
Installation and User Guide



MAP300

Automated
Wafer Analysis System

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INTRODUCTION

The PIKE MAP300 accessory is a sample compartment unit designed for the analysis of semiconductor wafers. The accessory may be configured to allow the analysis of the wafer either in reflectance or transmittance. Changing from reflectance or transmittance is by means of a single slide control.

Wafers up to 300 mm in diameter may be measured with this accessory. Sample rings are available to hold two inch, three inch, 100 mm, 125 mm, 150 mm and 200 mm wafers.

The accessory is supplied with a motion controller and software to perform automated mapping of the sample. Stepper motors are used to perform the motion. The resolution of the motors is approximately 1000 steps per inch in the linear direction and approximately 6 steps per degree in the angular direction.

When used in the reflectance mode, the thickness of the epitaxial layer may be measured. In transmission measurements may be made of interstitial carbon and substitutional oxygen concentration as well as the boron and phosphorus concentration of borophosphosilicate glass deposited on the surface of the wafer.

The autosampler is controlled by PIKE AutoPRO™ software which integrates easily with other FTIR and NIR software packages.

OPTICAL DESCRIPTION

The optics may be conveniently split into three parts.

Transfer optics.

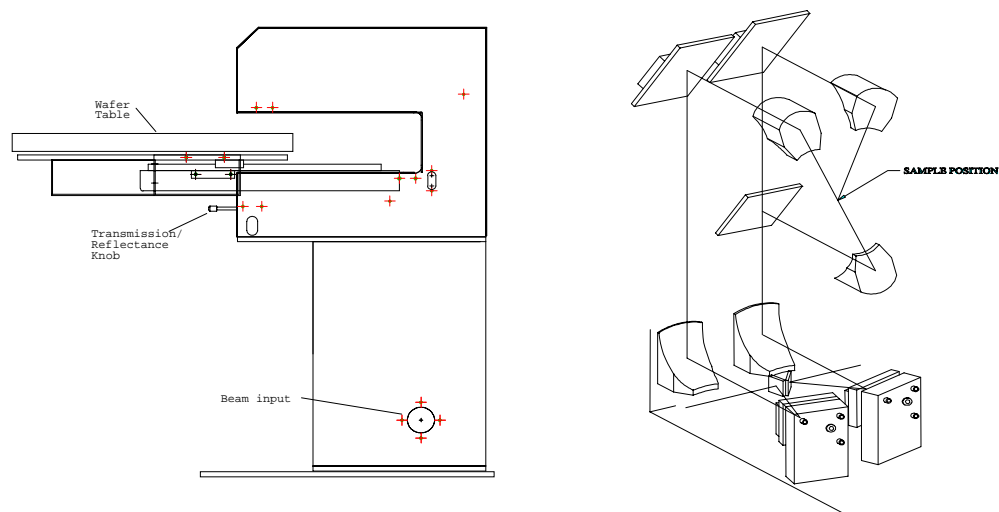
The baseplate of the accessory holds a mirror assembly which converts the incoming focused beam from the spectrometer into a collimated, upwardly traveling beam. It also takes the downward collimated beam from the sample and focuses it to be accepted by the spectrometer detector optics.

Reflectance Focusing Optics

The collimated beam from the base transfer optics is focused by a parabolic mirror onto the surface of the sample. The reflected beam from the sample is collimated by a similar parabolic mirror and sent to the transfer optics. The angle of the beam from normal as it strikes the surface of the sample is fifteen degrees.

Transmittance Focusing Optics

In this configuration, one leg of the reflectance optics is intercepted by the slider mirror. The beam from the instrument is focused by a parabolic mirror onto the surface of the sample. The beam passes through the sample and is transferred by two flat mirrors and a focusing mirror to the slider mirror which then directs the beam back to the transfer optics and then to the instrument detector.



MAP300 Diagram and optical configuration.

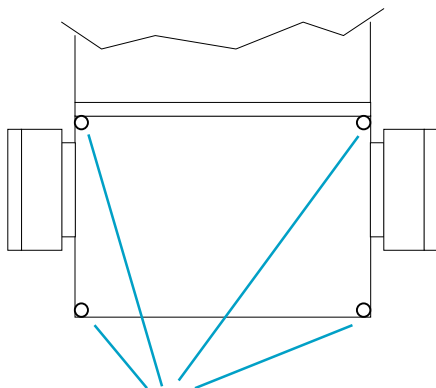
INSTALLATION AND ALIGNMENT

The accessory is mounted onto a sample compartment baseplate. The assembly may be placed into the sample compartment of the spectrometer and bolted down using the screws provided. The accessory is purgeable. In order to seal the accessory to the sample compartment, adjustable purge tubes are provided which may be adjusted to give a good seal. The only portion of the beam than is not purged is the path from the upper window of the accessory to the sample and back to the window, a path of approximately two inches. Around this window are a series of small holes. When the accessory is purged, dry air exits through these holes and provides an “air curtain” seal.

In order to align the accessory perform the following steps:

REFLECTANCE MODE

1. Place the sample ring on the accessory.
2. Insert the alignment mirror into the sample ring. This allows the accessory to be aligned in reflectance
3. Remove the front access panel of the accessory. This is held on with four thumbnuts.
4. Pull the reflectance - transmission control out all the way.



COVER THUMBSCREWS



MIRROR ADJUSTMENT SCREWS

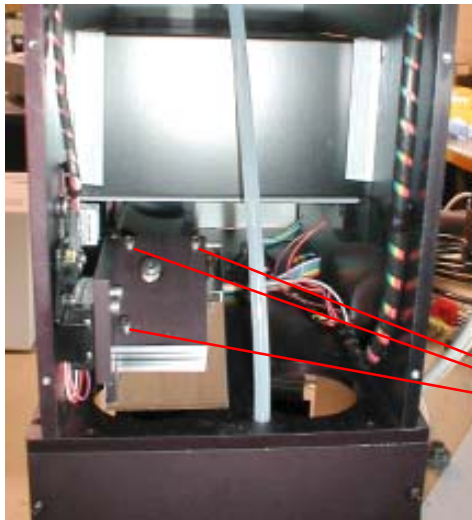
5. There are two flat mirrors that may be adjusted. Using the Allen wrench provided, adjust the left mirror by turning on the two adjustment screws as shown in the above picture, to maximize the IR signal.
6. Adjust the right mirror to maximize the signal.

7. Return to adjust the left mirror and right mirror again. This procedure may need to be repeated two or three times until the signal is maximized.

The accessory is now aligned in reflectance. Replace the front access panel.

TRANSMITTANCE MODE

1. Remove the rear panel of the accessory. This is held by means of four thumbscrews.
2. Push the reflectance - transmission control all the way in to set the accessory into transmission mode.
3. An adjustable mirror is located at the rear of the accessory on the slider mechanism. Using a 3/32 Allen wrench, adjust this mirror to maximize throughput.



MIRROR ADJUSTMENT SCREWS

REFLECTANCE - TRANSMITTANCE MATCHING

The throughput in reflectance and transmittance should be similar and about thirty percent of the open beam throughput. In order to optimize the two throughputs :

- A. Set the accessory to reflectance. Insert the reflectance alignment mirror on the stage and adjust the lower input mirror to maximize reflectance throughput.
- B. Set the accessory to transmittance. Remove the reflectance alignment mirror and adjust the rear transmission mirror and the lower output mirror to maximize transmittance.

Repeat steps A and B until the throughputs in reflectance and transmittance are maximized.

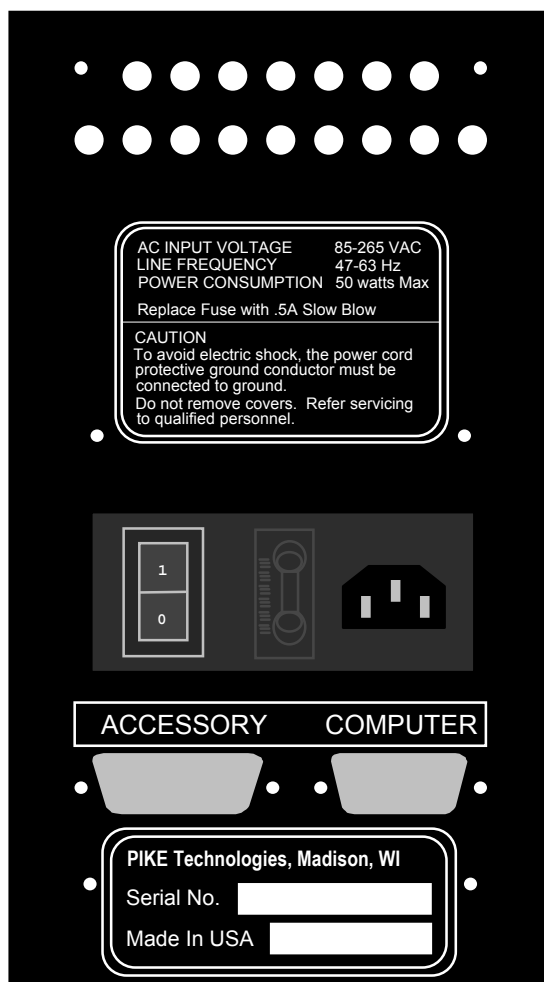
INSTALLING THE AUTOPRO MOTOR CONTROLLER

The motion control electronics interfaces MAP300 to your computer. Commands are sent to this electronics unit using RS 232. A 15 wire ribbon cable is used to connect this unit to the accessory.

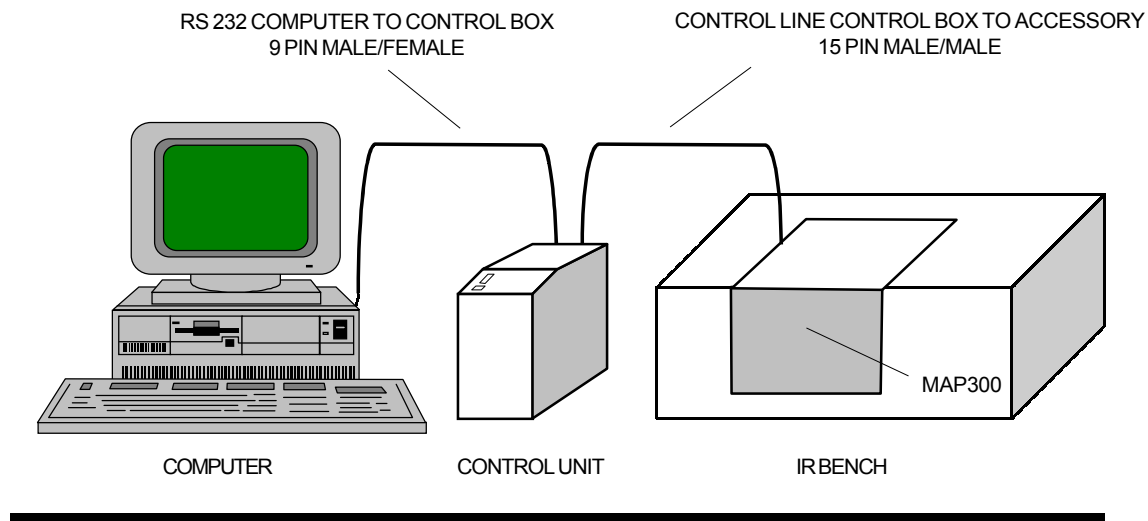
CONNECTING THE MOTOR CONTROLLER TO YOUR COMPUTER.

The power supply for the motor controller is self adjusting and can be used in most locations. Please read the labels on the rear of the motor controller before attempting to connect the system. The power for the motor controller should be turned off when attaching the cables.

Motor Controller Rear Panel



The correct cabling procedure for the accessory is shown below.



- The accessory port of the motor controller should be connected to the accessory through the six foot, male-to-male 15 pin ribbon cable provided.
- The serial RS 232 connection from the **COMPUTER** port is made with a female-to-male, molded 9 pin cable which is also provided. This cable should be connected to a serial port (COM1 or COM2) of your PC compatible computer.

INSTALLATION OF THE AUTOPRO SOFTWARE

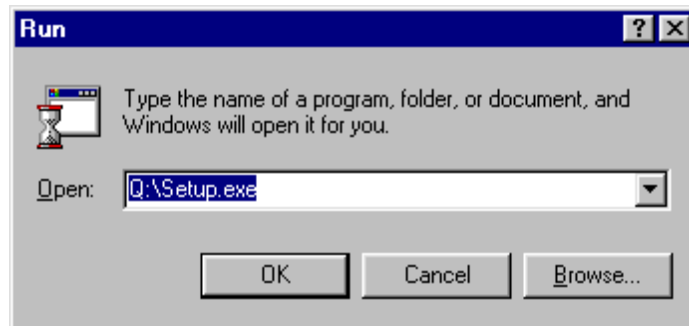
SYSTEM REQUIREMENTS

AutoPRO is a Microsoft Windows compliant program. The program was designed to run within Windows 95 or higher. It is recommended for Pentium based computers with CD-ROM and VGA monitors. A Microsoft - compatible mouse is required to access all of AutoPRO's features.

LOADING FROM WINDOWS

- Step 1 Insert the program disk into the CD-ROM Drive of your computer.
- Step 2 From within the Program Manager, select **Run...** from the **File Menu**.
The **Run** dialog box will appear to enter a filename.

You may either enter: **x:setup.exe** or "browse" to the CD Disk directory and select **setup.exe**.



A setup dialog box will appear for a few moments while the installation program checks for available memory and configuration.

The AutoPRO dialog box will appear:

Choose to use the default path and select:	Enter, or
Choose to enter an alternative path and then select	Enter, or
Choose to exit Setup by selecting	EXIT

The software will be copied. The source and destination files, and the percentage of the completed task is displayed. A dialog box will appear when the program has been loaded. Click on the OK box to complete installation.

FILES PLACED ON YOUR HARD DISK

During installation the following files are placed on your hard drive in the AutoPRO Directory:

AP31.exe	AutoPRO Control
AP31.hlp	AutoPRO Control help file
APV.exe	AutoPRO/VeeMaxprogrammer
APV.hlp	AutoPRO/Veemax help file
APW.exe	AutoPRO/Wafer programmer
APW.hlp	AutoPRO/Wafer help file
APD.exe	AutoDiffusIR programmer
APD.hlp	AutoDiffusIR help file
AP31.wri	File containing latest information
Motor.exe	Remote Control Software

In the Windows/System Directory:

mscomm.vbx	ccfcurs.DLL
ccmouse.vbx	cmdialog.vbx
commdlg.dll	dwspydll.dll
threed.vbx	grid.vbx

ON LINE HELP

AutoPRO provides on-screen help for commands and functions. More information on the general attributes of the help screens may be found in the AutoPRO Manual.

How to use Help

Choose Help from the menu, or press F1 on the keyboard

Index	Displays an index of Help topics including menus, commands, and shortcuts.
Using Help	Provides information on how to use Windows Help
About...	Provides specific information on the version AutoPRO and current system information.

You can use the Help buttons to display related Help topics. Options are:

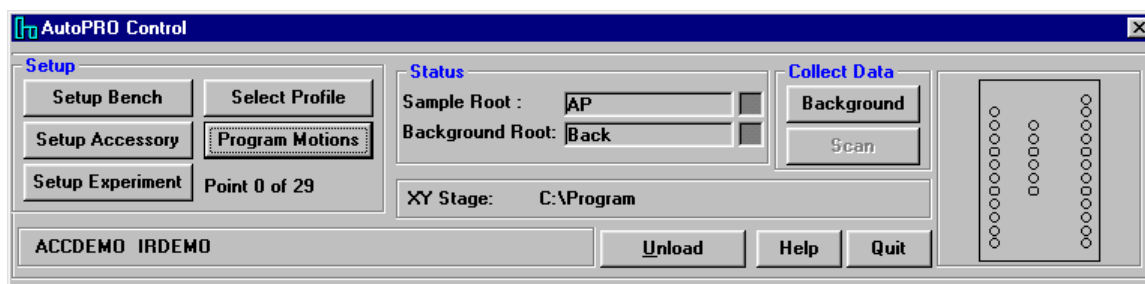
Contents	Displays a list of Help topics.
Search	Lists the keywords for AutoPRO. Enter a keyword or phrase in the Search For text box or select a keyword from the list box.
Back	Displays the last topic you displayed.
History	Displays a list of recent topics displayed.
Glossary	Displays a list of terms and parameters used in AutoPRO and their definitions.

AUTOPRO OVERVIEW

AutoPRO is a Windows based automation software program for use with PIKE automated accessories and the AutoPRO motion controller. With this software package a range of automated accessories may be programmed and operated in conjunction with most Windows based FTIR software packages. Several programs comprise the complete software package, but the following two programs are central to the function of the software and will be introduced briefly here.

AUTOPRO CONTROL

This program contains the tools required to operate your automated accessory



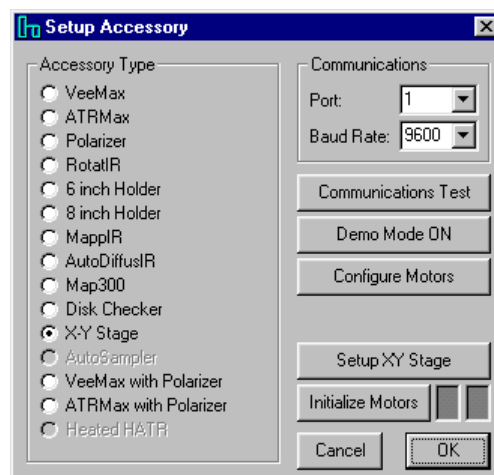
The AutoPRO control panel contains the following major functions:

Setup Bench

A basic parameters for data collection (number of scans, resolution, etc.) may be defined and stored to a file.

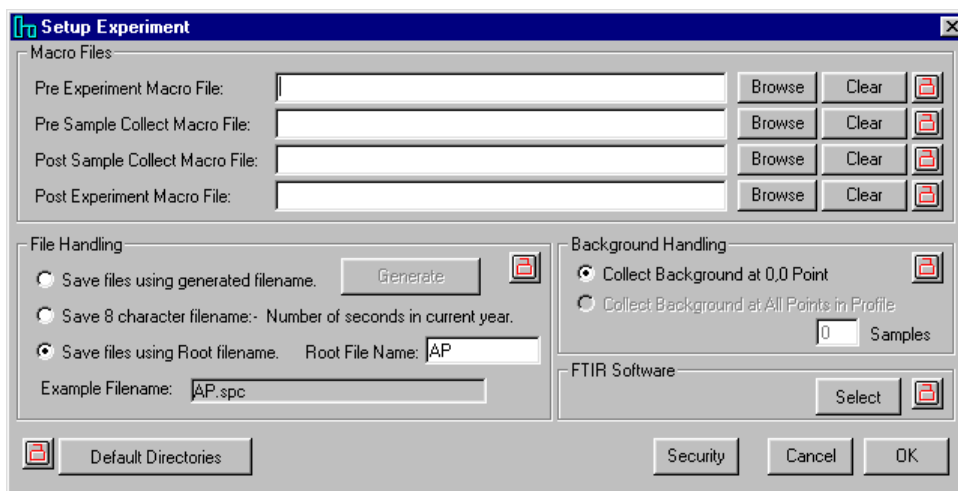
Setup Accessory

This function allows selection of the actual accessory used with the spectrometer, computer/accessory communication test and basic accessory setup.



Setup Experiment

Macros and executable files can be integrated into the autosampler routine. This function also allows special handling of multiple filenames and provides different security options.



Program Motions

A series of samples may be defined and stored to a file. This file may be subsequently used to move your accessory while collecting data from your spectrometer.

Load and unload

The MAP300 may be moved to an unload position to simplify the insertion of new samples.

Status

The status of the accessory at any time is displayed. This includes the position of the accessory, the current status of the motors and a thumbnail view of the file being used for programming the motion.

These and all other functions are described fully in the AutoPRO manual.

MOTOR . EXE

This is a program which may be inserted into an FTIR macro. With this program the basic functions required to run the accessory may be accessed from within the macro. While the software is running a small status box is displayed in the lower right hand corner of the display.

More details of how to use this and other .exe files available in the AutoPRO software are given in the User's Manual.

OPERATION OF THE ACCESSORY

REMOVING THE HOLDER FROM THE ACCESSORY

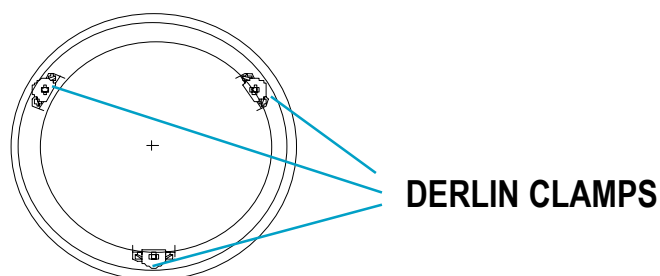
Perform the following steps:

1. Move the sample ring to the unload position.
2. Push the left side of the sample ring to the left.
3. Push the sample ring horizontally toward the instrument.
4. When the sample ring has cleared the idler pulley, lift up on the front of the ring to clear the idler pulley.
5. Push the sample ring towards the accessory so that it clears the driver pulley and remove the ring.

INSERTING A WAFER

Perform the following steps.

1. Place the sample ring on a flat surface.
2. Rotate the three clamps so that the flats on the clamps are facing inwards.
3. Place a wafer in the sample ring. The wafer will rest on the three delrin surfaces beneath the clamps.
4. Rotationally orient the flat on the wafer to the desired position. It may be useful to place a mark on the sample ring to aid in this positioning.
5. Rotate the wafer clamps through one hundred and eighty degrees to secure the wafer in place.



CHANGING BETWEEN REFLECTANCE AND TRANSMITTANCE

The accessory may be configured to perform a reflectance or transmittance analysis.

- To change the accessory from reflectance to transmittance push the reflectance - transmittance control all the way in.
- To change the accessory from transmission to reflectance pull the reflectance - transmittance control all the way out.

PRECAUTIONS

MIRRORS

In order to provide the maximum transmission in the infrared, with the minimum spectral interference, the mirrors used in this device are uncoated (bare) aluminum on glass substrate. Since the coatings are soft, care must be taken to avoid damage. Normally, these mirrors will not need cleaning, since they are contained within the housing of the accessory. If they do need cleaning, they may be gently wiped with a lint free, abrasive free cloth, such as lens tissue, or with a camel hair brush. Under no circumstances must the mirrors be rubbed with paper products such as “Kleenex” since this will produce scratching of the mirror coating.

PACKING LIST

MAP300 Automated 12' (300 mm) Semiconductor Wafer Analysis System, Part Number 017-28XX:

MAP300 - Autosampler Unit	1
Insert to Support 8" Wafer	1
Alignment Mirror	1
Motor Control Unit	1
9-pin Male/Female Computer Cable	1
15-pin Male/Male Accessory Cable	1
AutoPRO Software	1
User Manuals	2

Map300 - Optional Components:

017-3912	Additional 12" Wafer Mount
017-3980	Insert to support 8" Wafer
017-3960	Insert to support 6" Wafer
017-3950	Insert to support 5" Wafer
017-3940	Insert to support 4" Wafer
017-3930	Insert to support 3" Wafer
017-3920	Insert to support 2" Wafer