis Manuals

Optional components:

- A 110 Vac/60 Hz un-interruptible power supply (UPS)
- A 240 Vac/50 Hz un-interruptible power supply (UPS) that provides IEC 60320 connectors for use in countries with 240 Vac/50 Hz power.

Installation:

MI Technologies Customer Support Organization offers installation and training packages for customers as needed. Maintenance programs for both hardware and software are available.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3002 Data Acquisition and Analysis Workstation

The MI-3002 Data Acquisition and Analysis Workstation combines physical computer components and the MI-3000 Arena™ software to provide control and analysis for an instrumentation system using MI Technologies legacy receivers, the MI-1783 or MI-1795. Instruments are configured using the GPIB interface, with data collected over the GPIB interface with the MI-1783 Receiver. For the MI-1795 receiver, high-speed data is collected from the receiver and optionally from the MI-4190 Position Controller High Speed BCD interface over the Data Acquisition Co-Processor link. The exact instrument interfaces provided with the MI-3002 depend on the legacy equipment in use by the customer.

The following products are included with the standard **MI-3002 Workstation**:

Industrial quality Personal Computer with the following specifications:

- CPU 3.0 GHz minimum
- 2 GB RAM minimum
- 20" LCD Monitor
- Keyboard, Mouse and Mouse Pad
- 200 GB Disk Drive minimum in a removable carrier
- 48x20x40 R/W CD-ROM R/W DVD Combo Drive
- 3.5" Floppy Drive
- Windows™ XP Professional Operating System
- Microsoft Office™ Professional
- 10/100BaseT LAN interface

Large format (up to 11 x 17 in.) color printer with parallel port cable

National Instruments GPIB Controller Interface and software

MI-3040 Core Capabilities Software

MI-3041 Acquisition Software

MI-3042 Antenna Analysis software

Software drivers for the receiver, source and position controller controlled by the MI-3002

The following manuals are supplied in Adobe Acrobat (pdf) format:

- MI-3000 Operator Manual
- MI-3001 Administrator Manual
- MI-3042 Analysis Manuals



MI-3000 Family of Data Acquisition and Analysis Workstation Products

Optional components:

A 110 Vac/60 Hz un-interruptible power supply (UPS)

A 240 Vac/50 Hz un-interruptible power supply (UPS) that provides IEC 60320 connectors for use in countries with 240 Vac/50 Hz power.

Some instrumentation sets supported by this model are:

MI-1783 Receiver

MI-2180 Signal Source

MI-2012/4180/1885 Position Control System

MI-1795 Receiver

MI-2180 Signal Source

MI-2012/4180/1885 Position Control System

MI-1795 Receiver

MI-2180 Signal Source

MI-4139/1885 Position Control System

MI-1783 Receiver

MI-2180 Signal Source

MI-4190 Position Controller

MI-1795 Receiver

MI-2180 Signal Source

MI-2012/4180/1885 Position Control System

Installation:

MI Technologies Customer Support Organization offers installation and training packages for customers as needed. Maintenance programs for both hardware and software are available.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3003 Data Acquisition and Analysis Workstation

The MI-3003 Data Acquisition and Analysis Workstation combines physical computer components, MI-3000 Arena™ software to provide control and analysis for an instrumentation system using third party receivers and sources in conjunction with one or more MI Technologies Position Controllers. This configuration supports receivers, spectrum analyzers and vector network analyzers from several manufacturers.

The following products are included with the standard **MI-3003 Workstation**:

Industrial quality Personal Computer with the following specifications:

- CPU 3.0 GHz minimum
- 2 GB RAM minimum
- 20" LCD Monitor
- Keyboard, Mouse and Mouse Pad
- 200 GB Disk Drive minimum in a removable carrier
- 48x20x40 R/W CD-ROM R/W DVD Combo Drive
- 3.5" Floppy Drive
- Windows XP Professional Operating System
- Microsoft Office Professional
- 10/100BaseT LAN interface

Large format (up to 11 x 17 in.) color printer with parallel port cable

A National Instruments GPIB Controller Interface and software

MI-3040 Core Capabilities Software

MI-3041 Acquisition Software

MI-3042 Antenna Analysis software

Software drivers for the source, receiver and position controller controlled by the MI-3003

Control of the MI-788 Networked Acquisition Controller is included when that optional item is purchased. The Networked Acquisition Controller provides high speed data collection using a Vector Network Analyzer and can integrate multiplexer control and/or beam steering control codes into the low level acquisition loop.

The following manuals are supplied in Adobe Acrobat (pdf) format:

- MI-3000 Operator Manual
- MI-3001 Administrator Manual
- MI-3042 Analysis Manuals



MI-3000 Family of Data Acquisition and Analysis Workstation Products

Optional components:

A 110 Vac/60 Hz un-interruptible power supply (UPS)

A 240 Vac/50 Hz un-interruptible power supply (UPS) that provides IEC 60320 connectors for use in countries with 240 Vac/50 Hz power.

Some instrumentation sets supported by this model are:

Receivers:

| | |
|---------------------|--|
| Network Analyzers: | Agilent 8510, 8530, 8752, 8753, ENA or PNA, PNA-L, PNA-X Anritsu 4623 or 37000 Series Rohde & Swartz ZVA/ZVB |
| Spectrum Analyzers: | Agilent 440X, 444X, 8563 or 8564 |
| Power Meters: | Anritsu 243X Series |

Sources:

MI-31XX Series
Agilent PSG, 8340, 8350, 83660, 83750 series
Anritsu 369X Series

Position Control systems:

MI-4190 series
MI-2012/4180/1885 combinations
MI-4139/1885 combinations
MI-7112S series
Orbit Model 4806 series

Installation:

MI Technologies Customer Support Organization offers installation and training packages for customers as needed. Maintenance programs for both hardware and software are available.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3010 Analysis Only Workstation

The MI-3010 Analysis Only Workstation is a combination of physical computer components and MI-3000 Arena™ software that is designed to provide an analysis workstation for processing and display of data. This Workstation does not include any instrumentation interfaces. However, the computer chassis used is identical to the one used in the MI-3001 Data Acquisition and Analysis Workstation. This allows the MI-3010 to act as a backup control computer for instrumentation with the addition of instrumentation control interfaces.

The following products are included with the standard **MI-3010 Workstation**:

Industrial quality Personal Computer with the following specifications:

- CPU 3.0 GHz minimum
- 2 GB RAM minimum
- 20" LCD Monitor
- Keyboard, Mouse and Mouse Pad
- 200 GB Disk Drive minimum in a removable carrier
- 48x20x40 R/W CD-ROM R/w DVD Combo Drive
- 3.5" Floppy Drive
- Windows XP Professional Operating System
- Microsoft Office Professional
- 10/100BaseT LAN interface

Large format (up to 11 x 17 in.) color printer with parallel port cable

MI-3040 Core Capabilities Software

MI-3042 Antenna Analysis software

The following manuals are supplied in Adobe Acrobat (pdf) format:

- MI-3000 Operator Manual
- MI-3010 Administrator Manual
- MI-3042 Analysis Manuals

Optional components:

A 110 Vac/60 Hz un-interruptible power supply (UPS)

A 240 Vac/50 Hz un-interruptible power supply (UPS) that provides IEC 60320 connectors for use in countries with 240 Vac/50 Hz power.

Installation:

MI Technologies Customer Support Organization offers installation and training packages for customers as needed. Maintenance programs for both hardware and software are available.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

Workstation Hardware Options

MI Technologies can quote optional hardware configurations to optimize operations to customer requirements and desires. Optional hardware items available include, but are not limited to the following:

- Secondary display monitors
- Large display monitors
- Multiple disk drives
- External USB disk drives
- Video capture interface
- A second computer and software for remote control of the Workstation
- Higher performance printers
- Remote Control as with PCAnywhere™ software

Contact MI Technologies for specific requirements



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3000 Series Instrument Drivers

The MI-3041 Acquisition Software is designed to operate with a wide variety of instruments from MI Technologies and several third party manufacturers. The compliment of equipment generally includes a software driver for a signal source, a receiver and a position controller. The MI-3041 can be configured to support more than one instrument configuration for a single installation. For example, a spectrum analyzer driver could be included for configurations that collect EIRP data in addition to a basic receiver. The table below describes the instrument drivers that are available and any interdependencies between instruments.

MI Technologies can provide quotations for custom drivers for instruments not included in this list.

| Software Driver Model | Instrument | Limitations/Comments |
|---|---|--|
| Receivers/Power Meters/Network Analyzers | | |
| MI-3022-RCV-1783 | MI 1783 Receiver | |
| MI-3022-RCV-1795 | MI 1795 Receiver | Requires DAC and DAC SW Driver |
| MI-3022-RCV-1795P | MI 1795 Pulse Receiver | Requires DAC and DAC SW Driver |
| MI-3022-VNA-8530 | Agilent 8530 Network Analyzer | No source driver required, also supports Agilent 85330 switch control unit |
| MI-3022-VNA-8510 | Agilent 8510C Network Analyzer | No source driver required |
| MI-3022-SPA-440X | Agilent 440X Spectrum Analyzer | |
| MI-3022-RCV-1797 | MI-1797 Receiver | Requires DAC and DAC SW Driver |
| MI-3022-SPA-8566 | Agilent 8566 Spectrum Analyzer | |
| MI-3022-VNA-4623 | Anritsu 4623 Network Analyzer | No source driver required |
| MI-3022-VNA-8714 | Agilent 8714 Network Analyzer | No source driver required |
| MI-3022-SPA-8563/4 | Agilent 8563 or 8564 Spectrum Analyzer | |
| MI-3022-VNA-ENA | Agilent 506X or 5071C ENA | No source driver required |
| MI-3022-VNA-PNA | Agilent 8300 Series PNA (8356A, 8357A, 8358A, 8361A, 8362B, 8363B, 8364A), PNA-L series and PNA-X | No source driver required. Consult factory for specific model support. The Agilent PSG is also supported as an external source and/or LO for the PNA. Remote mixing configurations and pulse mode operations are also supported. |
| MI-3022-VNA-875X | Agilent 8752 or 8753 Network Analyzer | No source driver required |
| MI-3022-VNA-37XXX | Anritsu 37000 Series Network Analyzer | |
| MI-3022-SPA-444X | Agilent 444X Spectrum Analyzer | |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

| Software Driver Model | Instrument | Limitations/Comments |
|-------------------------------|---|--|
| MI-3022-POW-243X | Anritsu 2437 or 2438 Power Meter | Single frequency only |
| MI-3022-VNA-ZVX | Rohde & Swartz ZVA or ZVB | No source driver required |
| Sources | | |
| MI-3030-SRC-31XX | MI-3101, 3102, 3103, 3104, 3105, 3106, 3111, 3112, 3113, 3114, 3121, 3122 Sources | DAC hardware trigger compatible |
| MI-3030-SRC-2180 | MI-2180 Source and optional MI-2186 Synthesizer | DAC hardware trigger compatible |
| MI-3030-SRC-8340 | Agilent 8340 Source | |
| MI-3030-SRC-8350 | Agilent 8350 Source | |
| MI-3030-SRC-836X0 | Agilent 836X0 Sources | |
| MI-3030-SRC-8375X | Agilent 8375X Source | |
| MI-3030-SRC-866X | Agilent 866X Sources | |
| MI-3030-SRC-8257 | Agilent 8257 (PSG) Source | Can work with the Agilent PNA as an external source |
| MI-3030-SRC-369X | Anritsu Model 369X Sources | DAC hardware trigger compatible |
| Position Controllers | | |
| MI-3024-POS-419X | MI 419X Position Controllers | Requires HSBCD option to record positions during data collection |
| MI-3024-POS-4139 | MI 4139 Eight Axis Position Controller | Requires at least one MI-1885 Position Display Unit and the Data Acquisition Co-Processor |
| MI-3024-POS-4131 | MI 4131 Single Axis Position Controller | Requires at least one MI-1885 Position Display Unit and the Data Acquisition Co-Processor if it is to be used as a scan axis |
| MI-3024-POS-2012 | MI 2012A Six Axis Position Controller | Requires at least one MI-1885 Position Display Unit |
| MI-3024-POS-7112S | MI 7112S Single, Dual or Triple Axis Position Controller | Only for Sunol low dielectric positioners |
| MI-3024-POS-4806 | Orbit 4706 or 4806 Position Controllers | Use Generic BCD driver to read Orbit BCD position data |
| Position Display Units | | |
| MI-3024-DIS-1885 | MI 1885 Six Axis Position Display Unit | Required for MI-2012/4139 Position Controllers |
| MI-3024-DIS-4-HSBCD | MI 4190 High Speed BCD output option | Required for MI-419X systems when position data recording is required |
| MI-3024-DIS-G-HSBCD | Generic BCD Position input | For customer supplied BCD position data that conforms to MI Technologies HSPI interface |
| MI-3024-DIS-8500 | NAI 8500 Synchro/Digital Display Unit | For systems with 1:1 or 36:1 synchro position data without a supported |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

| Software Driver Model | Instrument | Limitations/Comments |
|-----------------------|---|--|
| | | position controller |
| Other | | |
| MI-3028-AUX-DAC | Data Acquisition Co-Processor | Required for all system that include a Data Acquisition Co-Processor. Required for use of the MI-1795 and MI-1797 Receivers |
| MI-3028-AUX-8110X | Agilent 81101 Pulse Generator | Single or Dual outputs supported |
| MI-3028-AUX-11713 | Agilent 11713A Ten Position Switch/Attenuator Driver Unit | Software is independent of MI-3000 data acquisition. Can be used to configure attenuators or switches prior to an acquisition |
| MI-3028-AUX-IOT488 | IOTech Digital488 32 bit TTL interface | Software is independent of MI-3000 data acquisition. Can be used to configure attenuators or switches prior to an acquisition. MI Technologies must provide the IOTech unit as part of a system. |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3000 Family of Software

The MI-3000 Family of Software is a cooperating set of modules that when tied together can manage instrumentation configuration, data acquisition, display processing and data evaluation. The following sections describe the various components of the MI-3000 family, their capabilities and inter-dependencies, from both a hardware and software perspective. Once a workstation is configured with the basic components, additional components can be installed as desired.

The MI-3001, 3002 and 3003 Data Acquisition and Analysis Workstations include:

- MI-3040 Core Capabilities
- MI-3041 Data Acquisition
- MI-30XX Instrument Drivers as required
- MI-3042 Antenna Analysis

The MI-3010 Analysis Only Workstation includes:

- MI-3040 Core Capabilities
- MI-3042 Antenna Analysis

The MI-3010-SW is also available for single PC license or multiple licenses. Contact MI Technologies for further information.

Any of the optional processing packages can be added to any of the Workstations.

NOTE: Some optional software packages may be subject to export restrictions. Contact MI Technologies for assistance.

MI-3040 Core Capabilities

The MI-3040 package provides the core functions used by all other MI-30XX software. It includes libraries that allow all other components to create and read MI-3000 configuration and data files. It also includes the following operational functions:

User Interface

The MI-3000 Arena™ user interface provides four distinct user environments as was discussed in the introduction. The user can switch environments at will to optimize the work to be performed at that time. If acquisition, plot and analysis definitions have been previously created, the user never has to leave the main screen in the Toolkit, Standard and Quick Pattern environments.

User Project Management

The MI-3000 software organizes user information in “projects”. A project is a specific folder on disk with a uniform set of sub-directories to hold user configurations for data collection, plotting and analysis. All data collected under a project is also stored within the project. The user can create new projects at will. A default project is used to provide default configurations and templates for any new project that is created. This has advantage when a range has several standard acquisitions or analyses that all projects should have available. The user is free to organize the projects as they see fit. Projects can be created by specific AUT, class of antenna, by user or by any other segmentation desired by the user. The software operates on the “current” project and the user can switch between projects as desired.

Plotting

The plot function for all data files is included in the MI-3040. The user can create plot definition files that set labels, titles, scales, colors, etc and then use that definition file for many data files over time. The plot capabilities include:

- Rectangular, polar, contour, color fill and isometric plots
- Up to 4 plots can be displayed with a single plot definition. Plot types can be mixed and data can come from separate data files.
- A rectangular or polar plot can contain up to 16 traces from the same file or different files.
- Plots can be directed to the screen or the printer as desired.
- Once a plot is displayed, the user can modify the basic plot presentation and save that configuration directly from the screen, allowing the user to quickly customize plots as desired.
- Plot tools such as rubber band zoom, markers, marker arithmetic, user annotations and font size selections are provided.
- A batch plot mode is available that can produce a sequence of plots from a complex file where every plot can be a different scan, frequency, beam or data channel combination.
- MI-3042 analysis definitions can be tied to a plot definition so that every time a plot is produced, the data is analyzed and the results included on the plot.

Reports

The report function produces Microsoft Access™ reports of a data file. The user can select instrument configuration data only, instrument data only or both in the report. Included in the report function is a conversion utility that transforms MI-3000 data files in Microsoft Access™ format into ASCII text or Microsoft Excel™ format. A “thumbnail” viewer is also supplied that allows the user to select a data file name and see the basic frequency, data channel and motion information in the file. An import utility for converting Microsoft Excel™ files into MI-3000 data files is included.

Sequencer

The Sequencer function allows the user to execute Visual Basic script files that tie simpler MI-3000 functions into complex operational sequences. For example, a simple script can prompt a range operator to perform manual operations, collect one or more data sets, manipulate the data files, analyze the data and produce reports and plots of the results. For the MI-2097 complement of instruments, the script can also operate on the instruments during a data acquisition sequence. This function provides a core capability to create production or depot test oriented operations that are consistent and require only a few operator selections to perform.

Classified Frequency Support

For ranges that deal with classified frequencies and those frequencies cannot be stored on disk, the Frequency Keeper function can be used. Acquisition definitions can be created with string names for frequencies instead of numerical values. When these acquisitions are executed, a memory resident utility activates and queries the operator for the actual frequencies desired. As long as the workstation is powered on, the utility will remember the frequencies. This feature insures that the frequency values are only kept in RAM and are not retained after the workstation is powered down.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

User Access Controls

A method for controlling operator access to MI-3000 functions is included. This function allows the administrator of the range to limit individual users. For example, a range may desire that range operators not have the ability to edit or change various configurations or scripts, only execute them. The function works in concert with the Windows User Group concept. The software knows predefined Windows user groups. Each user group allows a specific function within the MI-3000 Arena™ software. If none of the special user groups are created on the workstation, all users can use all MI-3000 functions. This is the factory default condition. If, for example, the range administrator wishes to limit editing of data acquisition configurations to one person, that user group is created on the workstation and only the user who should have this access is placed in that Windows user group. All other users will be restricted from editing the acquisition configurations.

On Line Documentation

All MI-3000 family manuals are included in the installation in Acrobat PDF format. All manuals are available to the user from the GUI screens and from a generalized help screen.

MI-3041 Data Acquisition

The MI-3041 Data Acquisition Software provides the capability to assign specific instruments to a particular user project, manage data acquisition configurations, collect data and store it on disk. The MI-3041 uses various software instrument drivers to control the assigned instrumentation. It includes the following functions:

Instrument Assignment and Configuration

This function allows the user to select what instruments are in use and define static parameters for those units that do not change from acquisition to acquisition. For example, the assignment of motion axes to particular position controllers and to provide a system wide name for each axis is part of this function. This function also defines whether or not a Data Acquisition Co-Processor or MI-788 Networked Acquisition Controller is installed or used. These configurations are on a user project basis, so different projects can contain different instrument complements or static configurations.

Acquisition Definition Manager

This function allows the user to create acquisition definitions. These definitions allow the user to set the data channels used, positioner motion, frequencies and the type of confirmation plot shown during acquisition. Any project can contain multiple acquisition definition files.

Acquisition Manager

This module implements an acquisition definition to collect and store data. It takes the current static equipment configuration information and the acquisition definition to set up all instrumentation involved in the data collection. The acquisition manager can collect data in a classic GPIB mode or it can manage data collection using the DAC when installed. This module creates and updates the real time confirmation plot shown during the acquisition. During acquisition, the user can change the data channel displayed and the scale of the confirmation plot. The module stores the data on disk in the MI-3000 data file format. Various data collection operations are supported:

- Data can be calibrated against an available SGH data file as it is acquired

MI-3000 Family of Data Acquisition and Analysis Workstation Products

- Multi-frequency data at a single AUT position
- Stepped or continuous scans and two dimensional rasters of multi-frequency data
- Scans can be bi-directional or re-trace style
- 16 bits of digital control lines are available when a DAC or MI-788 Networked Acquisition Controller is included. This allows management of a beam steering computer or other switching during an acquisition. The digital control can be interlaced with multiple frequencies during a single scan in a looped pattern. The “beam-frequency” list mode allows a specific beam state to be associated with each frequency.
- A “Range Walk” acquisition for gated CW RCS configurations that maps the range in time. This acquisition is only available with the MI-2097 set of instrumentation.
- Where the position controller configuration allows, a continuous scan mode is available that continuously rotates the scan axis while the step axis is moved during a raster scan acquisition instead of halting the scan axis at the end of a scan to position the step axis. This can provide significant increases in range throughput.
- Through the use of Visual Basic scripts, data can be collected at an arbitrary list of positions or non-uniform step angles when the MI-2097 complement of instruments is used.
- Up to six axes of position data can be recorded when a DAC is employed. For GPIB measurements, the scan and step axis can be recorded.
- Up to six axes of motion can be managed in a single acquisition. One axis can be the scan axis; one the primary step axis and four axes can be placed at a single location.
- When the position controller configuration allows, one axis can be configured to rotate continuously. This is useful for spinning linear axial ratio measurements.
- When the position controller is an MI-4190 and the axis configuration allows, a master slave relationship between two axes can be used. The relationship is in the form of $y = mx + b$, where “y” is the location of the slave axis, “x” is the location of the master axis, “m” is the gear ratio between the axes and “b” is an offset between the axes.
- When the position controller is an MI-4190 and the axis configuration allows, the system can define a “virtual” axis that is a combination of motion of actual physical axes. The user can insert equations that define the virtual axis in relation to motion of the physical axes. The virtual axis is then treated like any other axis from a motion control standpoint.
- Data at a specific pointing angle can be collected prior to and after an acquisition. In addition, data at this pointing angle can be collected every n scans. This additional data can be used to take out thermal drift effects for long acquisition patterns.
- Data can be collected over a time interval of up to 8 hours at user selected increments. This data is treated as a single scan of data.
- Data can be collected in a manual mode where the user moves the scan axis by hand and the MI-3000 collects data over a designated angle interval until the user is satisfied with the data. The user may also clear out data that has been collected and start over as desired.
- A manual axis can be defined for axes that are not under computer control. These axes can be designated as scan axes during a measurement and the operator will be prompted to move the manual axis whenever movement of that axis is required during the measurement. A manual axis can also be used to collect a manual scan if a position display is associated with the manual axis.

Post Acquisition Comments

A utility is provided that allows the user to update comments in a data file that has been collected at the end of data collection.

MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3042 Antenna Analysis

The MI-3042 Antenna Analysis software provides analysis of frequently used parameters in antenna measurements. The parameters include: gain, directivity, polarizations, pattern analysis, monopulse pattern analysis, monopulse error curve, measured data comparison and statistical distributions of measured data. It further allows operators to initiate plots or reports that can generate pass/fail conditions based on user-specified thresholds. Plot and report formats may be customized to meet specific requirements. Utilities are also provided to support user-written analysis algorithms. The MI-3042 consists of three major functions: Measured Data Correction, Data File Manipulation and Antenna Analysis.

Measured Data Correction

Measured Data Correction consists of several operations that can adjust raw data files:

- Channel Imbalance: For systems with transmit or receive multiplexers, the channel imbalance data versus frequency can be stored and that difference applied to the data to compensate for the data channel differences.
- Thermal Drift Correction: The MI-3041 can collect extra data periodically during a long acquisition to mark the thermal drift of the data during the acquisition. This processing option performs thermal drift correction based on the extra data collected during the acquisition.
- Receiver Non-Linearity Correction: If the receive chain is measured and the linearity of that chain is entered into the database, this processing can improve the linearity of collected data.
- Insertion Loss: This function uses insertion loss data to compute the gain of a near-field measurement.
- Probe Position Correction: For planar near-field systems, a probe position error map can be entered into the software and the probe position during a near-field measurement can be used to compensate for probe position errors in the Z dimension.

Data File Manipulation

Data File Manipulation consists of a suite of utilities that allow the user to manipulate data files into new data files. The main utilities consist of the functions:

- Merge files that are alike with the exception of one measurement parameter. For example data files that were collected identically except for the frequencies used can be merged together. Files can be merged by frequency, scan sector and step segments. For systems with single data channel capability, two files representing two orthogonal polarizations may also be merged into a single dual channel file that is compatible with the near-field processing options.
- Change data files by interpolation into a more “dense” file, decimation into a more “sparse” data file, or by smoothing. Interpolation can be linear, cubic or B-spline.
- A data file can be changed so that the scan and step axes are reversed.
- The order of the step angles in a raster scan file can be reversed.
- All data in a file can have the phase of each data point conjugated to switch between engineering and physics phase conventions.
- Files can be compared by vector addition, vector subtraction, magnitude subtraction or averaging and a new file with the results produced.
- Files can be created with a single magnitude and phase value to serve as thresholds or benchmarks.

MI-3000 Family of

Data Acquisition and Analysis Workstation Products

- Complex files of multiple frequencies, scans and beams can be reduced to single frequency, single beam or single scan files.
- A raster scan data file can be created from a larger data file with a smaller sector of the raster.
- Data files can be normalized to a user selected value of magnitude
- The phase data in a file can be “un-wrapped” to provide a phase data set that is not modulo 360 degrees.
- Manual scans can be combined to align their data for plotting, analysis or comparison.

Antenna Pattern Analysis

Antenna Analysis consists of the following processing functions. All functions can produce reports or plots of their results. All analysis types can be tested against threshold values for production type operations.

- Antenna Gain via the SGH method
- Planar Pattern analysis, consisting of such metrics as 3 dB beam width, location of peak signal, location and size of first nulls and side lobes.
- Monopulse Pattern analysis, consisting of such metrics as null location and depth, shoulder imbalance and shoulder location and height.
- Monopulse Error Curve analysis, consisting of calculation of the monopulse error curve in the main null of a monopulse difference pattern.
- Bore sight analysis, consisting of the location of main beam peak and null location for monopulse data.
- Data Comparison, consisting of the comparison of separate data files or different sections of the same data file.
- Analysis Comparison, consisting of the comparison of two previous analyses' plots or reports.
- Polarization Pattern, consisting of calculation of axial ratio and tilt angle for a polarization pattern.
- Directivity computation based on raster scan patterns or single scan directivity based on antenna symmetry.
- Linear to Circular or Circular to Linear polarization transform.
- Scan Statistics, consisting of the analysis of a scan pattern for various dB levels and centiles.
- Low Gain Pattern Analysis for omni-directional antenna. Includes pattern maximum, minimum, signal variation, mean signal and signal standard deviation.
- Front to Back Ratio Analysis for single scans or hemispherical data sets. Various options are provided for determining the “back” data to be used in computing the front to back ratio.



MI-3000 Family of Data Acquisition and Analysis Workstation Products MI-3043 Advanced Antenna Pattern Correction

The AAPC software enhances the accuracy of antenna pattern measurements. This is very useful for characterizing low side lobe antennas.

The analysis package operates by mathematically analyzing several measurements of an antenna to characterize the interference signals across the pattern of the antenna. Once the interference spectrum is determined, it can be removed from the antenna measurement. Typical results achieve a reduction of 10 to 15 dB in the interference signals of the antenna. Actual results vary according to the antenna under test, the chamber design and metrology practices.

Hardware Requirements:

A manual or automated slide axis is required to provide a means of differentiating the data to determine interference. The slide axis can be transverse or longitudinal to the test range.

MI-3044 Planar Near-Field Analysis

The Planar Near-Field Analysis Software processes raw near-field data acquired with the MI-3041 acquisition module. The processing consists of three phases:

- Correction for system errors associated with thermal drift, planarity, receiver linearity, and system losses (using the Measured Data Correction function of the MI-3042)
- Transformation of the corrected near-field data to the far-field using NIST-developed algorithms.
- The Output Processor provides an inverse transform to a user selected aperture plane.

The software module includes an output file processor that allows the far-field results to be presented in a variety of coordinate systems and polarization systems. OEWG probe data can be synthesized or imported for improved accuracy.

Hardware Requirements:

Data must be collected on an appropriate planar scanner.

MI-3045 Cylindrical Near-Field Analysis

The CNF Analysis Software processes raw cylindrical near-field data acquired with the MI-3041 acquisition module. The processing consists of:

- Correction for system errors associated with thermal drift, planarity, receiver-linearity, and system losses (using the Measured Data Correction function of the MI-3042)
- Transformation of the corrected near-field data to the far-field using NIST-developed algorithms
- Computation of the field in sine space or theta and phi coordinates.

The software module includes an output file processor that allows the far-field results to be presented in a variety of coordinate systems and polarization systems. OEWG probe data can be synthesized or imported for improved accuracy.

Hardware Requirements:

Data must be collected on an appropriate cylindrical coordinate system.



MI-3000 Family of Data Acquisition and Analysis Workstation Products MI-3046 Spherical Near-Field Analysis

The SNF Analysis Software processes raw spherical near-field data acquired with the MI-3041 acquisition module. The processing consists of:

- Correction for system errors associated with thermal drift, planarity, receiver linearity and system losses (using the Measured Data Correction function of the MI-3042)
- Transformation of the corrected near-field data to the far-field using industry-standard TICRA software
- Transformation of the corrected near-field data to the aperture plane at any value of z from the aperture plane
- Computation of the field at points equidistantly spaced in theta and phi coordinates. This field can be computed for the far-field or at any other radius about the test antenna where the field is wanted.

The software allows the far-field results to be presented in a variety of spherical coordinate systems and polarization systems. OEWG probe data can be synthesized or imported for improved accuracy.

Hardware Requirements:

Data collected on an appropriate spherical coordinate system.

MI-3047 Radome Analysis

Consult factory for latest specifications on Radome Analysis software. The MI-3047 is quoted to specific customer system requirements.

The basic MI-3047 Radome software extends the basic acquisition and analysis software with capabilities to perform radome acquisition and analysis. The analysis functions include:

- Transmission Efficiency - radome induced change in transmitted or received power
- Beam Deflection - radome induced shift in the sum beam peak
- Beam Deflection Rate
- Boresight Error - radome induced shift in the monopulse null location
- Radome Reflectivity - radome induced change in power reflected from the antenna after mounting the radome
- Pattern Distortion - radome induced change in key parameters that characterize the pattern of the antenna. The parameters of interest are: Gain Null-Fill-In, Beam width, Cross-Over Beamwidth, Imbalance of First Side lobes, Unbalance of Difference Pattern Primary Lobes, Change of 1st and 2nd Side lobe Levels, Identification of Reflection Lobes.

DO-213 specifications and parameters can be applied as thresholds to the transmission efficiency and pattern distortion options. Custom thresholds are also supported.

Hardware Requirements:

Radome measurement systems are unique from application to application. Consult MI Technologies for instrumentation requirements.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3048 RCS Analysis

Consult factory for latest specifications on RCS Analysis software. All RCS software is quoted to specific customer system requirements.

Typically the RCS Analysis software provides the capability to process data acquired in an RCS acquisition. Functions are provided to compensate for background subtraction and target calibration. The corrected data can be processed to generate various outputs such as RCS versus Frequency, Aspect; RCS versus Downrange, Aspect; Cross-range; Focused/Unfocussed ISAR Imaging; Temporal Doppler, and Range Walk among others. Zero Doppler Subtraction and Software Gating functions are also provided. The MI-3048 also includes an RCS drift correction utility to compensate for drift in long RCS acquisitions.

Hardware Requirements:

With the MI-3048 software gating function, RCS data can be collected with a CW system. However, to use the software gating function, all data must be collected in a multiple frequency mode. For gated CW RCS measurements, the system must include the MI-1798 Pulse Modulator system. The MI-1798 requires the Model MI-3033-81101 Pulse Generator driver for operation. When this equipment is included in the measurement system, the MI-3041 can use the MI-1798 to range gate the received signal.

MI-3060 EIRP Analysis

EIRP Analysis software computes the EIRP of a transmitting antenna. Output of the analysis is a report or plot of EIRP or the original data file can be normalized for EIRP. Supported measurement techniques include:

- A spectrum analyzer or power meter is used as the receiver with a Standard Gain Horn as the receive antenna. The range length and losses for both transmit and receive must be known.
- The AUT is used to transmit to the SGH as the receive antenna and the normal system receiver is used to measure the received signal. A power meter is used to measure the transmit power level before the AUT. The range length is not needed for this technique.

Hardware Requirements:

Appropriate power meter or spectrum analyzer is required, as are appropriate couplers, etc. The AUT must be mounted at the range transmit location or the range must have a reversal capability.

MI-3061 Antenna Gain Calibration Analysis

Antenna Gain Calibration software can compute the gain of one or more unknown antennas. The output of the analysis is a configuration file that is in the same format as the MI-3000 file that contains SGH data. This allows new antennas to be added to the basic SGH data table so that

MI-3000 Family of Data Acquisition and Analysis Workstation Products

these antennas become gain standards that can be used in other measurements. Supported measurement techniques include:

- Three unknown antennas. All pairs of the unknown antennas are used as transmit and receive antennas. The result is a gain standards file that contains the gain of all three antennas versus frequency along with a tabular report of the gains.
- Two identical antennas. If two unknown antennas are identical, the data collection for three unknown antennas is reduced to a single measurement of one antenna transmitting to the other. The result is a gain standards file that contains the gain of the antenna versus frequency along with a tabular report of the gains.
- One unknown antenna. Transmit and receive pair measurements are made with the unknown antenna with a SGH as the paired antenna. This is similar to the measurements for antenna gain with a SGH.

Hardware Requirements:

Appropriate power meter or spectrum analyzer is required, as are appropriate couplers, etc. The AUT must be mounted at the range transmit location or the range must have a reversal capability.

MI-3062 Ground Plane Data Simulator

For some measurement applications, spherical near-field data is collected over a ground plane. In this case, the spherical theta axis may not be able to cover a full 90 degrees of travel. The user of the spherical near-field system may desire data taken over a full hemisphere or sphere of data for directivity reasons. The MI-3062 takes a data file that is taken over less than a 90-degree arc in theta and synthesizes data to represent the lower hemisphere. The program accepts several user parameters to drive how data is synthesized. The user can select that completion of data from the end of data to the 90 degree point be a duplicate of the last real data set or the data can be set to null data. For the data synthesized in the lower hemisphere, the user can select to represent the lower hemisphere as null data, representing an absorber covered ground plane or the image data of the upper hemisphere, representing a metal ground plane. The output of the analysis is a new data file. This file contains the original data along with the fill in and lower hemisphere data.

Hardware Requirements:

Data must be collected in a spherical near-field compatible coordinate system.

MI-3063 Antenna Reflectivity Analysis

This analysis package accepts data taken on an antenna with a reflectometer kit. The analysis accepts data files taken on calibration load, short and open conditions along with the data collected on the antenna. The user can enter and store inductive and capacitive calibration parameters for the open and short test loads. The output of the analysis is a report or plot of reflectivity or VSWR versus frequency for the antenna.

Hardware Requirements:

A Model 3361 reflectometer kit is required. An MI-1795 or MI-1797 receiver is required to form the required ratio measurements with the reflectometer kit.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3064 Time Domain Analysis

This analysis package accepts frequency range data taken on an antenna and processes it to remove interfering signals. The operator can convert the data into the time domain and select a gating window to only retain the desired signal. The data in the time domain is windowed and returned to the frequency domain with the interfering signals removed as a new MI-3000 data file. The user can plot the original frequency domain data, the time domain data without a gate, the time domain data without a gate and the frequency domain data after gating. In a scripting or toolkit operation, the gating limits can be set in the analysis definition file and all operations proceed without operator intervention.

Hardware Requirements:

A spectrum analyzer or power meter may not be used to collect the data for time domain analysis. A receiver that produces phase information is required. The test antenna must support at least a 100 MHz bandwidth for the frequency range data.

Custom Software

MI Technologies has extensive experience in the development of custom software to meet customer measurement and analysis requirements. Some of the custom software done routinely by MI Technologies includes:

- New instrument driver software for receivers, network analyzers, sources and position controllers
- Adjunct control such as relay drivers, transmit leveling attenuators or switching matrices
- Special analysis functions for custom metrics
- Example Visual Basic scripts coordinating standard MI-3000 functions into a specific operational sequence to meet a customer need.
- Turnkey software systems for production and depot test situations, including management of data by test serial number, custom test databases and specific test reports and plots to meet government or commercial reporting requirements

All custom software, from simple utilities to complete turnkey systems includes complete user documentation.

Consult factory for custom software needs or requirements.



MI-3000 Family of Data Acquisition and Analysis Workstation Products

MI-3000 Workstation Configuration Guide

The following Configuration Summary Sheet can be used to select the workstation and software content desired for the user configuration. This information is provided for a basic assessment of the customer needs. There are a number of questions that must be addressed to obtain the total requirement.

A list of the required or desired instrumentation is needed. A determination of compatibility of the instrument group is required. The axes of motion used in the system are also needed.

The antenna/radome/RCS measurements and analyses needed for the system should be defined to determine which standard software packages or possibly custom software is needed.

MI Technologies application engineers can assist in defining the final configuration requirements needed for a fully functional system. Proposals can be prepared that indicate the exact equipment configuration that best meets the application need.

| MI-3001 Workstation | | | Select (X) | Charge |
|---------------------|---------------------|-------------------------------|---------------|--------|
| Basic: | MI-3001 | Standard for MI-2097 | X | |
| UPS Options: | MI-3001-UPS-60 | 850 VA 110 Vac/60 Hz UPS | | |
| | MI-3001-UPS-50 | 850 VA 240 Vac/50 Hz UPS | | |
| Required Drivers | MI-3022-RCV-1797 | MI-1797 Receiver | X | |
| | MI-3024-POS-419X | MI-4190 Position Controller | X | |
| | MI-3028-AUX-DAC | Data Acquisition Co-Processor | X | |
| | MI-3030-SRC-31XX | MI-31XX Family of Sources | X | |
| Instrument Options | MI-3028-DIS-4-HSBCD | MI-4190 HSBCD Interface | | |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

| MI-3002 Workstation | | | Select (X) | Charge |
|--|---------------------|---|---------------|--------|
| Basic: | MI-3002 | Standard for Legacy Instruments | X | |
| UPS Options: | MI-3001-UPS-60 | 850 VA 110 Vac/60 Hz UPS | | |
| | MI-3001-UPS-50 | 850 VA 240 Vac/50 Hz UPS | | |
| Select 1 Receiver Driver: | MI-3022-RCV-1783 | MI-1783 Receiver | | |
| | MI-3022-RCV-1795 | MI-1795 Receiver * | | |
| Required Source Driver: | MI-3030-SRC-2180 | MI-2180 Source. The MI-1783 can also work with a variety of third party sources | | |
| Select 1 Position Controller Driver: | MI-3024-POS-2012 | MI-2012 Position Controller ** | | |
| | MI-3024-POS-4139 | MI-4139 Position Controller ** | | |
| | MI-3024-POS-419X | MI-4190 Position Controller *** | | |
| Instrument Options: | | | | |
| *Required with MI-1795 Receiver | MI-3028-AUX-DAC | Data Acquisition Co-Processor | | |
| **Required with MI-2012 or MI-4139 Position Controller | MI-3024-DIS-1885 | MI-1885 Position Display Unit | | |
| ***Only with 4190 Option | MI-3024-DIS-4-HSBCD | MI-4190 HSBCD Interface | | |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

| MI-3003 Workstation | | | Select (X) | Charge |
|---|--------------------|---|---------------|--------|
| Basic: | MI-3003 | Standard Third Party Receiver system | X | |
| UPS Options: | MI-3001-UPS-60 | 850 VA 110 Vac/60 Hz UPS | | |
| | MI-3001-UPS-50 | 850 VA 240 Vac/50 Hz UPS | | |
| Select 1 Receiver Driver: | MI-3022-VNA-8530 | Agilent 8530 Network Analyzer | | |
| | MI-3022-VNA-8510 | Agilent 8510C Network Analyzer | | |
| | MI-3022-SPA-440X | Agilent 440X Spectrum Analyzer | | |
| | MI-3022-SPA-8566 | Agilent 8566 Spectrum Analyzer | | |
| | MI-3022-VNA-4623 | Anritsu 4623 Network Analyzer | | |
| | MI-3022-POW-3221 | MI 3221 Power Meter | | |
| | MI-3022-SPA-8563/4 | Agilent 8563/4 Spectrum Analyzer | | |
| | MI-3022-SPA-8560 | Agilent 8560 Spectrum Analyzer | | |
| | MI-3022-VNA-ENA | Agilent 5070B or 5071B ENA Network Analyzer | | |
| | MI-3022-VNA-PNA | Agilent PNA, PNA-L or PNA-X Network Analyzer | | |
| | MI-3022-POW-243X | Anritsu 2437 or 2438 Power Meter | | |
| | MI-3022-SPA-444X | Agilent 444X Spectrum Analyzer | | |
| | MI-3022-VNA-37000 | Anritsu 37000 Network Analyzer | | |
| | MI-3022-VNA-ZVX | Rohde & Swartz ZVA or ZVB | | |
| Select 1 Source Driver if Power Meter or Spectrum Analyzer is used: | MI-3030-SRC-8340 | Agilent 8340 Source | | |
| | MI-3030-SRC-8350 | Agilent 8350 Source | | |
| | MI-3030-SRC-836X0 | Agilent 83600 Series Source | | |
| | MI-3030-SRC-8375X | Agilent 83750 Series Source | | |
| | MI-3030-SRC-866X | Agilent 866X Sources | | |
| | MI-3030-SRC-8257 | Agilent 8257 (PSG) Source | | |
| | MI-3030-SRC-369X | Anritsu 369X Source | | |
| | | Manual or No Signal Source | | |
| Select 1 Position Controller Driver: | MI-3024-POW-2012 | MI-2012 Position Controller ** | | |
| | MI-3024-POW-7112S | MI-7112S Single, Dual, Triple Axis Controller | | |
| | MI-3024-POW-4139 | MI-4139 Position Controller ** | | |
| | MI-3024-POW-419X | MI-4190 Position Controller | | |
| | MI-3024-POW-4806 | Orbit 4706 or 4806 Position Controller | | |
| Instrument Options: | | | | |
| **Required with MI-2012 or MI-4139 Position Controller | MI-3024-DIS-1885 | MI-1885 Position Display Unit | | |
| | MI-3024-DIS-8500 | NAI-8500 Synchro/Digital Display Unit | | |



MI-3000 Family of Data Acquisition and Analysis Workstation Products

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|---------------------|----------------|--------------------------|---|
| MI-3010 Workstation | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Select (X)</div> |
| Basic: | MI-3010 | Standard Analysis Only | X |
| UPS Options: | MI-3001-UPS-60 | 850 VA 110 Vac/60 Hz UPS | |
| | MI-3001-UPS-50 | 850 VA 240 Vac/50 Hz UPS | |

| | | | |
|--------------------|---|--|---|
| Optional Software: | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Select (X)</div> |
| MI-3033-81101 | Agilent 8110X Driver | | |
| MI-3033-11713 | Agilent 11713A Switch Driver | | |
| MI-3033-IOT488 | IOtech Digital 488 32 bit TTL interface | | |
| MI-3043 | AAPC Analysis | | |
| MI-3044 | Planar Near-Field Analysis | | |
| MI-3045 | Cylindrical Near-Field Analysis | | |
| MI-3046 | Spherical Near-field Analysis | | |
| MI-3047 | Radome Analysis | | |
| MI-3048 | RCS Analysis | | |
| MI-3060 | EIRP Analysis | | |
| MI-3061 | Antenna Gain Calibration Analysis | | |
| MI-3062 | Ground Plane Data Simulator | | |
| MI-3063 | Antenna Reflectivity Analysis | | |
| MI-3064 | Time Domain Analysis | | |



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