Varian ProStar 363
Fluorescence Detector

Field Service Manual
(Preliminary)

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Agilent Technologies

*** Company Private ****

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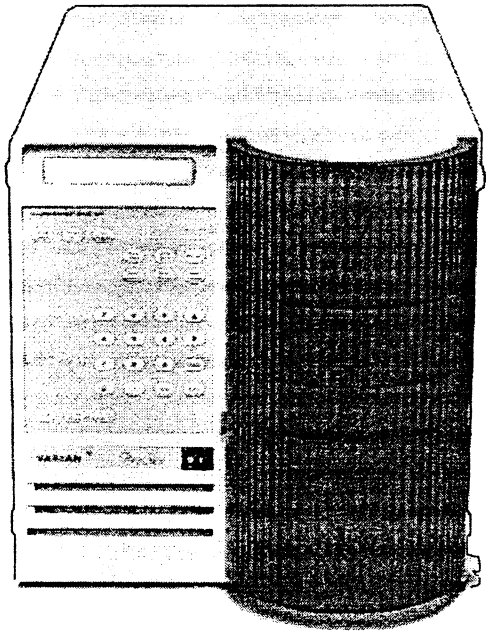
VARIAN

PIB

Product Information Bulletin
INTERNAL VARIAN USE ONLY

Worldwide HPLC Distribution

Introducing
The ProStar 363 Fluorescence Detector



Summary

1. The ProStar 363 Fluorescence Detector is a completely new fluorescence detector built by Hitachi for Varian.

2. The ProStar 363 has significantly improved signal to noise for all fluorescence applications, compared to the ProStar 360.

3. The ProStar 363 has signal to noise equivalent to or better than any other fluorescence detector on the market today.

4. The functions of the ProStar 363 are controlled by the Star workstation through the RS 422/485 serial interface.

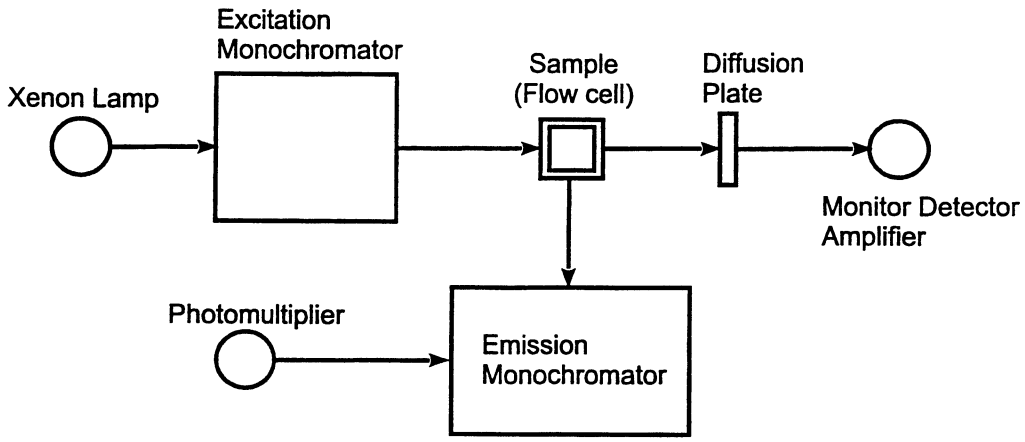
5. Data from the ProStar 363 is taken either through the Star ADC board or the CIM module, either standalone or in a ProStar pump.

6. The ProStar Fluorescence Detector can scan both the excitation and emission monochrometers to help determine the best wavelengths for monitoring the fluorescence.

Product Overview

The ProStar 363 Fluorescence Detector is a high sensitivity low noise fluorescence detector. It uses a continuous Xenon arc lamp and ratio photometry to minimize the lamp noise and maximize the fluorescence signal. It can operate as a stand-alone detector with 9 built in methods that include time programming of both the excitation and emission wavelengths. It can be controlled by the Star workstation for full automation. Both the excitation and emission monochrometers can be scanned to determine the best wavelengths for monitor individual samples.

Optics



The optics of the ProStar 363 Fluorescence Detector are shown in the figures above. The unique part of the optics is the straight through measurement of the changes in the lamp intensity. The major cause of noise in a fluorescence detector is the variation of the light entering the flow cell. The "wandering" of the xenon lamp arc with time causes this variation. As the arc moves, the amount of light going through the flow cell changes and, therefore, the signal changes. This change in signal is noise.

Most systems try to monitor the lamp output by taking part of the light between the excitation monochrometer and the sample flow cell. Although this does correct for lamp wander to some extent, the optical path is different to the flow cell and to this monitor. The ProStar 363 monitors the light going into the flow cell by looking at the light going directly through the flow cell. This allows the system to accurately compensate for any lamp wander, therefore, minimizing the noise. This is the unique aspect of the ProStar 363 Fluorescence Detector.

Performance

This optical system produces excellent performance. The S/N specification set for this detector is measured on the Raman scattering of water. In this test, water is put into the flow cell, the excitation wavelength is set at 350 nm and the emission is measured between 390 and 400 nm. In this area, water scatters light (it does not fluorescence) and some of this light will be detected by the detector photomultiplier. This is the test which fluorescence detectors, based on continuous lamps, usually use as a specification test. Continuous lamps put out more light at higher wavelengths and, therefore, are better at 350 nm instead of lower wavelengths, such as the 250 nm excitation used for Anthracene in methanol. The S/N specification for Raman scattering of water is 350:1 for the ProStar 363. The comparable measurement on the ProStar 360 was 200:1.

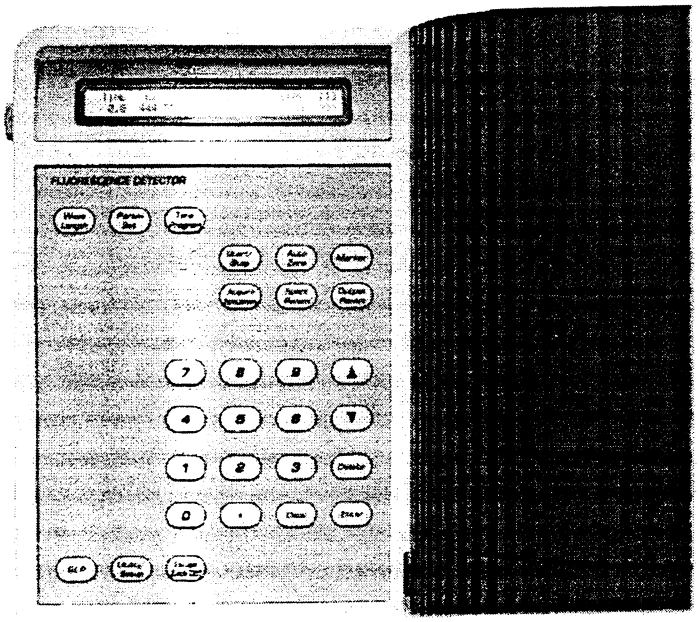
The performance of the ProStar 363 under several different conditions was compared to the ProStar 360. The signal to noise was measured using several different compounds (with several different excitation and emission wavelengths) on both the 360 and 363, and the ratios were calculated. The results are shown in the table below. In all cases, the 363 out performed the 360.

Compound	Excitation λ	Emission λ	S/N Ratio (363/360)
Raman scattering	350	396	3.6
Anthracene in methanol	248	396	3.5
Naphthalene chromatography	224	330	2.1
Anthracene chromatography	248	396	3.6
Benzo(a)pyrene	268	398	14.4
Vitamin A	350	520	9

Several other measurements were made on the 363. In all cases, the unit met its specifications.

Standalone Operation

The ProStar 363 can be operated as a standalone detector with complete control built into the unit. It uses the standard ProStar two line display and keypad (as shown below).



Some of the features of the detector in the standalone mode are:

1. Numeric and special function keys make programming the detector easy.
2. Nine built in methods allow control of the excitation and emission wavelengths and auto zero on a time-programmed basis. Up to 100 entries can be made in those 9 methods.
3. The detector time constant (0.1, 0.5, 2, 4 and 8 sec) lets you optimize the detector to the type of chromatography being done.
4. The PMT voltage can be set (low, medium, and high) to either minimize the noise or maximize the detector signal.
5. The emission bandwidth (standard- 15 nm or wide- 30 nm) can be set to maximize the signal (wide) or get better selectivity (standard).
6. A recorder offset can be entered to keep the recorder output on scale even if there is negative drift.
7. The lamp can be set to be turned off by an end input signal.
8. You can choose to display either the fluorescence, the excitation energy or the emission energy. The energy display can be used to align the lamp.
9. You can attenuate the signal from the recorder output
10. Through the GLP function, you can deactivate the keypad, check the lamp energy and keep track of how long the lamp has been on, how many times it has been turned on and off and the date when the lamp was changed last.

All of the above functions, except 8 & 9, can be controlled through Star Workstation. See section on Star Workstation control below for further information.

The detector is capable of scanning either the excitation or the emission monochrometer in order to determine the best wavelength for monitoring a particular compound. As a scan can take several seconds, it is recommended that scanning be done with stopped flow. This way the user will be assured that the compound of interest is still in the flowcell for the duration of the scan.

As the scan is acquired, it is stored in the detector. After up to 7 scans are acquired, they can be played back. As the scan is replayed, the wavelengths and fluorescence values are displayed on the front panel. The scan can also be output to a CIM box, ADC board or chart recorder.

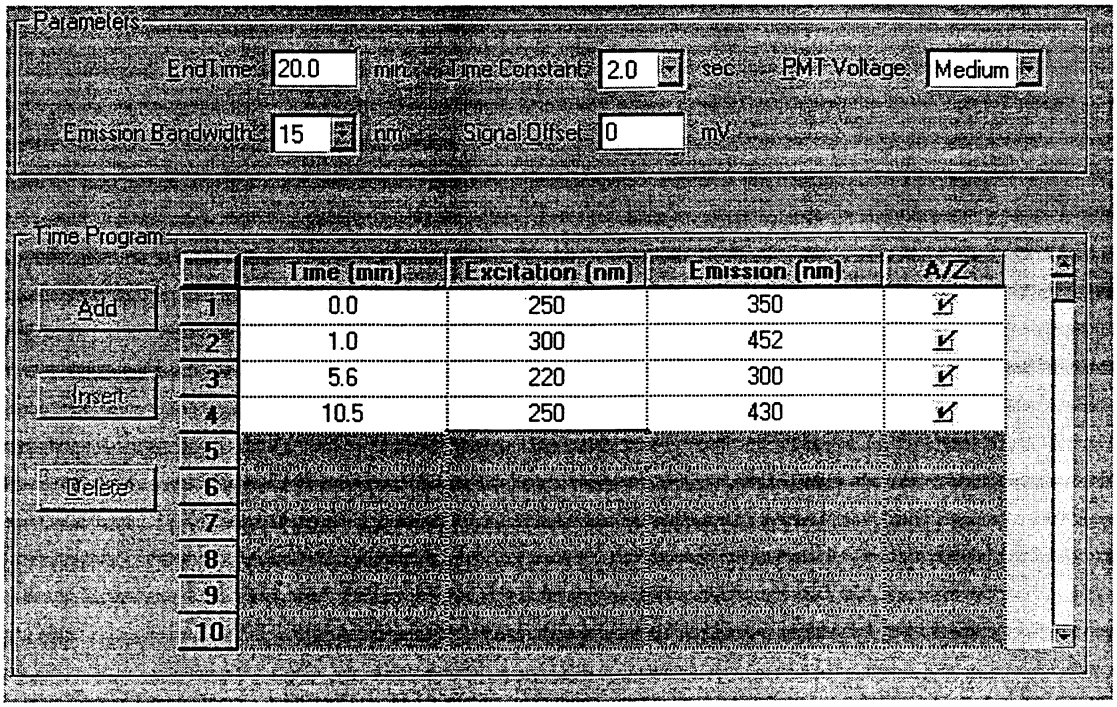
For a complete description and instructions on scanning, please refer to the operation manual.

Star Workstation Control

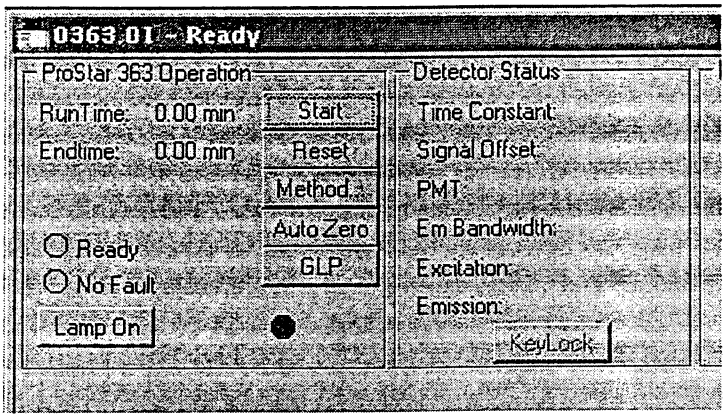
The ProStar 363 detector can be controlled through the Star workstation. This requires Star workstation 5.51 or greater. It is interfaced to the Star workstation through RS-422/485 multi drop serial control similarly to the ProStar 400 series AutoSamplers and the ProStar 210/215 and SD-1 pumps. The driver software is loaded from a floppy disk included with every ProStar 363 detector. At the next release of the Star workstation, the driver will be included on the LC control section of the Star CD.

Data is acquired through either an ADC board or a CIM module. (The CIM module can be either in a pump or a standalone unit.) An ADC board or CIM module is required to acquire data.

The Method editor section for the ProStar 363 is shown in the figure below:



The Status screen for the ProStar 363 is shown in the figure below. Note, the detector signal is seen on the AC board status screen.



Four instruments can be run from one workstation by changing the address on the ProStar 363. The ProStar 363 operates similarly to all of the other ProStar modules with the Star workstation.

Ordering Information

ProStar 363 Fluorescence Detector		
03-935728-01 ProStar 363 Fluorescence Detector (includes Back Pressure Regulator)	Standard range: 200 to 730 nm. Dual monochromator design. Time programmable excitation and emission wavelength changes Continuos Xenon source lamp (15W). Twelve microliter illuminated cell volume. Two independent analog outputs. Settable spectral bandwidth of 15 or 30 nm for emission. Fixed excitation spectral bandwidth of 15 nm. Wavelength accuracy of +/- 3 nm. Capable of scanning both excitation and emission wavelengths. Operates in fluorescence, phosphorescence or chemiluminescence modes.	$9,590
03-935728-02 ProStar 363 Fluorescence Detector with ADC Board	Same as above, but packaged with an ADC board and cable to connect ADC to detector.	$9,990
ProStar 363 Fluorescence Detector Options and Accessories		
03-935922-01 Spare cable to connect CIM to ProStar 363		$88
03-936156-01 Cable to connect ADC board to ProStar 363		$88
03-926131-02 Xenon Lamp	1200 hour lamp	$450
03-926131-03 Long-Life Xenon Lamp	2000 hour lamp	$750
03-926131-09 12 uL flow cell (cell only)		$380
56-180002-00 Extended Range PMT	up to 900nm	$1,200

Specifications

Photometric principle	Ratio Photometry, intensity of transmitted beam is monitored
Light source	150 W Xenon lamp, continuously run
Excitation wavelength setting range	200 to 850 nm
Emission wavelength range	250 to 900 nm. (Note that the photomultiplier must be changed at emission wavelengths greater tan 731 nm)
Excitation bandwidth	15 nm
Emission bandwidth	15 or 30 nm controllable atandalone and through the Star workstation
Wavelength accuracy	+/- 3 nm
Wavelength repeatability	+/- 0.5 nm
Recorder output	10 mV full scale with a controllable range of 1 to 1000
Data system output	1 Volt full scale
Response	0.1, 0.5, 2.0, 4.0, 8.0 sec. controllable standalone and through the Star workstation
Auto Zero range	0 - 1000
Offset	0 – 1000 settable
Flow cell	12 micro liters illuminated
Flow cell pressure	29 ATM
Communications	RS 422/485
External I/O contacts	Start Input, Not ready output, Error input/output, AutoZero input, Marker input, lamp off input.
Display	40 characters, x 2 lines (standard ProStar format)
Operating temperature	4 to 35 C
Operating humidity	45 to 80 % RH
Power requirments	110 – 115, 220-240 V, 50/60 Hz swtiching supply
Power consumption	420 VA
Dimensions	12 inches high, 11.5 inches wide, 16 inches deep
Weight	19 Kg
Rated lamp life – normal lamp	1200 hr
Rated lamp life – extended life lamp	2000 hr

Item	Description	Varian P/N	Hitachi P/N	
1	Service Manual, Hitachi L7485 FL	03-926131-01	810-9283	
2	Xenon Arc Lamp	03-926131-02	650-1500	
3	Long-Life Xenon Arc Lamp	03-926131-03	250-1600	
4	Power Supply Assy, Xenon Lamp	03-926131-04	810-4782	
5	DC Fan Assy	03-926131-05	810-2344	
6	Motor Slit	03-926131-06	810-4762	
7	Motor Cam	03-926131-07	810-3810	
8	Thermal Switch	03-926131-08	810-4769	
9	Flow Cell, 12 (cell only)	03-926131-09	810-3927	
10	Sensor, GP1A34LC (photointerruptor)	03-926131-10	J33-9165	
11	Photomultiplier, R3788	03-926131-11	J33-9545 or 250-1804	
12	Fuse	03-926131-12	J82-1349	
13	Elliptical Condenser Mirror	03-926131-13	810-3847	
14	Plane Mirror Assy	03-926131-14	810-3827	
15	Starter, Xenon Lamp	03-926131-15	810-2431	
16	LCD Unit (Varian)		Varian part	
17	Keyboard (Varian)		Varian part	
18	Photocell, VIS	03-926131-18	810-3921	
19	Teflon Inlet Tubing	03-926131-19	810-3758	
20	Teflon Outlet Tubing	03-926131-20	810-3759	
21	FLM PC Board (Main PCB)	03-926131-21	810-7064?	
22	Main Power Switch	03-926131-22	?	
23		03-926131-23		
24		03-926131-24		
25	Filter Holder	03-926131-25	810-3970	
26	Cutoff Filter Set, 6 pcs. (not used)	03-926131-26	810-3979	
27	Holmium Oxide Filter	03-926131-27	810-3980	
28	Target (Mirror Alignment)	03-926131-28	810-3967	
29	Target Base (for above)	03-926131-29	810-3968	
30	EM Slit Assembly Tool (not used)	03-926131-30	810-3969	
31	Photomultiplier, R928, Red-Sensitive	56-180002-00	N/A	
32	Inverter Unit, 24 (also for 330PDA)	03-935705-48	R62-9230	

Varian ProStar 363
Fluorescence Detector

WORLDWIDE SERVICE STRATEGY

* * * *Company Private* * * *

Prepared by: Dean Waterbury

Approvals:

_____ October 1, 2000
Ray Attwell
Manager, Technical Services

_____ October 1, 2000
Graeme Luxford
Manager, North America Field Service

PRODUCT LINE: **Chromatography Systems** *Intro. Date:* **October 1, 2000**

MODEL: **ProStar 363 Fluorescence Detector** *Issue Date:* **October 1, 2000**

* * * *COMPANY PRIVATE* * * *

WORLDWIDE SERVICE STRATEGY

I. *INTRODUCTION/PRODUCT DESCRIPTION*

The ProStar 363 Fluorescence Detector is an OEM product from Hitachi Instruments, modeled after their L-7485, but repackaged in size and colors to conform to the other Varian ProStar HPLC modules.

Key Features

- Stackable with the other modules in the ProStar HPLC line.
- High sensitivity at all wavelengths.
- Excitation and Emission scanning to determine a compound's wavelength maxima.
- Time programmable excitation and emission wavelengths.
- Stand-alone operation or single-point control through Star Chromatography Workstation Software.

In the stand-alone mode of operation, all user inputs are made on the front panel keypad. All operator inputs are displayed on a front panel display consisting of two lines of forty characters each. The detector measures the sample fluorescence at the user-selected excitation and emission wavelengths. The fluorescence is output as an analog signal to an external data system, workstation, integrator or recorder.

The ProStar 363 can also be operated with Star Workstation Software, utilizing an RS422/485 interface to the serial port of the Workstation computer, similar to the ProStar/Dynamax interface. The driver for the ProStar 363 will be included in Star Workstation Chromatography Software Version 5.5x, available at the Fluorescence Detector's introduction.

Optics Design

The ProStar 363 Fluorescence Detector utilizes a 150-watt *Xenon Arc Lamp* to produce high-intensity light which is reflected back via a large *Condenser Mirror*, through the excitation entrance slit, and to the excitation monochromator. Light is then dispersed by a *stepper motor-driven concave diffraction grating*. The dispersed light at the user-selected excitation wavelength leaves the excitation exit slit and irradiates the sample through the *standard 12uL Flow Cell.*

The emitted fluorescence passes through the emission entrance slit, into the emission monochromator, and is dispersed by another concave diffraction grating, which is also stepper motor-driven. The dispersed light of the user-selected emission wavelength leaves via the emission exit slit and is directed to the *Photomultiplier* .

A diffusion plate and *Photocell,* located opposite the flowcell in the excitation light path, is used to measure the intensity of the excitation beam as a function of time and corrects for any changes in xenon lamp intensity.

II. *SERVICE PHILOSOPHY*

ProStar 363 Fluorescence Detectors sold by Varian will be serviced by trained Varian Customer Support Representatives at the Customer site, using standard HPLC diagnostic procedures and the assembly exchange method.

All Service parts will be stocked at Chromatography Systems Parts and Supplies in Walnut Creek for the U.S. and Canada, Varian European Operations, Latin America and other International countries. Stocking levels will be adjusted according to parts usage and instrument population. (See Appendix I for Service Parts List).

III. *INSTALLATION PROCEDURE*

The Customer can easily install the ProStar 363 Fluorescence Detector to most LC systems. In the U.S. and Canada, a Varian Customer Support Representative will provide installation if the ProStar 363 is purchased with an LC system, and the Customer has paid for a system installation. Installation can also be purchased separately if the detector is added to an existing Varian LC system. In European countries, installation is normally included in the purchase price.

A. Installation by a Varian Customer Support Representative includes the following:

1. Verification of delivered items for completeness and absence of shipping damage.

2. Instrument setup and connection to a Varian LC System. The ProStar 363 Fluorescence Detector can operate as a standalone detector, or it can be controlled via Star Workstation software. Varian Star Workstation computer/software installation is included. Software installation to an *unqualified* PC may cause problems out of Varian's control. Therefore, extra installation charges may be incurred; in addition, Varian cannot guarantee operation of the software to unqualified computers. See the *Varian Star Workstation Service Strategy* for more information.

3. Installation Qualification (IQ) procedures will include demonstration of proper operational parameters and explanation of recommended maintenance to the Customer. See the *LC Regulatory Compliance Documentation Manual*, Varian p/n 03-914756-00, for more information on IQ, OQ, and PQ procedures.

B. Installation to non-Varian equipment, or any assembly of *special cabling* for external control is not included as part of normal installation. Any such interfacing is considered as billable service and should be charged at regular service rates, or as directed by Service Management.

C. ProStar 363 Fluorescence Detectors found to be DOA (dead on arrival) at the time of installation should be returned to Walnut Creek Chromatography Systems for replacement. To initiate the replacement process, the area Service Manager should complete and return, via FAX, a *CSB Warranty Replacement Form* to the Tech. Services Mgr. for approval. As defined by Walnut Creek's formal *Problem Escalation Process*, a Returned Materials Authorization (RMA) will be issued and a replacement module will be shipped to the Customer. The discrepant instrument module should be returned to Walnut Creek as soon as the RMA has been issued; Chromatography Systems Technical Services will either attempt to repair the unit or return the instrument to Hitachi for repair/replacement.

IV. *WARRANTY*

A. For details regarding Warranty, see the *Varian Analytical Instrument Warranty*, Appendix B, at the end of this Service Strategy.

B. The following services are available to Customers under Warranty:

1. Technical assistance from trained Technical Support Representatives via telephone from Technical Services in Walnut Creek, CA or Middleburg, Netherlands, or the local Service Office in European and O.I. countries.

2. Instrument repair or replacement of any Warranted items as outlined in Appendix B.

V. *OUT-OF-WARRANTY SERVICE*

A. The ProStar 363 Fluorescence Detector is designed for minimum downtime and most repairs can be accomplished on-site. Outside of a Service Contract, the following service options are available:

1. On-site billable service by Varian Customer Support Representatives is available at prevailing service and travel rates, plus parts.

2. The Customer may purchase parts from, or exchange parts with, their local Varian Parts and Supplies center and perform the actual repair himself.

3. In some cases, repair at a Varian office, or at a Hitachi Service Center, can be arranged through the local Customer Support Representative, Technical Services, or Service Management.

4.

VI. *SERVICE CONTRACTS OR EXTENDED WARRANTY*

A. A number of options are available for Extended Warranty and/or Service Contracts. For specific information on these options, please contact Varian Customer Support or the local Varian Field Office.

B. In all Varian Extended Warranties and Service Contracts, the Customer has specific responsibilities. These responsibilities consist of (but are not limited to) the following:

1. Place service requests through the appropriate country or local service office.

2. Perform normal recommended operator maintenance functions as described in the Operation Manual.

3. Assist the Technical Services Representative or local Customer Support Representative in performing diagnostic functions by phone contact and executing minor repair actions if recommended.

5. Protect the instrument from internal and external corrosion, misuse, and abuse.

VII. *SERVICE AND REPAIR CONCEPT*

A. All Service requests in the U.S. should be routed through the HPLC Technical Services Hotline at 1-800-FOR-HPLC (Option 3). Outside of the U.S., service requests should be directed to the local Service office.

B. The Assembly Exchange Concept applies.

C. Service will be restricted to the performance of the instrument's electronic and mechanical hardware, and clarification of operational problems. Built-in instrument diagnostic tests and standard troubleshooting techniques will be the primary source of determining instrument malfunctions. If it is determined that the Customer's application is at fault, the Customer Support Representative may contact Walnut Creek Technical Services, or they may enlist the help of a Service Support Chemist, if available in the particular country, to assist the Customer in solving his application problem.

D. In general, Field repairs to the ProStar 363 Fluorescence Detector's Optical Monochromator assemblies (gratings, and stepper motor drive assemblies) are *not* recommended. When Field Service has determined monochromator repairs are required, Technical Services should be contacted to arrange for repair by Hitachi Instruments in San Jose, CA, or Japan.

Parts and Supplies Information: The Contract between Varian and Hitachi provides for a 12 month Warranty against defects in materials and workmanship. As such, defective PCB's, components, or subassemblies failing during the Warranty period (from date of installation) shall be replaced or repaired (at Hitachi's option) at no charge to Varian.

Note: For Varian to receive credit for components under Hitachi's Warranty, parts returned to Chromatography Systems should include documentation indicating instrument serial number and date of installation, as well as a detailed description of the problem.

VIII. *SERVICE TRAINING*

Service training for this product will be incorporated into the Varian HPLC Service Training program. Initial Service Training for the U.S. and Canada is scheduled for the second week of September 2000, and will be included in the HPLC Intermediate and Update Training courses scheduled throughout the year. Consult the Technical Services Training Catalog and Training Schedules for more information.

IX. *SERVICE SUPPORT*

A. Chromatography Systems Technical Services will assist Varian Customer Support Representatives in solving difficult problems and provide support to all Service Advisors.

B. In the U.S., all *Customer* inquiries are supported through LC Technical Services in Walnut Creek, CA, or Woburn MA. For European Operations, Latin America and Other International, Customer Support will be provided through Varian Middleburg, Netherlands, and/or the individual country's Service Management.

Appendix A
ProStar 363 Fluorescence Detector Service Parts

Part Description	*Hitachi P/N*	*Varian P/N*	*SAP*
Service Manual, Hitachi L7485 FL	810-9283	03-926131-01	*
Standard Xenon Arc Lamp	650-1500	03-926131-02	*
Long-Life Xenon Arc Lamp	250-1600	03-926131-03	*
Power Supply Assy, Xenon Lamp	810-4782	03-926131-04	*
DC Fan Assy	810-2344	03-926131-05	*
Emission Slit Stepper Motor	810-4762	03-926131-06	*
EXC/EMI Stepper Motor	810-3810	03-926131-07	*
Thermal Switch	810-4769	03-926131-08	*
Flow Cell, 12uL (cell only)	810-3927	03-926131-09	*
Sensor, GP1A34LC (photointerruptor)	J33-9165	03-926131-10	*
Photomultiplier, R3788	250-1804	03-926131-11	*
Fuse, 5A/250V, T-type	J82-1349	03-926131-12	*
Elliptical Condenser Mirror	810-3847	03-926131-13	*
Plane Mirror Assy	810-3827	03-926131-14	*
Starter, Xenon Lamp	810-2431	03-926131-15	*
		03-926131-16	
		03-926131-17	
Photocell, VIS (not available)	810-3921	03-926131-18	
Teflon Inlet Tubing	810-3758	03-926131-19	*
Teflon Outlet Tubing	810-3759	03-926131-20	*
FLM PC Board (Main PCB)	810-7064	03-926131-21	*
		03-926131-22	
		03-926131-23	
		03-926131-24	
Filter Holder (not used)	810-3970	03-926131-25	
Cutoff Filter Set, 6 pcs. (not used)	810-3979	03-926131-26	
Holmium Oxide Filter (not used)	810-3980	03-926131-27	
Target (Mirror Alignment)	810-3967	03-926131-28	*
Target Base (for above)	810-3968	03-926131-29	*
EM Slit Assembly Tool (not used)	810-3969	03-926131-30	
Photomultiplier, R928, Red-Sensitive	Varian	56-180002-00	*
Inverter Unit (also for 330PDA)	R62-9230	03-935705-48	*
Main Power Switch, DPST Rocker-Type	Varian	71-619106-00	*
LCD Display w/Backlight	Varian	03-936368-01	*
Display Overlay	Varian	03-936229-01	*
Keyboard, PS363	Varian	03-935726-01	*
Ship Kit, PS363	Varian	03-935730-91	*
Start Cable (PS330/PS363)	Varian	03-935922-01	*
Male Nut, 10-32, PEEK	Varian	UCF120	*
Ferrule, 1/16" Flangeless, Tefzel	Varian	UCP200	*
Bushing, Flangeless, Delrin	Varian	UCP201	*

Varian Analytical Instrument Warranty

Hardware Products

All analytical instruments sold by Varian are warranted to be free from defects in material and workmanship for the periods specified and in accordance with the terms on the face of Varian's quotation or as otherwise agreed upon in writing between Varian and the Customer. The warranty period begins on the date of **shipment** from Varian to the original Customer. However, where installation is paid for by the Customer or included in the purchase price, the warranty period begins upon completion of installation. If the Customer schedules **installation** to start later than 30 days after delivery or if such delay is caused through the Customer's inability to provide adequate facilities or utilities or through failure to comply with Varian's reasonable pre-installation instructions or through other omissions by Customer, then the warranty period starts on the 31st day from date of shipment. Moreover Varian will charge the Customer for labor and other expenses involved in making multiple or follow-up installation service calls.

Software Products

Where software is provided within the frame of a license agreement concluded between the Customer and Varian, any warranty shall be strictly in accordance with the terms of such agreement.
In the absence of a license agreement and unless an alternate warranty period is agreed upon in writing between Varian and the Customer, the warranty period is as specified on the face of Varian's quotation. Varian warrants such software products, if used with and properly installed on Varian hardware or other hardware as specified by Varian to perform as described in the accompanying Operator's Manual and to be substantially free of those defects which cause failure to execute respective programming instructions; however, Varian does not warrant uninterrupted or error-free operation.

Remedies

The sole and exclusive remedy under hardware warranty shall be **repair** of instrument malfunctions which in Varian's opinion are due or traceable to defects in original materials or workmanship or, at Varian's option, **replacement** of the respective defective parts, provided that Varian may as an alternative elect to **refund** an equitable portion of the purchase price of the instrument or accessory.
Repair or replacement under warranty does not extend the original warranty period.
Repair or replacement under warranty claims shall be made in Varian's sole discretion either by sending a Customer Support Representative to the site or by authorizing the Customer to return the defective accessory or instrument to Varian or to send it to a designated service facility. The Customer shall be responsible for loss or damage in transit and shall prepay shipping cost. Varian will return the accessory or instrument to the Customer prepaid and insured. Claims for loss or damage in transit shall be filed by the Customer. To correct software operation anomalies, Varian will issue software revisions where such revisions exist and where, in Varian's opinion, this is the most efficient remedy.

Limitation of Warranty

This **warranty does not cover** software supplied by the Customer, equipment and software warranted by another manufacturer or replacement of expendable items and those of limited life, such as but not limited to: Filters, glassware, instrument status lamps, source lamps, septa, columns, fuses, chart paper and ink, nebulizers, flow cells, pistons, seals, fittings, valves, burners, sample tubes, probe inserts, print heads, glass lined tubing, pipe and tube fittings, variable temperature dewars, transfer lines, flexible discs, magnetic tape cassettes, electron multipliers, filaments, vacuum gaskets, seats and all parts exposed to samples and mobile phases.
This **warranty shall be void** in the event of accident, abuse, alteration, misuse, neglect, breakage, improper operation or maintenance, unauthorized or improper modifications or tampering, use in an unsuitable physical environment, use with a marginal power supply or use with other inadequate facilities or utilities. Reasonable care must be used to avoid hazards.
This warranty is expressly in lieu of and excludes all other express or implied warranties, including but not limited to warranties of merchantability and of fitness for particular purpose, use or application, and all other obligations or liabilities on the part of Varian, unless such other warranties, obligations or liabilities are expressly agreed to in writing by Varian.

Limitation of Remedies and Liability

The remedies provided herein are the sole and exclusive remedies of the Customer. In no case will Varian be liable for incidental or consequential damages, loss of use, loss of production or any other loss incurred.

Spare Parts Availability

It is the policy of Varian to provide operational spare parts for any instrument and major accessory for a period of five (5) years after shipment of the final production run of that instrument. Spare parts will be available after this five (5) year period but on an *as available* basis. Operational spare parts are defined as those individual electrical or mechanical parts that are susceptible to failure during their normal operation. Examples include relays, lamps, temperature probes, detector elements, motors, etc. Sheet metal parts, structural members or assemblies and castings, printed circuit boards, and functional modules are normally capable of being rebuilt to like-new condition throughout their useful life and therefore will be supplied only on an *as available* basis after the final production run of the instrument.

Service Availability

Varian provides a variety of services to support its customers after warranty expiration. Repair service can be provided by attractively priced service contracts or on a time and material basis. Technical support and training can be provided by qualified personnel on both a contractual or as-needed basis.

Varian Analytical Instruments Sales Offices

For Sales or Service assistance and to order Parts and Supplies, contact your local Varian office.

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Varian Argentina Ltd.
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Vösendorf bei Wien
Tel. 43.1.699.96.69

Belgium
Varian Belgium NV/SA
Zaventem
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São Paulo
Tel. 11.820.0444

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Varian Canada Inc.
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Varian China Ltd.
Beijing
Tel. 10.6209.1727

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Varian S.A.
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Varian GmbH
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Tel. 6151.7030

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Varian India Pvt. Ltd.
Mumbai
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Tel. 3.5232.1211

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Tel. 2.3452.2452

Mexico and Latin America (N)
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Mexico City
Tel. 5.523.9465

Netherlands
Varian Nederland B.V.
Houten
Tel. 3063.50909

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Varian Associates Inc.
Moscow
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Tel. 91.472.7612

Sweden
Varian AB
Solna
Tel. 8.445.1620

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Varian International AG
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Tel. 61.295.8000

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Tel. 4125.7608

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Palo Alto, California
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Tel. 650.424.4819

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For HPLC
1.800.FOR.HPLC

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http://www.varian.com

VARIAN

ProStar 363 Fluorescence Detector Control Software Instructions

This manual describes the installation, configuration and use of the ProStar 363 Fluorescence Detector Control Software with the Star Chromatography Workstation. For information on the operation of the Star Workstation, please refer to the Data Acquisition with LC Control Operation Manual on your Star Workstation Version 5.51 CD-ROM.

Installing the Control Software

1. Install the Star Chromatography Workstation Version 5.51.

Verify that version 5.51 of the Star Chromatography Workstation is installed on your computer. You can do this by selecting "About..." under Help in the menu bar of any of the Star Workstation applications and checking the version number, or right-click on an open area of the Star Workstation Toolbar, select "About Star Toolbar" and check the displayed version number.

2. Install the ProStar 363 Detector Drivers.

The ProStar 363 Drivers are on a diskette separate from the Chromatography Workstation Version 5.51 Software. Follow the installation procedure described on the diskette label.

3. Connect the Detector to Your Star Workstation.

The detector communicates with the Star Workstation using the RS-422/485 serial communications. This allows multiple devices such as the ProStar 210 or 215 pumps to be attached to a single RS-422/485 serial I/O cable (P/N 03-935462-91). An R/S-422/485 converter connects the Star Workstation computer's serial port to the RS-422/485 Communications cable. The instructions for connecting this hardware to the Star Workstation computer are included in the RS-422/485 Communication Kit.

4. Connect the Detector to your Varian ADC Board or CIM.

The Processor/Data System analog output (top connector on back of the detector) is connected to the ADC board with cable part number 03-936156-01. If you purchased the ProStar 363 detector with the ADC board, this cable is included in the package. The Channel A of the ADC board should be set for 1 volt. The cable connects only to Channel A.

The cable used for the CIM (computer interface module) comes as standard with the ProStar 363. The CIM box, ProStar 210/215 pump CIM, or the PrepStar SD-1 pump CIM, can all be used to collect the analog output of the ProStar 363. Follow the instructions that came with the CIM instrument for its installation.

Configuring the Detector

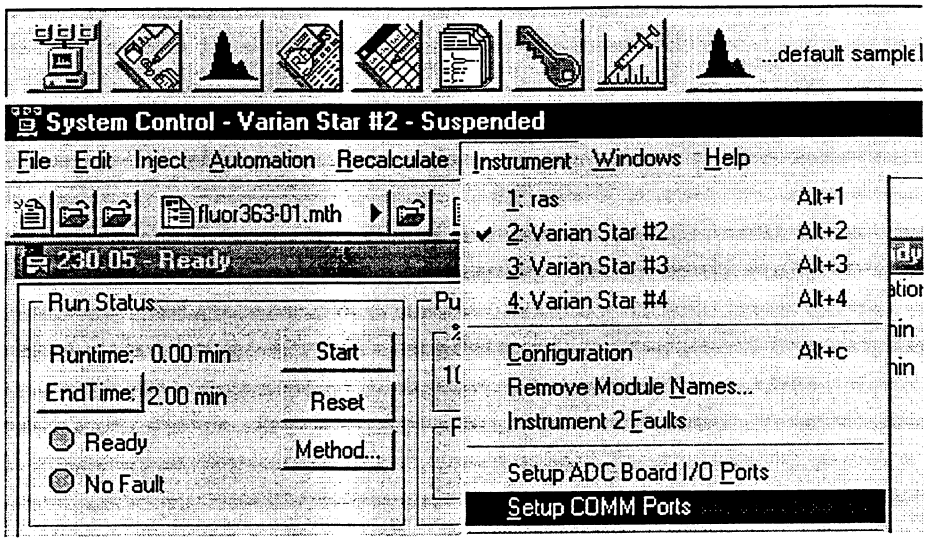
1. Set the Device Identifier on the Detector.

Power up the detector while holding down the "Utility/Setup" key on the front panel. This will cause the detector to go into a special mode where you can change the Device Identifier for that detector module. The display will show "SET UP UNIT ID" on the left side of the display with a number 0-9 directly under the D in ID. Press *Enter* and the display will show "UNIT ID: (0-9)" with a number 0-9 directly below the D in ID. Press a number on the keypad to select the UNIT ID. Press *Enter* to change the UNIT ID. Now power down the detector and power it back up to put the detector in the standard operating mode. Currently 0 is the default and only numbers 0-3 are used with this detector. If you selected 0 as the UNIT ID then the Device Identifier is 90. UNIT IDs 0, 1, 2, and 3 correspond to Device Identifiers 90, 91, 92, and 93. When powered up the Device

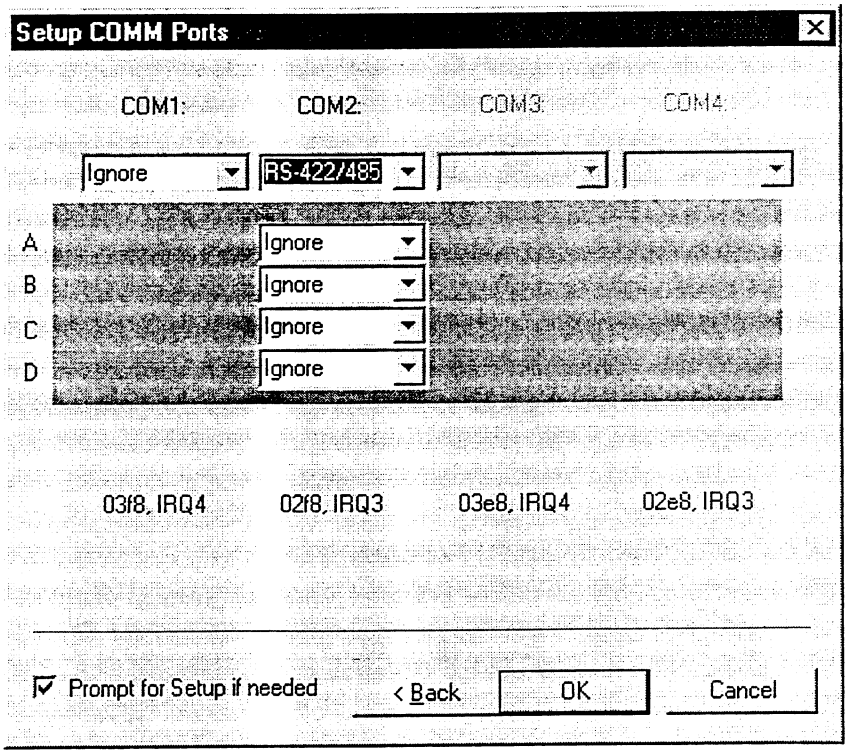
Identifier is shown to the right of the display in brackets. Using Device Identifiers higher than 93 are not supported by the Star Workstation.

2. Configure the Communication Ports in System Control.

The first time you start System Control, the Star Communication Configuration "Wizard" will start automatically to guide you through the configuration setup. Read the description presented in the Star Communication Configuration windows. Click on Next to advance to the next step until you get to the Setup COMM Ports window. This window can also be displayed from the Instrument menu item, "Setup COMM Ports"



Select "RS-422/485" in the Combo Box below COM 1, COM 2, etc., which you have an RS-422/485 cable attached. After you select "RS-422/485", four additional Combo Boxes will appear in the column: one each for sub ports A, B, C, and D, as indicated by the labels at the left side of the Dialog Box.

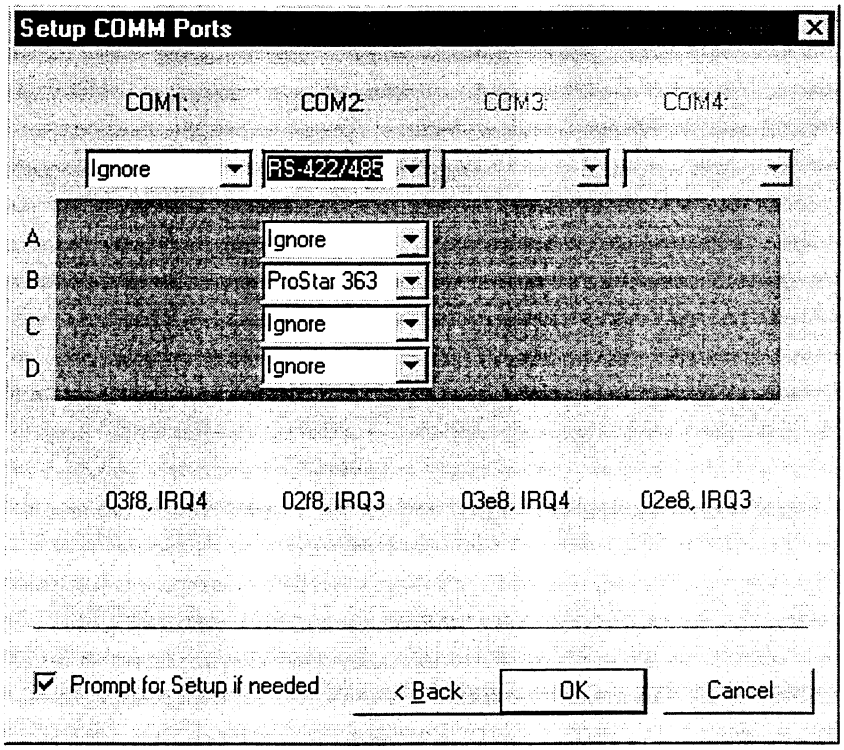


The Device Identifiers (90, 91, 92, 93) are assigned to the COM Ports and sub ports as shown in the following table. System Control Module addresses that correspond to the port, or sub port to which the Detector is connected, are also listed. The Unit ID described above is also listed

Device Identifier	Unit ID	COM 1	Module Address	COM 2	Module Address
90	0	A	24	A	28
91	1	B	25	B	29
92	2	C	26	C	30
93	3	D	27	D	31

To attach the ProStar 363 to the Star Workstation, click on the Combo Box for the sub port that corresponds to the Device Identifier set previously in the detector. Then select "ProStar 363". Select "Ignore" for the sub ports that you are not using.

After you have completed your selections, the Dialog Box should appear similar to the following figure.



This example shows the ProStar 363 with its Device Identifier set to 91 that is connected to sub port B of COM 2. This detector will be assigned the address 29 in System Control, and its icon will have the label reading 363.29. You can have up to four detectors or other modules connected to each RS-422/485 cable, depending on the load that these systems impose on the communication cable bandwidth.

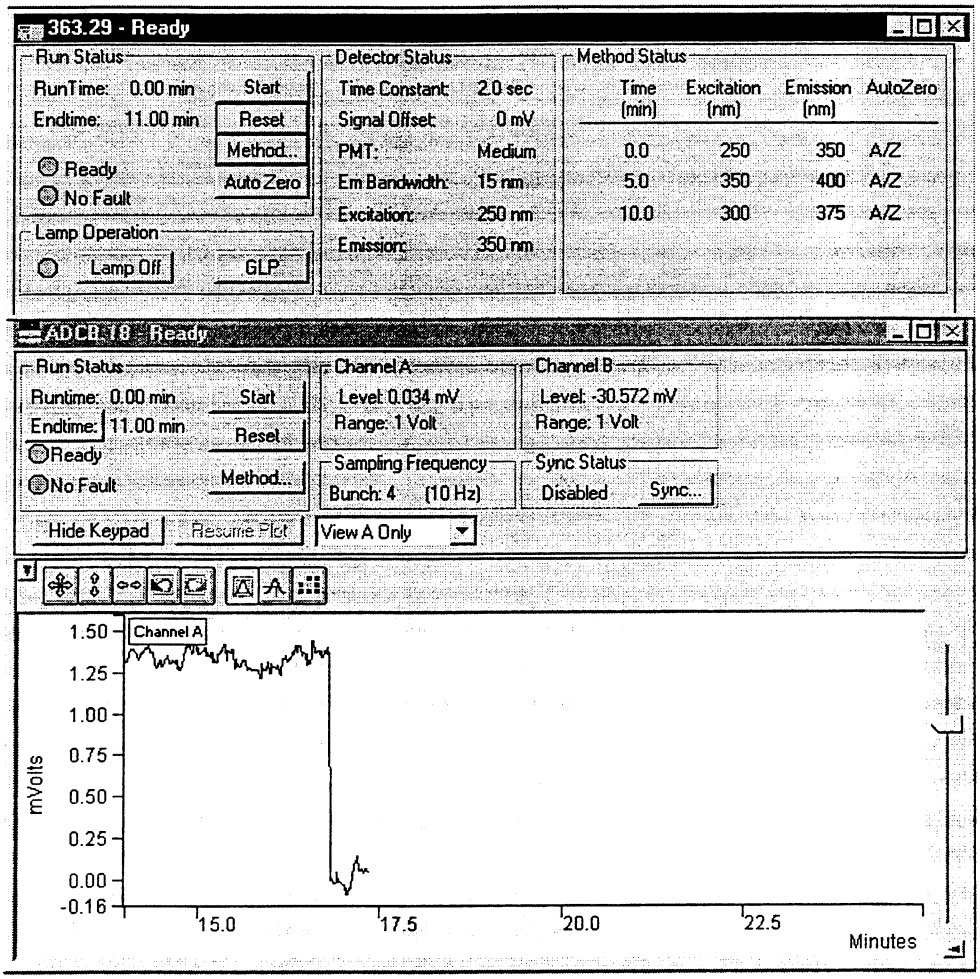
Now press the *OK button* to close the Dialog Box. The detector will connect and be represented by icons in the Available Modules area of the Configuration Window.

After each detector connects to System Control, configure it in a designated Instrument by dragging its icon from the Available Modules area of the Configuration Window into one of the four Instrument Areas. A maximum of four ProStar 363 detectors are allowed per workstation.

Now switch to the Instrument Window to view the Module Window for the detector configured in that instrument. You are now ready to program the Detector Excitation and Emission wavelengths and other detector settings.

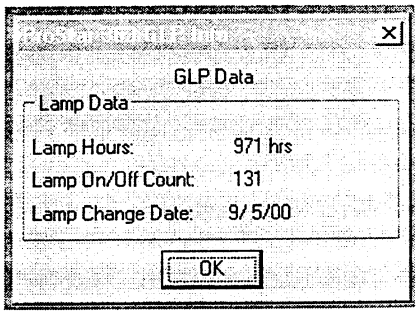
The ProStar 363 Detector Status Window

Below is shown the status window for the ProStar 363 detector along with the status window of the ADC board to which is connected.

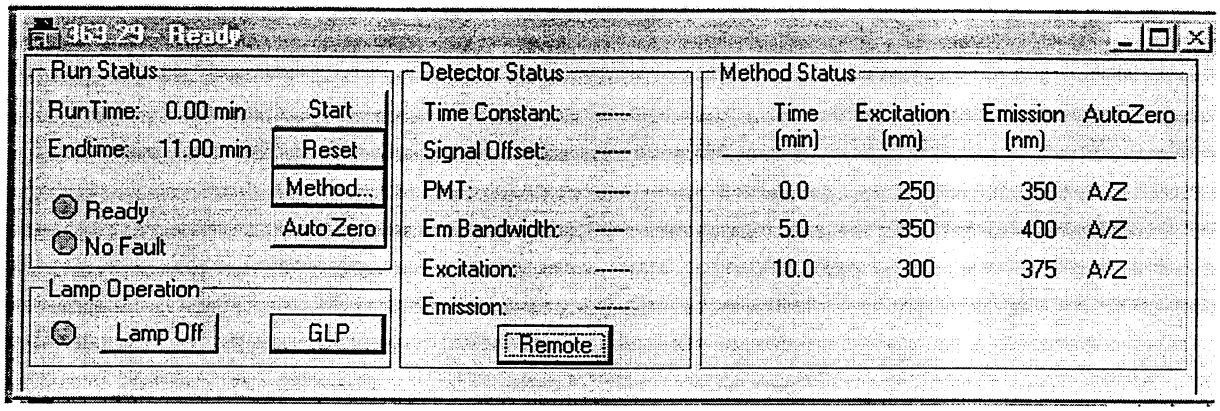


Description of the ProStar 363 Detector Status Window

On the left of the ProStar 363 status window is the Run Status that includes the usual Workstation buttons (Start, Reset, Method Edit, Auto Zero). Below that window is the Lamp Operation window which has a button for turning the lamp off and on, and a GLP(Good Laboratory Practice) button. When the *GLP* button is pressed another window opens which shows lamp hours, how many times the lamp has been turned off and on, and the date of the last lamp change. This information is passed onto the Workstation at the end of each run and when the Detector initially connects with the Workstation.



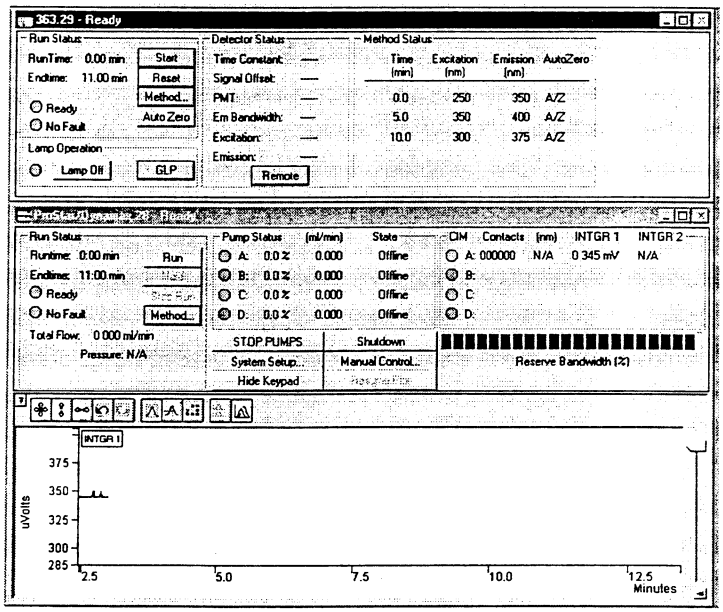
The center section of the Status window shows the Detector Status, which includes how the detector parameters are currently set. If you press the Escape button on the ProStar 363 Detector, it will go to local control and you will be able to make changes from the front panel. When the Escape key is pressed, a Remote button appears in the bottom of the Detector Status section of the ProStar 363 Status Window in the Workstation. The Detector Status is cleared also. Clicking on the Remote button restores Remote control and Detector Status. To the right is the Method status window, which shows a listing of the current method and how far the method has progressed. As the method line is executed an arrow appears to the left of the Time column pointing to that line.



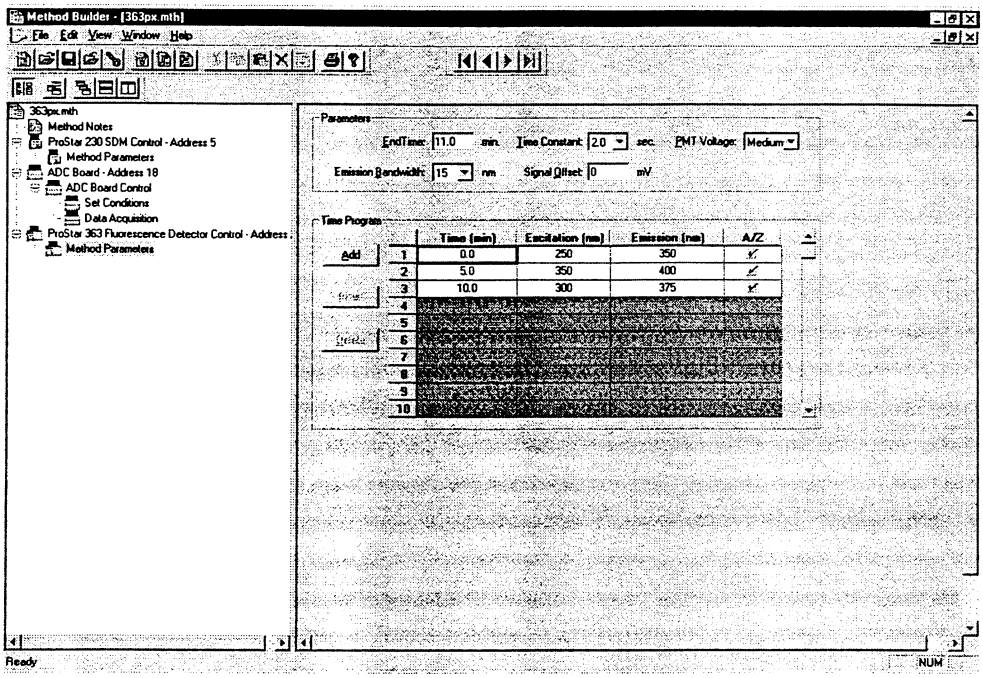
Detector Status with Remote Button present. Detector is in Local mode.

ADC Board Window

The ADC board window is shown directly under the ProStar 363 Detector Status window as this is a convenient location to position it so the Detector Status and Detector output signal can be viewed simultaneously. If the ProStar 363 Detector output (Processor/Data System) is connected to a CIM, it would be part of the ProStar/Dynamax window as shown below.



Building a ProStar 363 Detector Method



Above is the Workstation Method Builder window. The window consists of two distinct areas: the Parameters and the Time Program. The Parameters includes non-time programmable settings. The Time Program includes the Time, Excitation Wavelength, Emission Wavelength and A/Z (auto zero). Three buttons (Add, Insert and Delete) are also included in this area to help in editing. There are 99 lines available in the time program. A minimum of 0.3 minutes between lines is recommended to allow time for the monochromators in the Detector to change and stabilize at a new wavelength. An auto zero (adjusts the output to 0 Volts) is recommended after each wavelength change if the change causes a large offset in the baseline. Refer to the ProStar 363 Operation Manual (03-914875-00) for more information about adjusting the Parameters shown in this window. By time programming the Excitation and Emission wavelengths you can maximize the sensitivity for each fluorescent component.

Wavelength Scanning to ADC Board

In order to maximize the sensitivity of the ProStar 363 detector it is necessary to use the optimal Excitation and Emission wavelengths. Those optimal wavelengths will give the largest signal for a specific compound. In most cases literature research of the molecules of interest will provide this information or at least a starting point based on molecules of similar structure. In some cases it will be necessary to determine the optimal wavelengths by scanning each the Excitation and Emission monochromators of the ProStar 363. The ProStar 363 Fluorescence detector is capable of Excitation or Emission scanning with storage of up to eight spectra. Setting up and initiating scanning takes place from the front panel of the detector while in local mode. Read the ProStar 363 Fluorescence Detector Operation Manual for details of how to scan and store fluorescent spectra. Following is an explanation on outputing the fluorescence spectra to the ADC board so that wavelength maxima can be determined using the Workstation Interactive Graphics Program.

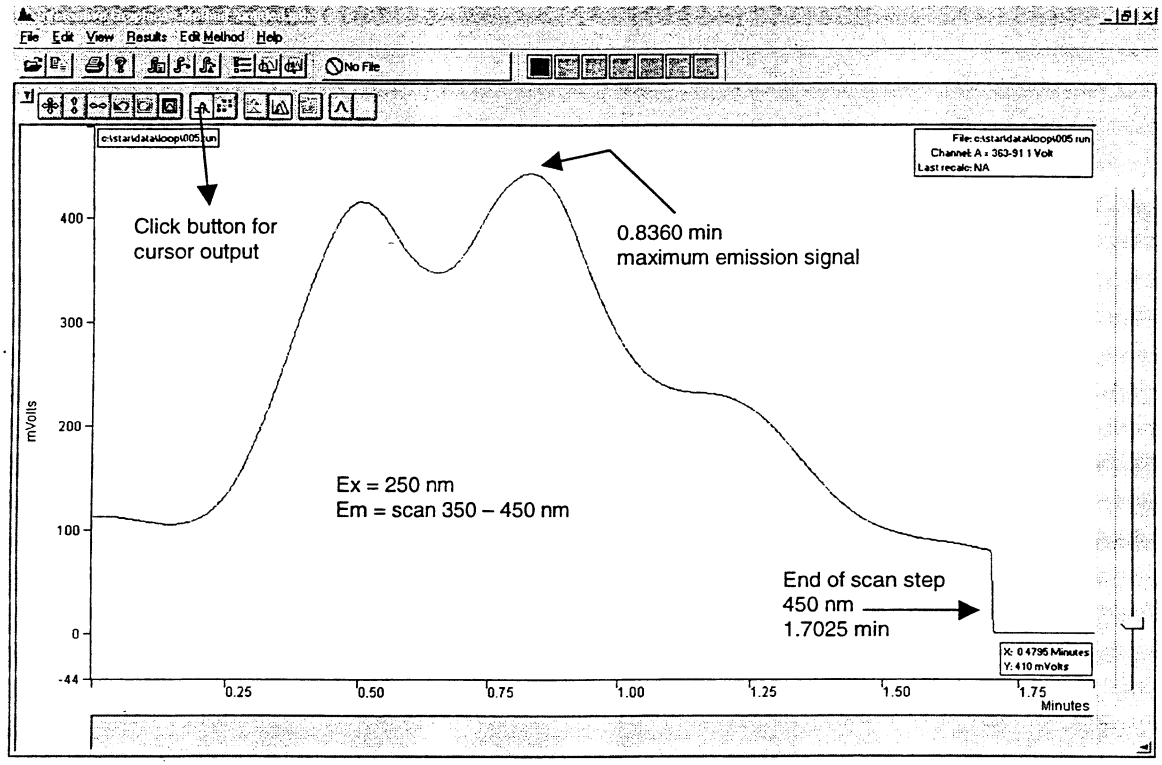
Before a scan is initiated it is important to have the mobile phase in the detector flow cell static. There are two ways of accomplishing a no flow condition in the flow cell. First, you can make up a solution of the compound of interest and use a syringe to put it into the flow cell. Second, you can stop the peak of interest in the flow cell during a chromatographic run by stopping pump flow. In this second case it will be necessary to wait a period of time until flow is completely stopped. A no flow condition is usually indicated by zero pressure in the system and a level baseline on the

ProStar 363 detector. This stop flow scanning technique is best used on peaks that are at least thirty seconds wide at the baseline.

Now that you have successfully made a scan it is now time to output the scan to the ADC board. The Processor/Data System Output of the detector should be connected to the ADC board. The ProStar 363 should be in local mode (press *Escape* to go to the local mode).

Press the *Output Param key* and select RCD SPEED of 60 nm/min. Press *Output Param* again and then select SPECT RCD. Under RECORD SPECTRUM NO. (1-8) pick the number of your stored spectrum and press *Enter*. For BACKGROUND SPECTRUM NO. (0-8) select 0 and press *Enter* unless you have stored a background spectrum of your mobile phase that you would prefer to use. The 0 means no background subtraction. The ProStar 363 display now indicates that pressing the *Start* button will begin the output of the spectrum. On the Workstation click on the ADC board window Start button. Have the End Time set at about 10 minutes and a bunch rate of 4(10 hz). This action also starts the ProStar 363 scan output. The ProStar 363 display will show the emission wavelength and fluorescence output as the spectrum is output. The output is from the lowest wavelength to the highest wavelength while the actual scan is from high to low wavelength. When the output is complete there will be a beep. To end the data collection, click on the Reset button in the ADC window. Use the Workstation Interactive Graphics program to look at the data.

As an example we will use anthracene in MeOH (~2 µg/liter). This was an emission scan from 450-350 nm with an excitation wavelength of 250 nm. The ADC run is shown in Interactive Graphics and is annotated to indicate the time for the end of scan and the time of the maximum signal.



Click the button shown in the above window so that you can read out time and mVolts at the cursor position. Use the cursor to determine the time of the maximum signal and the time of the end of scan step. Using this information and knowing the output rate of the scan (60 nm/min) you can now determine the maximum signal wavelength. The end of scan was at 1.7025 min(@450 nm). The highest signal was at 0.8360 min. Find the difference in minutes between these two times and convert it into nm difference (1.7025 – 0.8360 = 0.8665 min X 60 nm/min = 52 nm).

Now subtract this difference from the end wavelength of 450 nm and you have 450 – 52 nm = 398 nm. This is the maximum emission output wavelength for anthracene in MeOH.

SERVICE MANUAL

for

Model L-7485 Fluorescence Detector

- **This service manual has been created for the service personnel who have been trained by Hitachi, Ltd.**
- **Before starting your service work, read carefully and understand well the safety instructions described in the instruction manual for Model L-7485 Fluorescence Detector, then use this service manual.**

Part No.810-9283 TT-G (FFM-KT002006)

Contents

Preface

This service manual has been created for the service personnel who are authorized by Hitachi. Ltd. to perform maintenance and repair of Model L-7485 Fluorescence Detector.
Error in maintenance and repair work may affect the performances of the instrument, and cause problems of safety. Be careful to perform properly.
Please carry this service manual with you when you perform maintenance and repair. Read carefully the manual before starting your work. Perform proper work for the maintenance and repair.

The Way of Using this Manual

Cautions, Safety Guidelines, Important Notes, and Warning Labels are described at the beginning. Read carefully and understand well them before starting your work.

CAUTION

Cautions for Electromagnetic Wave Interference

1. Electromagnetic Wave Interference That This Instrument Gives to Other Equipment

When using this instrument, receiving trouble of radio and television set may occur.
When cables are used to connect equipment for composing the system, use the specified cables following the instruction manual.
This way will minimize the electromagnetic wave interference.
However, it cannot guarantee that this instrument does not give the interference.
If you suspect that this instrument is the cause of interference, turn off the power of this instrument, and check the receiving conditions of radio and television set. If it is improved, this instrument may be the cause.
Try to improve as follows.

- Change the direction of the antenna of radio and TV set.
- Separate this instrument from the radio and TV.
- Connect the power cord of this instrument to an outlet of the power which is different from that for radio and TV set.

2. Electromagnetic Wave Interference That May be Given to This Instrument

If this instrument is used near devices that generate strong electric/magnetic fields, noises enter this instrument, and the performances and functions may be affected.
When using cables to connect equipment for composing the system, use the specified cables following the instruction manual.
This way will minimize the electromagnetic wave interference.
However, it cannot be guaranteed that this instrument is not affected by the interference.
If you think that the interference is affecting this instrument, turn off the power of the device that may be the cause, and check the running conditions of this instrument.
If better, the interference may be the cause.
Try to improve as follows.

- Change the direction of this instrument.
- Separate this instrument from the device that may be the cause.
- Connect the power cord of this instrument to an outlet of the power which is different from that for the device which may be the cause.
- Check that other equipment connected to this instrument is not affected by the interference.

Guarantee of Product

Hitachi, Ltd. guarantees the following based on the specifications described in the instruction manual only when Model L-7485 Fluorescence Detector is used following the contents described in the instruction manual.

1. Range of Guarantee

When the instrument is troubled owing to the defect of the manufacturing process of Hitachi, Ltd., only repair of the instrument is performed free of charge.
When repairing, some substitute parts may be used or an equivalent instrument may be offered instead of repair.
About the products which are frequently improved or discontinued in the market such as personal computers or printers, the same model cannot be provided in some cases.
The following are out of guarantee:

- Instrument that was disposed of.
- Resold Instrument without notifying to Hitachi, Ltd.
- Articles of consumption.
- Parts whose guarantee periods are limited.

2. Period of Guarantee

Within 1 year from the day of the installation.

3. Service Hours

Within the business hours specified by Hitachi, Ltd.

4. Items Not Guaranteed

The following are out of Guarantee even though it is in the period of Guarantee.

4a. Trouble caused by use in a place where the installation place standards specified by Hitachi, Ltd. are not satisfied.

4b. Trouble caused by the power (voltage, frequency) that is out of the specifications specified by Hitachi, Ltd.
Trouble caused by abnormal source power.

4c. Pipings are corroded and deteriorated by impurities in gas, air, cooling water prepared by the users.

4d. Electric circuits are corroded, or optical elements are deteriorated by corrosive gas in the air.

4e. Trouble caused by hardware, software and parts which are provided by other companies than Hitachi, Ltd.

4f. Trouble caused by improper handling or maintenance by the users.

4g. Trouble caused by maintenance, repair work performed by service personnel of a maintenance service company not approved by Hitachi, Ltd.

4h. Instrument that was disposed of, or resold without notifying to Hitachi, Ltd.

4i. Trouble caused by movement or transport after the installation.

4j. Disassembly, modification, or transfer without approval of Hitachi, Ltd. was performed.

4k. Trouble of Articles of Consumption, or parts whose guarantee periods are limited.

4l. Trouble of parts that are described as out of guarantee in the instruction manual.

4m. Trouble caused by fire, earthquake, storm and flood, lightning, disturbance, riot, crime, terrorism, war, radiation contamination, contamination by toxic substances, and inevitable accidents.

4n. Trouble of hardware, or damages to basic software, application software, and data caused by computer virus.

4o. Trouble of personal computer used for the instrument, damages to basic software, application software and data caused by power failure or momentary voltage drop of the power by lightning etc.

4p. Trouble of personal computer used for the instrument, damages to basic software, application software and data caused by turning off the main power of personal computer without performing the normal finish operation.

5. Restriction of Guarantee

5a. Express guarantee other than the express guarantee based on the contents of guarantee described in 1 above is not offered.

5b. Implied guarantee such as guarantee of merchantability or guarantee of fitness for a particular purpose is not offered.

5c. Direct and indirect damages created by express or implied guarantee are not compensated.

5d. Damages caused by that the performances of the product do not match to oral or written information transmitted by selling agent, agency or employee without the approval specified by Hitachi, Ltd. are not compensated.

6. Guarantee Card

The Guarantee Card is not reissued. Keep it securely.

Installation, Transfer, and Service

Installation at the delivery is performed by Installation/Service personnel of Hitachi, Ltd., or engineers approved by Hitachi, Ltd., or under the supervision of them.
When installing, perform preparation to satisfy installation conditions for this instrument, seeing the instruction manual, on the customers' own responsibility.
When transfer is required after the delivery, please contact the selling agent from which you purchased the instrument or your nearest Service office of Hitachi, Ltd. to prevent trouble attendant on transfer.

Other Cautions

1. Handling of Chemicals and Samples

1a. When analysis is performed with this instrument, perform handling, keeping and treatment of chemicals and samples that are used by you, being based on the standards or regulations on customer' own responsibility.

1b. Follow the instructions indicated by the sales agent etc. about handling, keeping and disposing of reagents, standard solutions and samples for precision control.

2. Service Manual

2a. The contents of this Service Manual are subject to change without prior notice in the future.

2b. The copyright of this Service Manual is held by Hitachi, Ltd.

2c. The contents of this Service Manual may not be copied or reproduced in whole or part, without written consent of Hitachi, Ltd.

⚠ SAFETY SUMMARY

Before using the Hitachi Model L-7485 Fluorescence Detector, read carefully the following safety instructions, and understand the contents thoroughly.

⚠ General Safety Guidelines

- Operate the instrument following the procedure described in the instruction manual for it.
- Installation at the delivery must be performed by only persons who have been trained and approved by Hitachi, Ltd.
  Do not install by yourself.
- Be sure to follow cautions described on the instrument or in the instruction manual.
  If not, injuries to persons or damages to instrument can be caused.
- Cautions on safety are as follows.
  They are combinations of alert word "Danger", "Warning", and "Caution", and alert symbol "⚠"

⚠ **DANGER**	: Shows imminent danger that can cause death or serious injuries. (This instrument has not "⚠ Danger".)
⚠ **WARNING**	: Shows potential danger that can cause death or serious injuries.
⚠ **CAUTION**	: Shows potential danger that may cause relatively light injuries or severe damages to instrument.
⚠	: This alert symbol is used with an alert word to indicate the item described is on safety that must be careful.
Important Note	: Shows cautions that are not directly related to human safety.

⚠ SAFETY SUMMARY

⚠ General Safety Guidelines (Continued)

Cautions before Starting Operation

- Read carefully the instruction manual and understand the contents well before starting the operation.
- Keep the instruction manual securely and handy to read it whenever necessary.
- Follow the proper using way and the using way that are described in the instruction manual.
- Understand the contents of the instructions on safety, and follow them without fail.

Be sure to follow the above instructions.
If not, not only proper analytical results cannot be obtained, but also injuries to persons can be caused.

- Never do the following because they are very dangerous.
  - Modification of instrument.
  - Using parts that are not specified.
  - Removing the protection devices.
- When using chemicals, well ventilate the room on the customers' own responsibility.
  If not, trouble may occur.

SAFETY SUMMARY

General Safety Guidelines (Continued)

Cautions for Installation, Maintenance, and Transfer

- Installation at the delivery, maintenance, and transfer should be performed under the control of the engineers who have been approved by Hitachi, Ltd.

- When installing, check the standard furnished parts for the proper quantities with the customers.
  If something is missing, damaged, or if you find abnormality, contact your nearest sales agent.
  If some standard furnished parts are missing, running the instrument can cause trouble and danger.
  Follow the instructions of the responsible engineers.

SAFETY SUMMARY

General Safety Guidelines (Continued)

- When using chemicals, ventilate the room well on the customer' own responsibility.
  Insufficient ventilation can cause trouble.

- Do not perform the following because they are very dangerous.
  - Modification of instrument
  - Change of parts
  - Using parts other than the specified
  - Using instrument removing the protection devices

- Perform installation at the delivery, maintenance, and transfer under the control of the engineers approved by Hitachi, Ltd.

- Do not perform the operation and the function other than the description in the instruction manual.
  If you have a problem about the instrument, contact the sales agent from which you purchased the instrument or the service office of Hitachi, Ltd.

- Cautions described on the instrument or in the instruction manual have been made after examining well.
  Still, it is possible that unexpected matters occur.
  When operating, not only follow the instructions, but also be careful always by yourself.

⚠ SAFETY SUMMARY

⚠ Warning : Ignition of Flammable Chemicals

Handling of Flammable Chemicals

- Be careful about ignition when using flammable chemicals such as organic solvents.

- Check the following regularly about the flow system.
  If you find abnormality, stop the operation immediately.
  - Leak of solvent or waste
  - Leak of solvent in the instrument

- Ventilate the room well.

- This instrument is not explosion-proof type.
  Do not use organic solvents whose ignition point is lower than 70℃ when running without the operator.

- When using flammable chemicals, pay attention to ignition by static electricity.
  When using chemicals whose conductivity is low, use vessels whose conductivity is high, and perform grounding properly.
  (See section 1.5 in the Instruction Manual.)

⚠ Warning : Explosion of Vapor of Flammable Chemicals

Handling Flammable Chemicals

- If flammable chemicals such as organic solvents leak from the flow system of the instrument, and the vapor of it reaches the explosion concentration, it can explode.

- When using flammable and vaporable chemicals such as organic solvents, check leakage from the flow system of the instrument regularly and ventilate the room well.
  (See section 1.5 in the Instruction Manual.)

⚠ SAFETY SUMMARY

⚠ Warning : Electric Shock by Touching Inside of Instrument

Touching the Inside of the Instrument can Cause Electric Shock.

- When removing the cover of instrument for replacing the parts etc., be sure to turn off the power, remove the power cord from the power outlet.
- When removing the Lamp Cover for replacing the Xe-lamp, turn off the power switch without fail.
- Electric shock by the power of Xe-lamp (30 kV) can cause death or serious injuries. Be careful.
- When removing the Lamp Cover for replacing the Xe-lamp etc., turn off the power, and wait for two hours or longer until the Xe-lamp is cooled down enough.
  (See section 6.7 in the Instruction Manual.)

⚠ Warning : Electric Shock Caused by Improper Grounding

Improper Grounding can Cause Electric Shock

- Use the power cable which is furnished with the instrument. Using a power cable other than the specified one can cause electric shock.
- This instrument is "Plug Connection Type Equipment" (European standard EN61010-1)
  Connect the power cable to a receptacle for 3-pin plug with ground terminal.
- If a receptacle for 3-pin plug is not available, use a conversion adapter and connect it to a receptacle for 2-pin plug.
  Perform proper grounding in this case.
  (See sections 1.1,1.5 and 6.1 in the Instruction Manual.)

⚠ SAFETY SUMMARY

⚠ Warning : Explosion of Xe-lamp

Handling of Xe-lamp

- High pressure gas (about 1 MPa at room temperature, and about 4MPa when running) is sealed in the Xe-lamp.
  If a strong shock is given to the Xe-lamp, or the quartz bulb is scratched, the Xe-lamp may explode and scatter to cause injuries.
  When handling the Xe-lamp, be sure to wear a protection mask, a thick long sleeve shirt, protection glasses and gloves.

- Do not touch the quartz bulb of the Xe-lamp with your bare hands.
  If the quartz bulb is dirty with dust or dirt from the hands, and when the lamp is turned on, dirt is printed on the bulb, transparency becomes low, and the irradiation intensity and the mechanical strength of the lamp are lowered.
  If the Xe-lamp is dirty with dirt from the hands etc., wipe it with gauze or cotton moistened with high purity alcohol (not wet).
  Do not give shocks to the Xe-lamp when wiping.

- Mount the Xe-lamp keeping the proper direction. If a wrong direction (polarity) is used, the cathode is consumed, and the Xe-lamp will not be lit.
  Attach the "+"(anode) mark side (marked on the Xe-lamp) to the indicated metal piece of the Lamp Holder.
  If the cathode deteriorated Xe-lamp is used, the pressure in the lamp bulb becomes abnormally high, and the Xe-lamp can be broken.
  Replace the Xe-lamp with a new one at once.

- If the Nut fastening the lamp base and the wiring is loose, the contact resistance increases by the poor contact, and heat is generated to be high temperature to cause explosion.
  Tighten the Nut securely.

- Replace the Xe-lamp whose accumulation of lighting time is over the guaranteed lifetime with a new one immediately.
  If the Xe-lamp is used over the guaranteed lifetime, evaporation of the electrode is advanced, and the scattered matters stick to the bulb wall to be darkened.
  This lowers heat radiation and the temperature in the bulb (pressure) becomes abnormally high that may cause explosion.

- When replacing the Xe-lamp, turn off the Xe-lamp and wait until the Xe-lamp is cooled down enough, for two hours or longer, then replace the Xe-lamp.
  The replaced Xe-lamp still has a high-pressure gas inside.
  Do not handle it rougthly to avoid explosion.
  Handle it carefully similar to a new one.
  (See sections 6.1 and 6.2 in the Instruction Manual.)

Warning : Injuries caused by Explosion of Xe-lamp

- Explosion of the Xe-lamp can cause serious injuries.
  The Xe-lamp contains a high-pressure gas of about 1 MPa (at room temperature).
  When replacing the Xe-lamp, pay attention not to apply force to the bulb (quartz).
  Wear the protection glasses and gloves, and handle the Xe-lamp carefully.

Caution : Disposing of Xe-lamp

- Wrap unnecessary Xe-lamps with a thick cloth (about 3 pieces overlaid cotton cloth) completely, and hit the wrapped Xe-lamps with a hammer to break the quartz bulb.
  Dispose of the broken Xe-lamps as "dangerous matters"

SAFETY SUMMARY

Caution : Burns by Touching High Temperature Part

- High temperature of the Xe-lamp can cause burns.
  When replacing or adjusting the Xe-lamp, turn off the Xe-lamp, wait for two hours or longer to cool down, then perform replacing or adjusting.
  (See sections 6.2 and 6.7 in the Instruction Manual.)

- When the Lamp Cover is removed, the safety device turns off the Xe-lamp automatically.
  Do not remove the safety device.

Caution : Lighting Xe-lamp can Injure Eyes

- The lighting Xe-lamp emits strong ultraviolet rays.
  Do not look at it directly.
  Wear the protection glasses.
  (See sections 6.2 and 6.7 in the Instruction Manual.)

Caution : For Carrying Heavy Thing

- This instrument weighs at 19 kg.
  Handle it carefully to avoid injuries when carrying.

Caution : Fatigue du to Long Use

- When operating the instrument, if you continue to look at the display in the same pose for a long time, fatigue is accumulated in the eyes and the body.
  When using for a long time, take a rest of 10-15 minutes every 1-hour to release the eyes and body for keeping good health.

SAFETY SUMMARY

Important Notes:

Restriction of Reagents

- The flow system of this instrument consists of fluoroethylene plastics and quartz.
  Do not use solvents that corrode them.

Cautions for Using Corrosive Solvents

- Drain flow path, where leaked liquid flows in, consists of polypropylene.
- Materials which are corroded by strong acid, strong alkali, and organic solvents are used inside of this instrument.
- When using corrosive solvents, check that the screws of Piping are tight.
- Use the pressure limiter function of Pump to stop pumping automatically in case the liquid leaks.

Restriction of Disposing of Waste Solution

- Collect the waste solutions without fail and treat them properly following regulations of preventing water pollution and of sewage disposal.
  If not, environmental pollutions may result.
  Disobedience to laws or regulations is the object of punishment.

Cautions for Keeping Accuracy and Precision of Measurement Values.

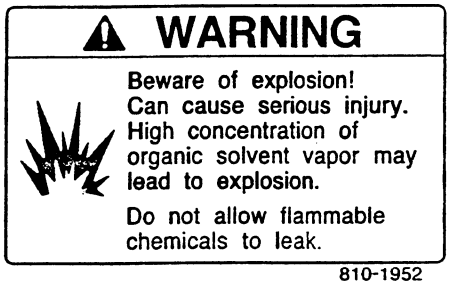
- Measure the control samples to check that the instrument is running normally.

⚠ SAFETY SUMMARY

⚠ Warning Labels

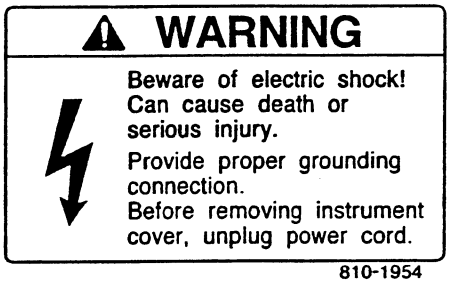
The following warning Labels are attached to Hitachi Model L-7485 Fluorescence Detector.

1. Explosion of Vapor of Flammable Chemicals



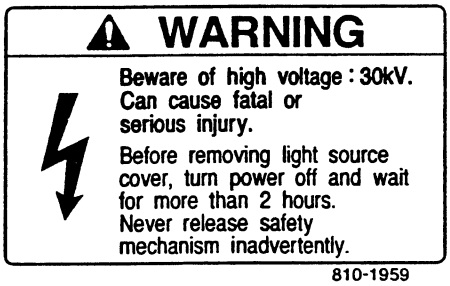
Attached position : right side front

2. Electric Shock Caused by Touching Inside of Instrument



Attached position : left side rear

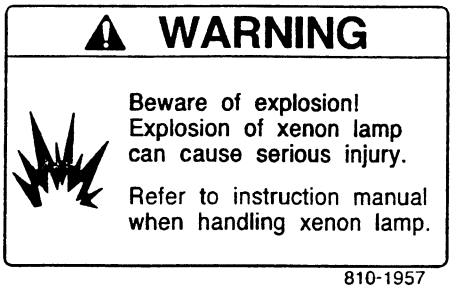
3. Electric Shock by Touching Lamp Power Supply



Attached position : right side rear

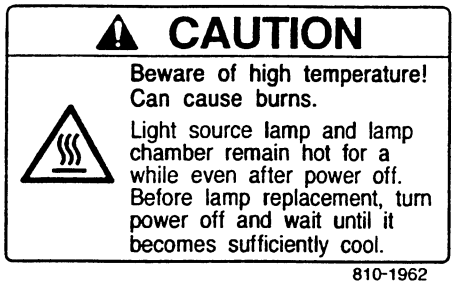
SAFETY SUMMARY

4. Explosion of Xe-lamp



Attached position : right side rear

5. Burns Caused by High Temperature



Attached position : right side rear

1 Main Differences from Model L-7480

Table 1-1 Main Different Points between Model L-7480 and L-7485

No.	Item	Model L-7480	Model L-7485	Interchange -ability
1	Light source condenser	Lens	Ellipsoidal mirror	No
2	EX exit slit	Phosphor bronze plate	Inconel evaporated film (Evaporated onto surface of Flow-cell.)	No
3	EM entrance slit	Black quartz of Flow-cell	Inconel evaporated film (Evaporated onto surface of Flow-cell.)	No
4	EM exit slit	15 nm fixed	15 nm/30 nm selectable	No
5	Xe-lamp power supply	P/N 810-2430	P/N 810-4782	No
6	Starter	P/N 810-2431		Yes
7	DC power supply	P/N 060-3332	Incorporated in FLV PC board.	No
8	DC fan assembly	P/N 060-7563	P/N 060-2344	No
9	EX stepper motor	P/N 810-7565	P/N 810-3810	No
10	EM stepper motor	P/N 810-7564	P/N 810-3810	No
11	EM slit motor	-	P/N 810-4762	-
12	Thermoswitch assembly	P/N 810-2432	P/N 810-4769	No
13	LCD unit	P/N 810-7556		Yes
14	Keyboard	P/N 810-2420		Yes
15	Flow-cell (12µl)	Four corners are made of black quartz. (P/N 050-1895)	Only two corners (exciting light entering surface) are made of black quartz. (P/N 810-3827)	No
16	Exciting light monitoring detector	Photomultiplier R1413 (P/N J386041)	Photo-cell VIS (P/N 810-3921)	No
17	Emission light monitoring detector	Photomultiplier R3788 (P/N 250-1804)		Yes
18	Wavelength accuracy	±4 nm	±3 nm	No
19	Sensitivity (Raman spectrum of water)	200 or more	350 or more	No
20	Photomultiplier voltage	-	-	-
	LOW	400 V	400 V	Yes
	MED	500 V	600 V	No
	HIGH	600 V	800 V	No
21	Measurement conditions of Raman Spectrum of water	-	-	-
	Photomultiplier voltage	MED	MED	Yes
	Time constant	2.0 s	2.0 s	Yes
22	150W Xe-lamp	P/N 650-1500	P/N 650-1500	Yes
23	Long life Xe-lamp	P/N 250-1600	P/N 250-1600	Yes
24	Teflon tube (Outlet)	P/N F275144 (ID 0.33 × 0.62T)	P/N F275144 (ID 0.33 × 0.62T)	Yes
25	Teflon tube (Inlet)	P/N F274222 (ID 0.25 × 0.66T)	P/N F274222 (ID 0.25 × 0.66T)	Yes

2 Specifications

2.1 Specifications

1. **Photometric method** : Ratio measurement method with transmission light monitor

2. **Light source** : 150 W Xe-lamp

3. **Wavelength setting range of excitation light**
: 200-850 nm, 0-order light.

4. **Wavelength setting range of emission light**
: 250-900 nm
Note: Photomultiplier should be changed in the range of 731 nm or longer.

5. **Band width of excitation spectrum** : 15 nm

6. **Band width of emission spectrum** : 15 nm, 30 nm (selectable)

7. **Wavelength setting way** : Through keyboard or communication.

8. **Wavelength accuracy** : ±3 nm

9. **Wavelength reproducibility** : ±0.5 nm

10. **Recorder output** : 10mV full-scale Full-scale range (1-1000) can be set by one step.

11. **Processor output** : 1 V full-scale Digital output through D-line

12. **Response** : 5 steps selectable
Time constant: 0.1, 0.5, 2.0, 4.0, 8.0 s

13. **Sensitivity** : S/N of Raman peak of water is 350 or more.

14. **Auto zero range** : 0-1000

15. **Offset** : 0-1000 (can be set by one step.)

16. **Spectrum memory**:
: Contents of memory : Excitation or Emission spectra
Number of spectrum memory : 8
Measurement wavelength range : Settable depending on measurement conditions.

17. Marker : Marker of about 6 divisions (0.6 mV) is outputted from Recorder terminals.

18. Instrument conditions setting : The following conditions are set, and stored in battery backup memory.

- Full scale range
- Spectrum measurement range
- Photomultiplier voltage
- Offset value

19. Time program

: Number of program : 9
Setting time : Max. 600 min (0.1 min step)
Number of memory step : Max. 100 steps (summation of 9 files)
Program : Excitation wavelength
Emission wavelength
Baseline process

20. Display : 40 letters × 2 lines, LCD with backlight

21. Communication : D-line communication

22. Output terminals : Analog output

- Processor : 1 V full scale
- Recorder : 10 mV full scale

23. Output Contact terminals:

- Time program start
- Error input/output
- Busy output
  (The above Contact is incorporated in D-line connector, effective with analog connection.)
- Auto zero input
- Marker input
- Lamp off input

24. Flow-cell capacity : 12 µl standard (irradiation capacity)

25. Withstanding pressure of Flow-cell: 2.9 MPa

26. Temperature range for use : 4-35°C

27. Humidity range for use : 45-80% RH (no condensation)

28. Power : 100-115/220-240 V AC 50/60 Hz

29. Power consumption : 420 VA

30. Size (mm) : 260(W) × 500(D) × 230(H) mm

31. Weight : About 19 kg

3 Principle and Optical System

3.1 Principle

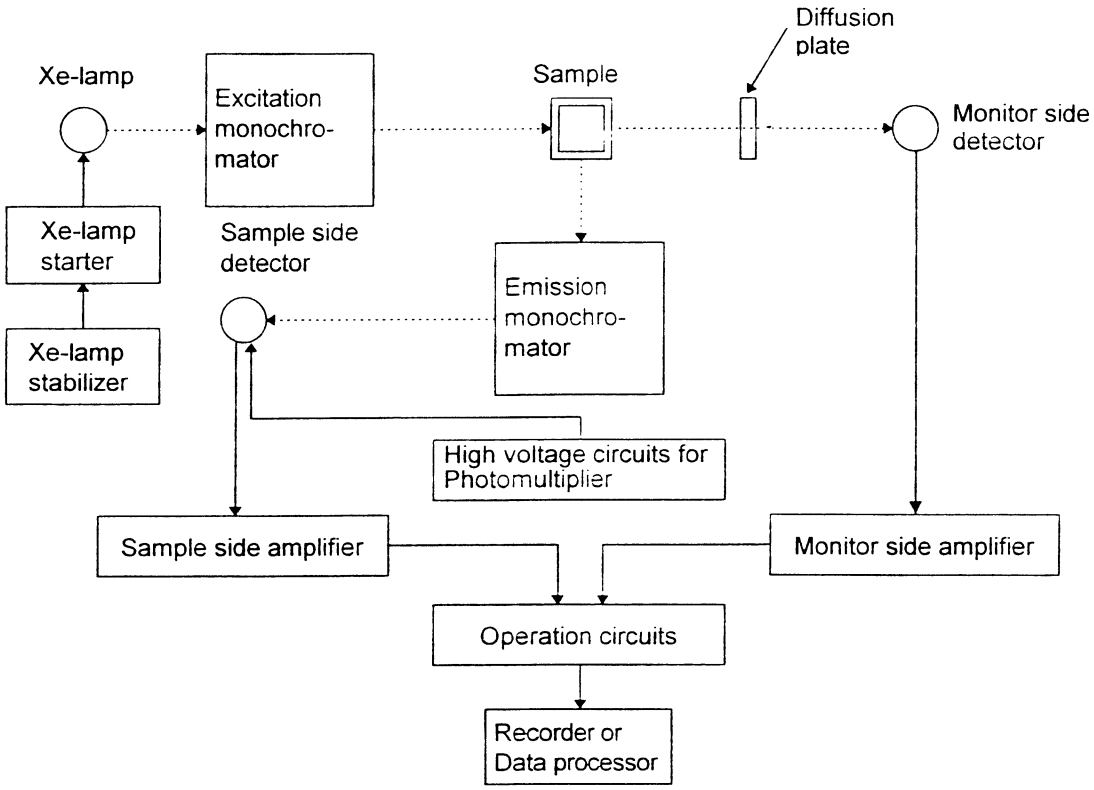


Figure 3-1 Functional System Diagram

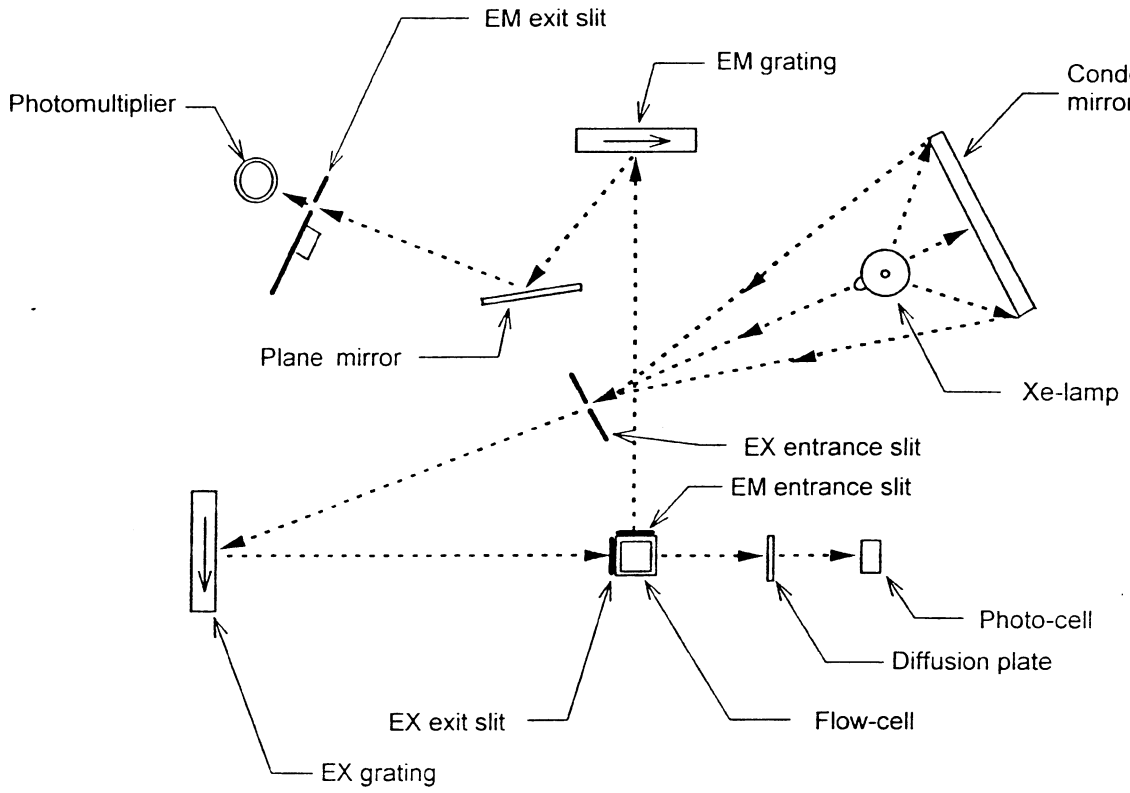
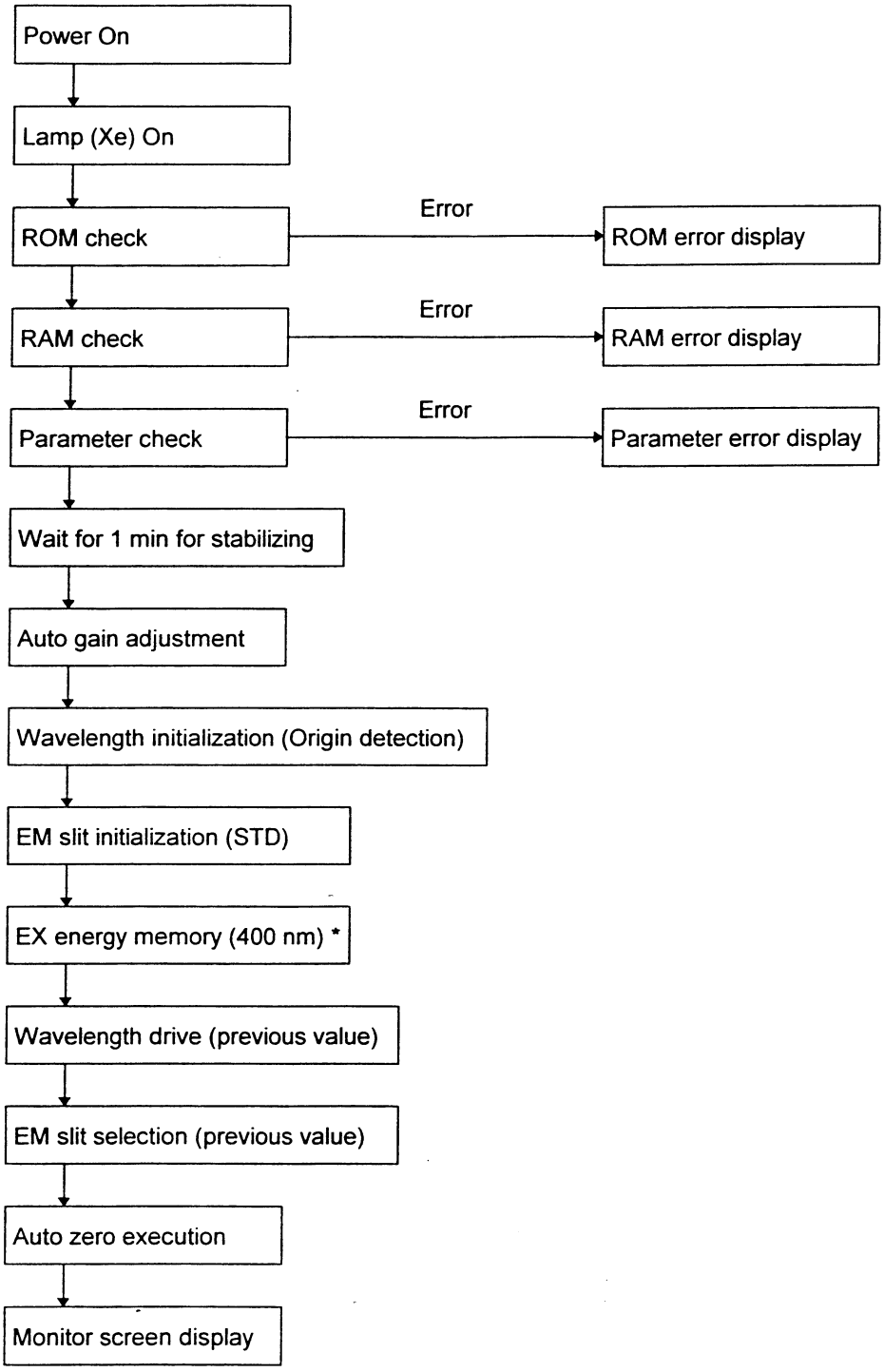


Figure 3-2 Optical System

3.1.1 Optical System

The light emitted from the source lamp is condensed by Condenser mirror, through EX entrance slit, enters EX monochromator, and is dispersed by the concave diffraction grating. The dispersed light of a specific wavelength comes out from EX exit slit, and irradiates the sample.
The fluorescence emitted from the sample, through EM entrance slit, enters EM monochromator, and is dispersed by the concave diffraction grating.
The dispersed light of a specific wavelength comes out from EM exit slit, and enters Photomultiplier.
The excitation light which passes the sample, through Diffusion plate, enters Photocell.

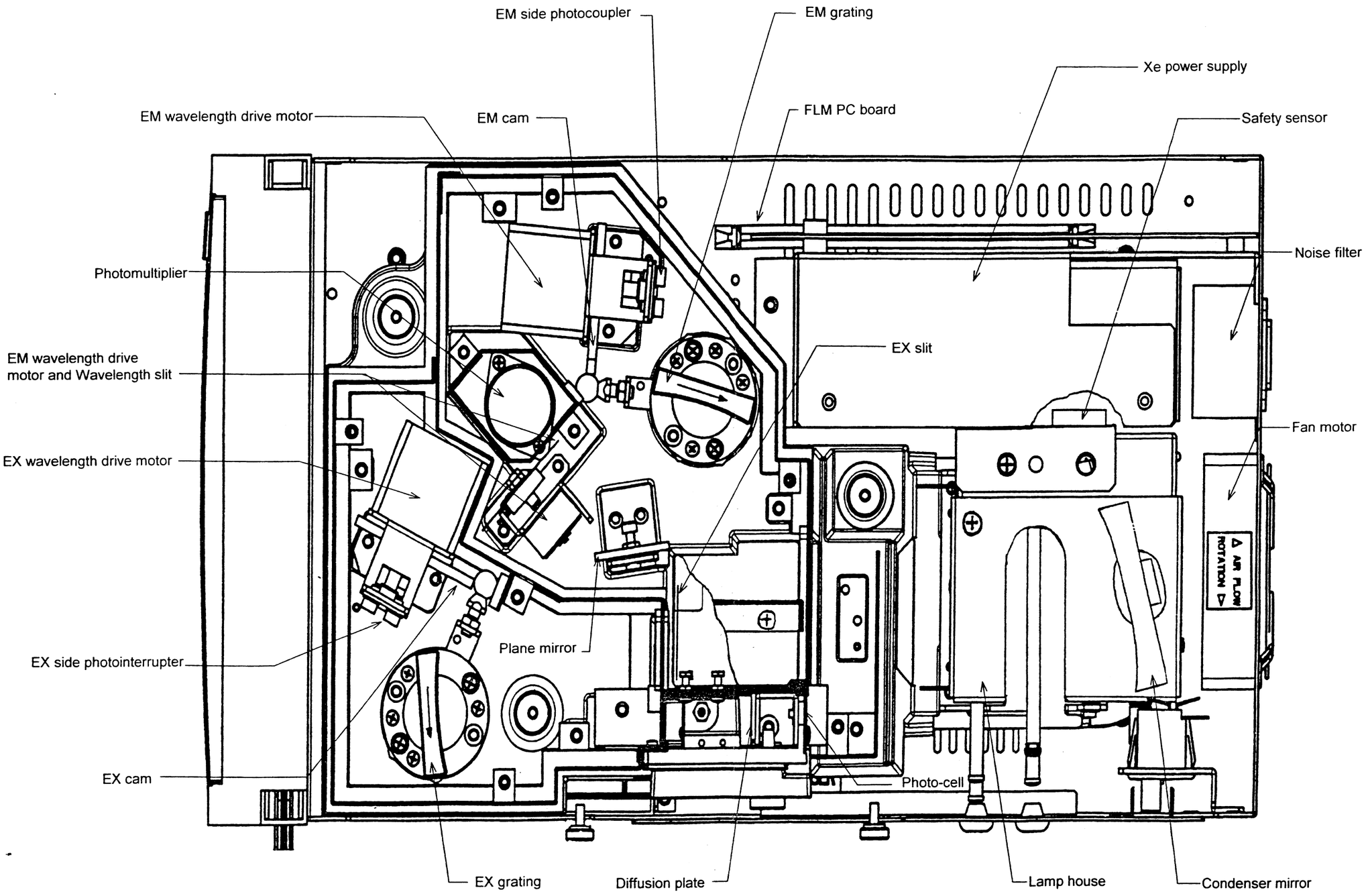
3.2 Flow of Functions at Initializing



* Energy on Monitor at 400 nm of excitation wavelength is memorized, however, judgment is not performed.

This value is stored as Lamp Energy value in Logbook, and can be checked by printing Logbook.

3.3 Parts Arrangement



Note: Xe-lamp starter is located under Monochromator (below Flow-cell).

4 Circuit Diagram

4.1 Functions of Connector on FLM PC Board (P/N 810-7064) of Model L-7485

Connector number	Pin number	Function	
ZJ1	1	DC+24 V	Power input
	2	N.C.	
	3	GND	
ZJ2	1	DC+24 V	Cooling fan
	2	GND	
ZJ29	1	DC+24 V	Inverter for LCD back light
	2	GND	
ZJ4	1	DC+24 V	Stepper motor for driving EX wavelength
	2		
	3	N.C.	
	4	Φ A	
	5	Φ B	
	6	Φ/A	
	7	Φ/B	
ZJ5	1	DC+24 V	Stepper motor for driving EM wavelength
	2		
	3	N.C.	
	4	Φ A	
	5	Φ B	
	6	Φ/A	
	7	Φ/B	
ZJ7	1	DC+24 V	Slit motor for driving EM wavelength
	2		
	3	N.C.	
	4	Φ A	
	5	Φ B	
	6	Φ/A	
	7	Φ/B	
ZJ10	1	DC+5 V	Photointerrupter for EX side position detection
	2	GND	
	3	Position detection signal	
ZJ12	1	DC+5 V	Photointerrupter for EM side position detection
	2	GND	
	3	Position detection signal	
ZJ11	1	N.C.	Door switch 1
	2	GND	
	3	Lamp cover open/close signal	

Connector number	Pin number	Function		
ZJ34	1	N.C.		Door switch 2
	2	GND		
	3	Lamp cover open/close signal		
ZJ9	1	Temperature sensor signal		Temperature sensor
	2	N.C.		
	3	N.C.		
	4	GND		
ZJ8	1	Xe-lamp On/Off signal		Xe power supply
	2			
	3			
	4	Xe-lamp status signal		
ZJ25	1	S3	Scan signal	Keyboard
	2	S2		
	12	S1		
	11	S0		
	3	R0	Return signal	
	4	R1		
	6	R2		
	9	R3		
	8	R4		
	7	R5		
	5	R6		
	10	R7		
ZJ24	B1	DC+5 V	Power supply for driving	LCD module
	A2	V0		
	A1	GND		
	B3	E	Control signal	
	A3	R/W		
	B2	RS		
	B7	LCD7	Data	
	A7	LCD6		
	B6	LCD5		
	A6	LCD4		
	B5	LCD3		
	A5	LCD2		
	B4	LCD1		
	A4	LCD0		
	A8	LED(+)	(Power supply exclusive for LED back light)	
	B8	LED(-)		

Connector number	Pin number	Function	
ZJ22	1	Detection signal	EX signal
	2	N.C.	
	3	GND	
ZJ23	1	Detection signal	EM signal
	2	N.C.	
	3	GND	
ZJ21	1	High voltage for Photomultiplier (E/M side detector)	
	2	N.C.	
	3	N.C.	
	4	N.C.	
	5	N.C.	
	6	GND (analog)	
ZJ14	6	RYVCC	NEW NET
	7	PAN I/O	
	8	PAN COM	
	1	GND	
	5	START I/O	
	4	STOP I/O	
	3	BUSY I/O	
	2	N.C.	
	9	F.G.	
	10	F.G.	
	11	F.G.	
	12	F.G.	
ZJ15	6	RYVCC	NEW NET
	7	PAN I/O	
	8	PAN COM	
	1	GND	
	5	START I/O	
	4	STOP I/O	
	3	BUSY I/O	
	2	N.C.	
	9	F.G.	
	10	F.G.	
	11	F.G.	
	12	F.G.	

Connector number	Pin number	Function	
ZJ16	1	Output for processor	1 V full scale
	2	GND (analog)	
	3	F.G.	
ZJ17	1	Output for recorder	10 mV full scale
	2	GND (analog)	
	3	F.G.	
ZJ18	1	LAMP OFF IN	
	2	GND	
	3	F.G.	
ZJ19	1	AUTO ZERO IN	
	2	GND	
	3	F.G.	
ZJ20	1	MAKER IN	
	2	GND	
	3	F.G.	

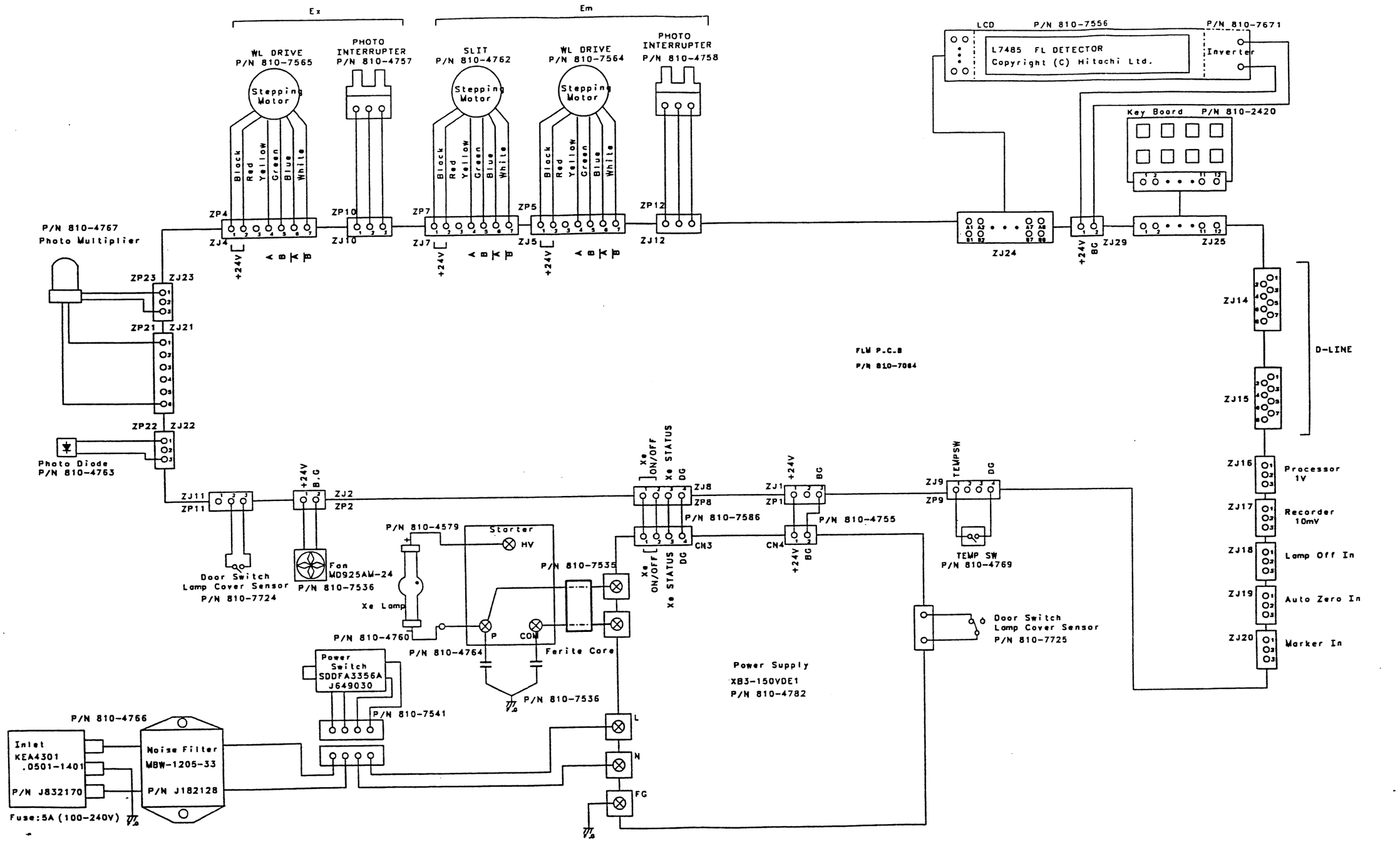


Figure 4-1 General Circuits Diagram of FLM PC Board of Model L-7485

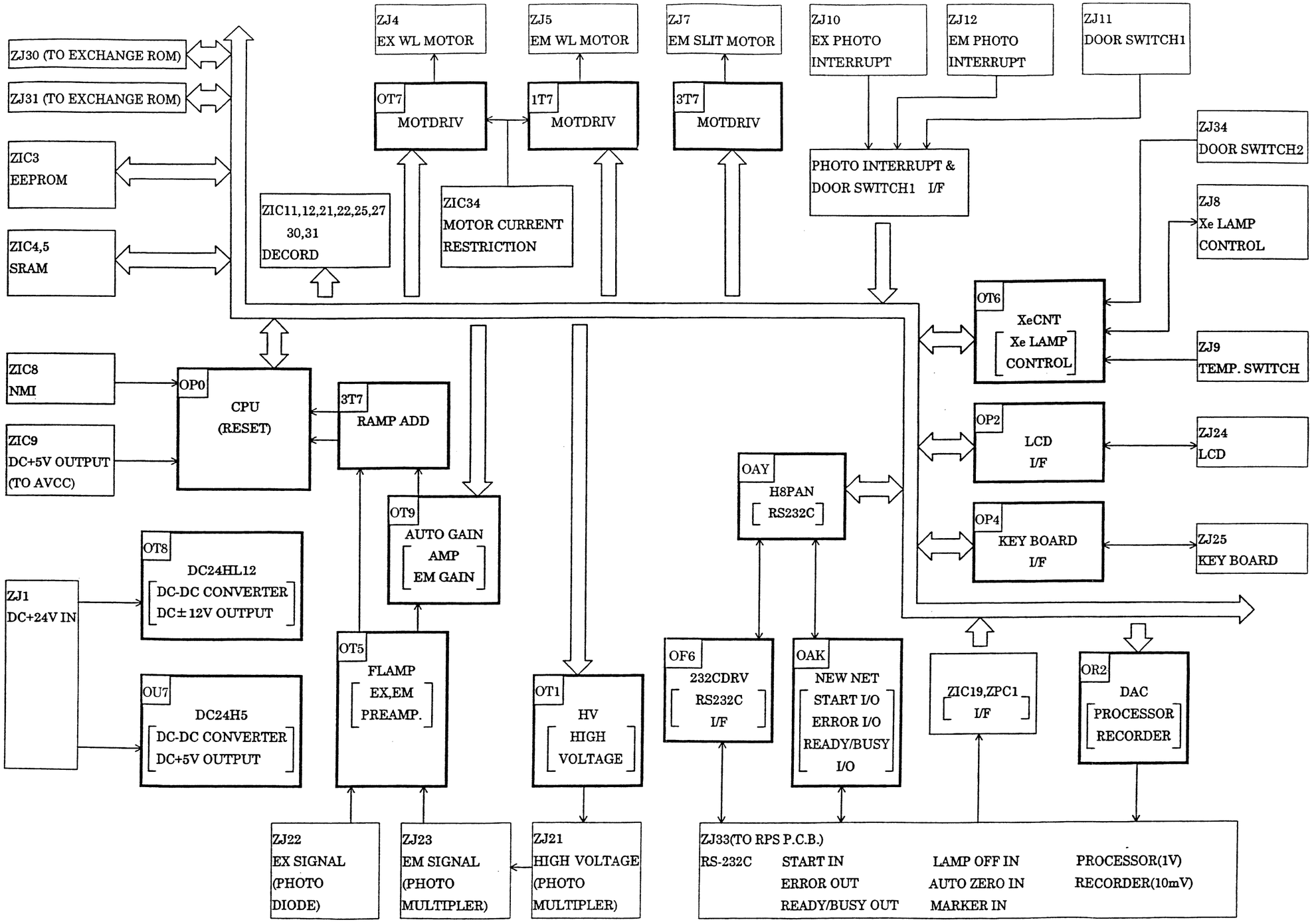


Figure 4-2 Composition of Electric Circuits of FLM PC Board of Model L-7485

① : EPROM (Not attached when shipped.)
② : EPROM
③ : SRAM
④ : Decode circuits
⑤ : Power supply for SH-2 analog circuits
⑥ : NMI signal generation circuits
⑦ : Current restriction circuits for wavelength drive motor

Figure 4-3 Wiring Diagram for FLM PC Board of Model L-7485

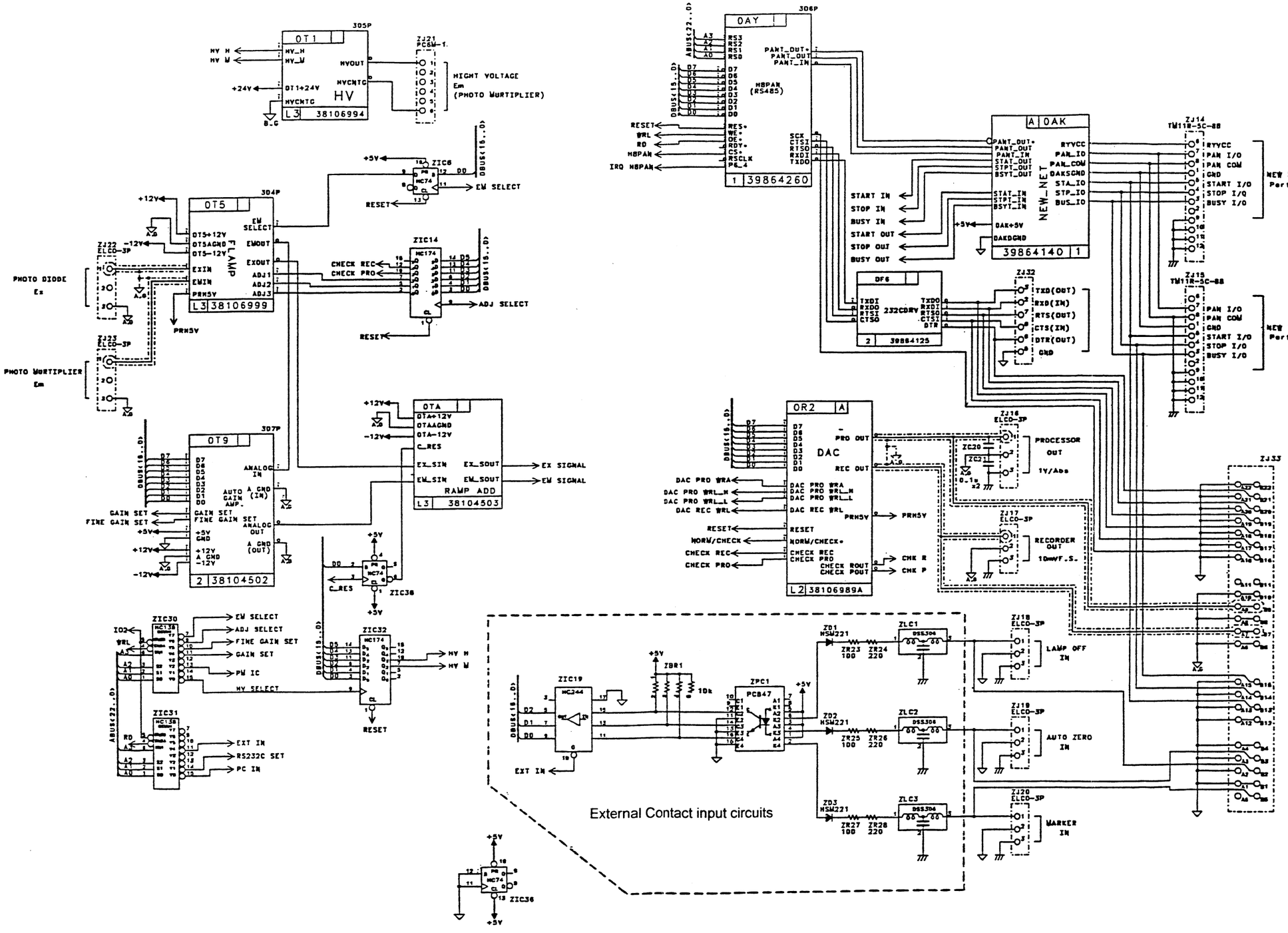


Figure 4-3-1 Wiring Diagram for FLM PC Board of Model L-7485

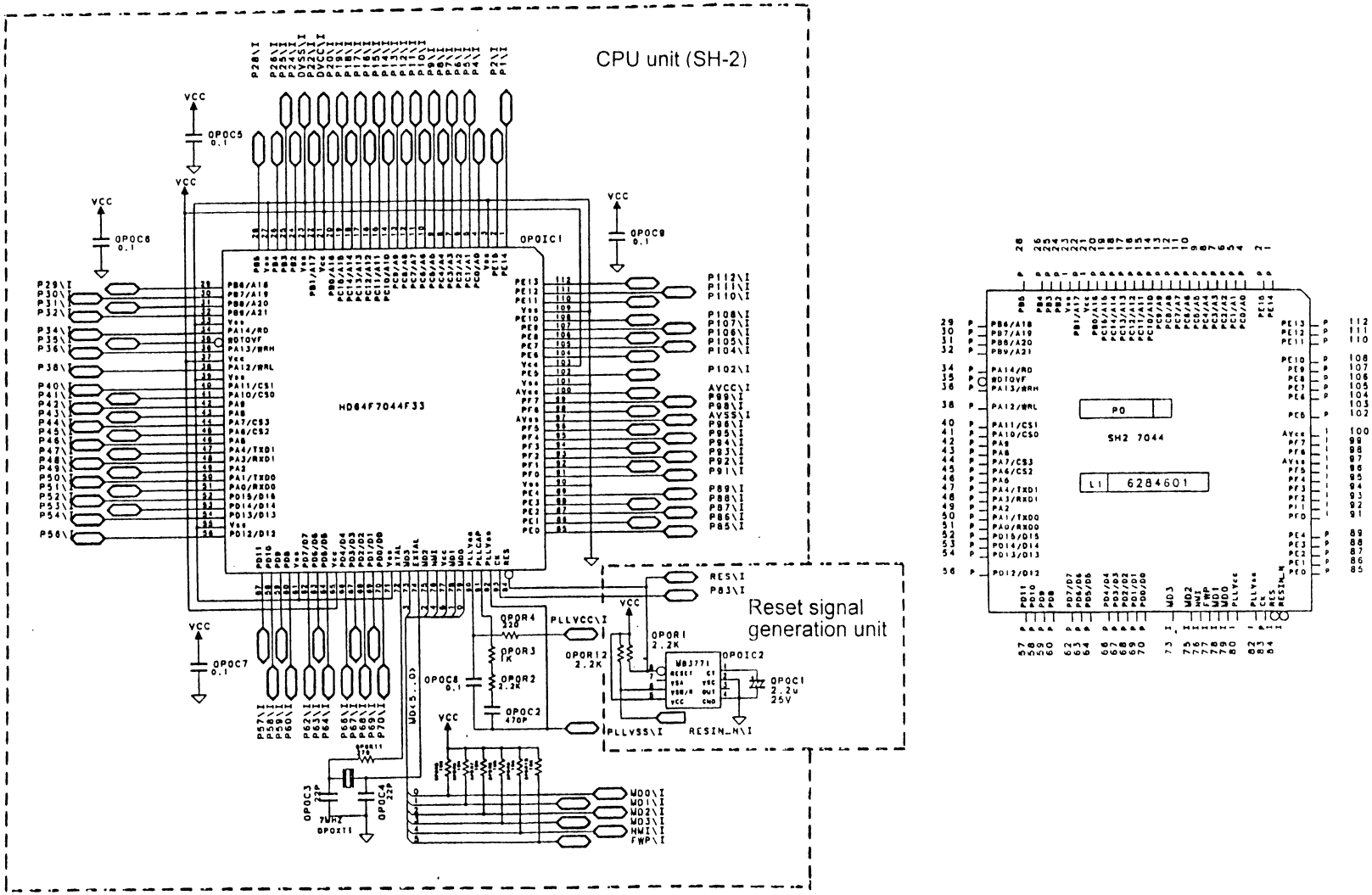


Figure 4-4 FLM PC Board (CPU) of Model L-7485

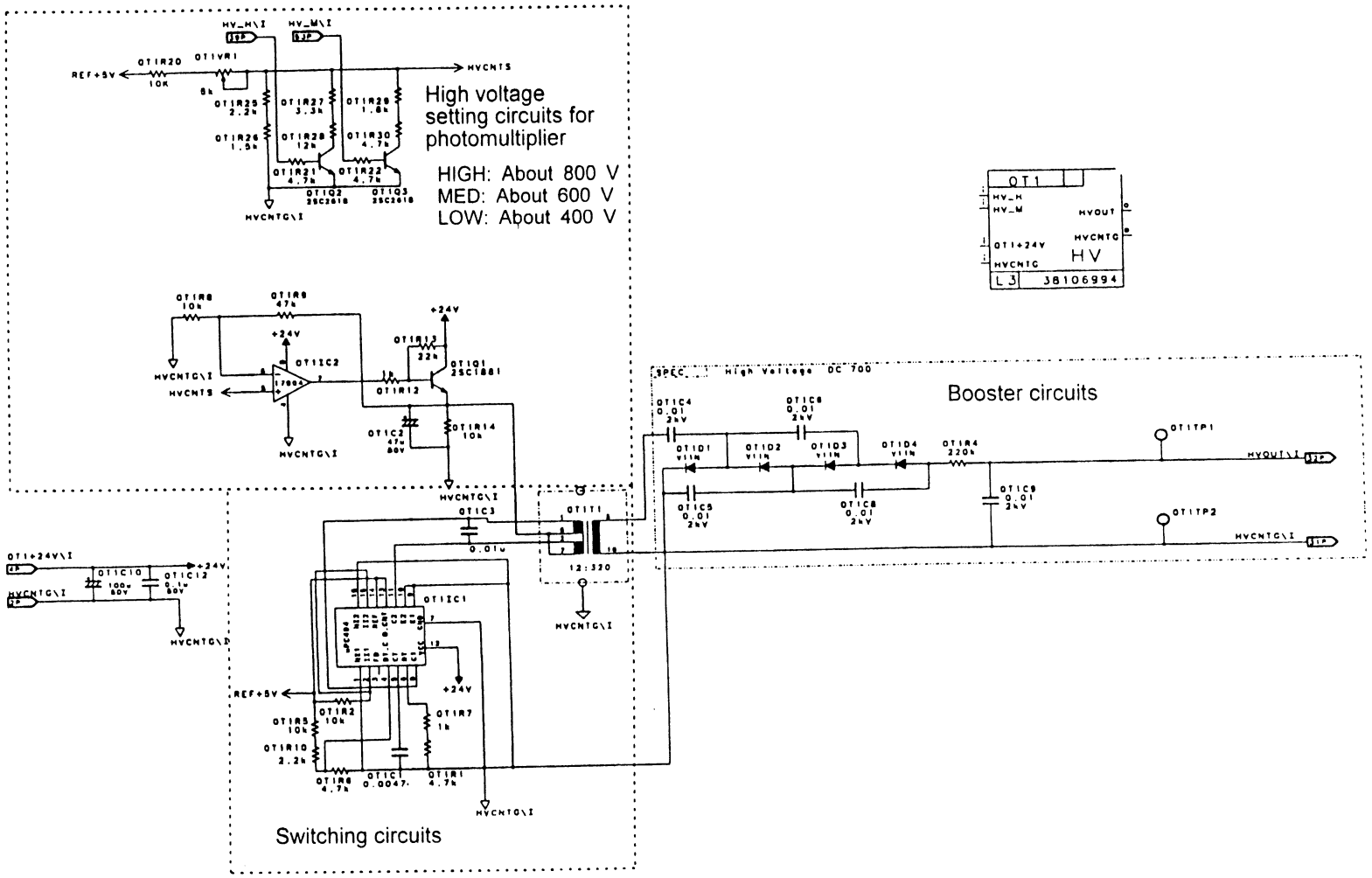
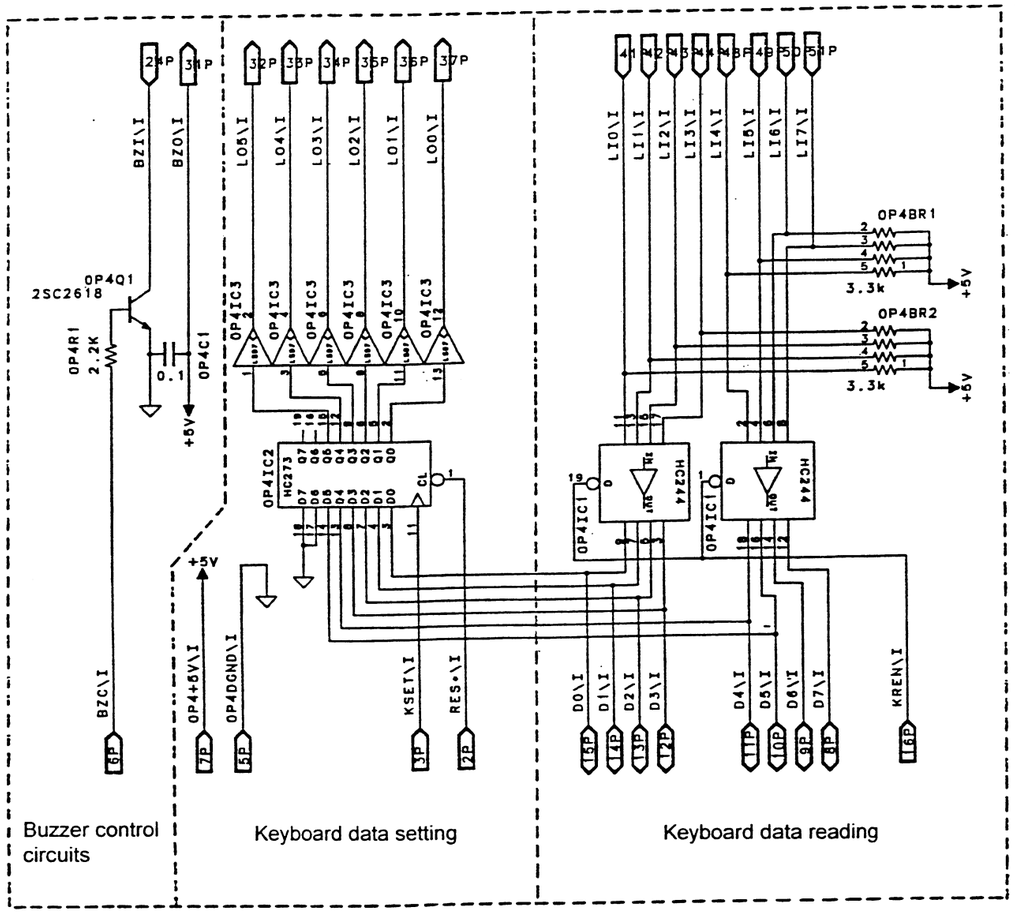
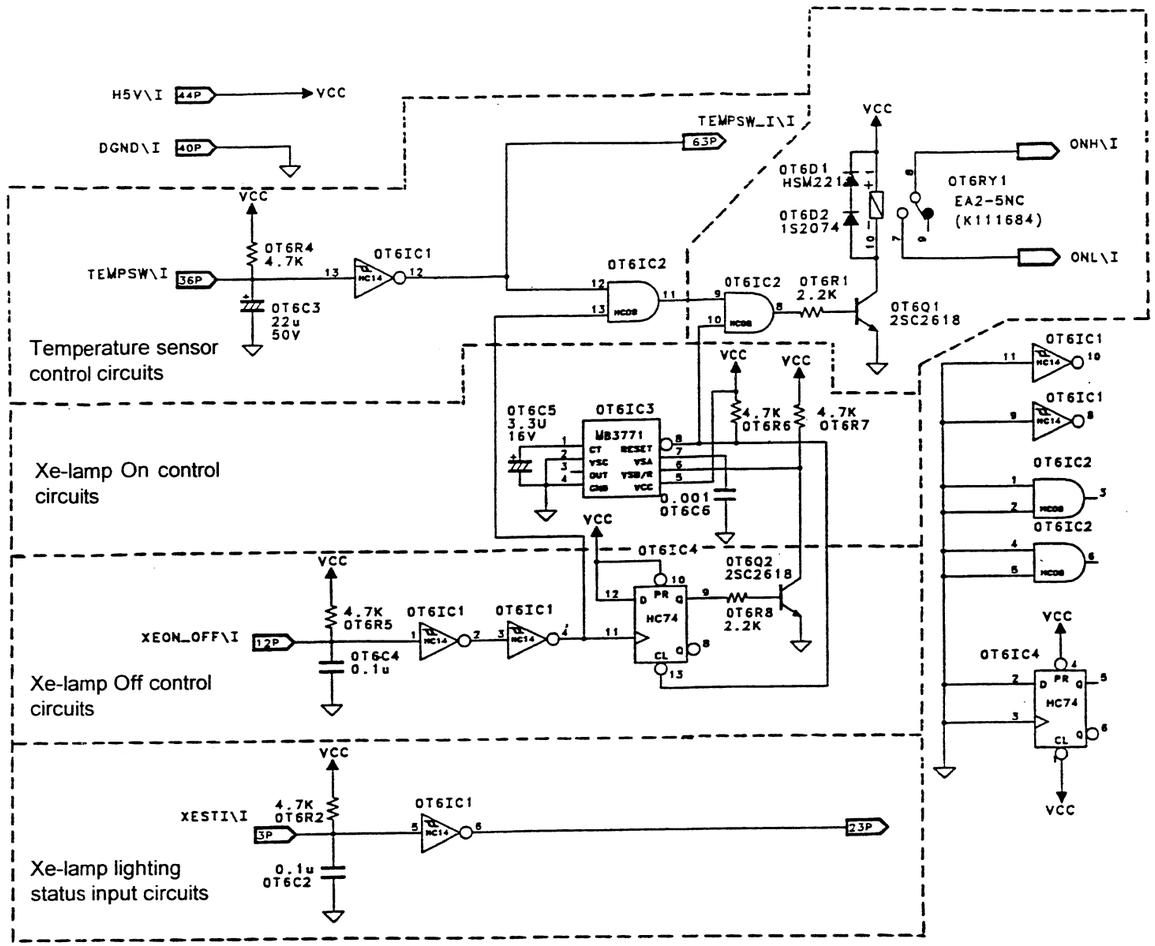
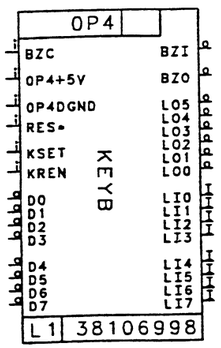


Figure 4-5 FLM PC Board (OT1) of Model L-7485







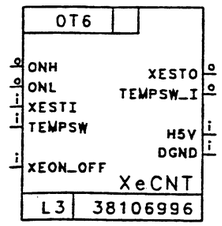
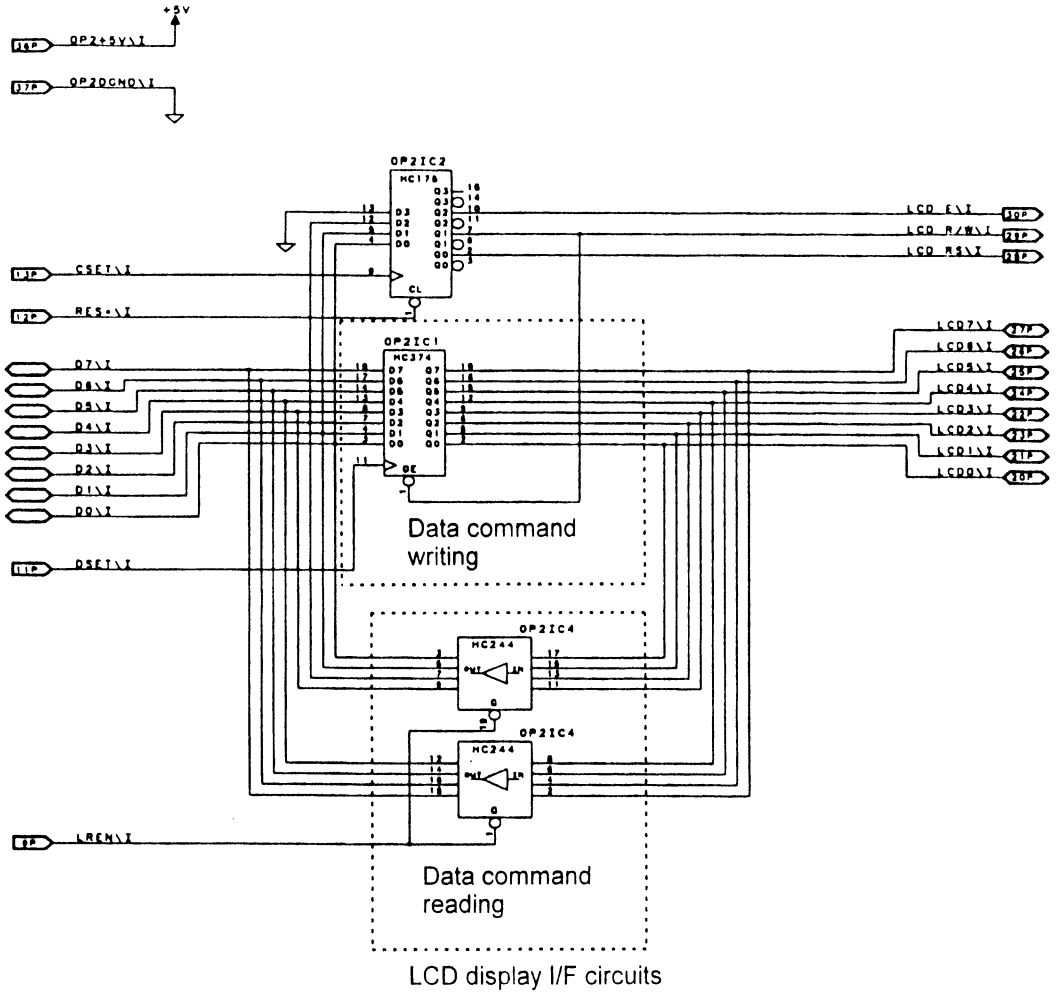


Figure 4-6 FLM PC Board (OT6, OP4) of Model L-7485



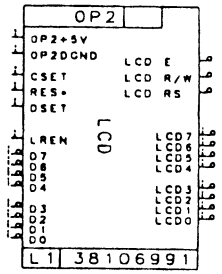
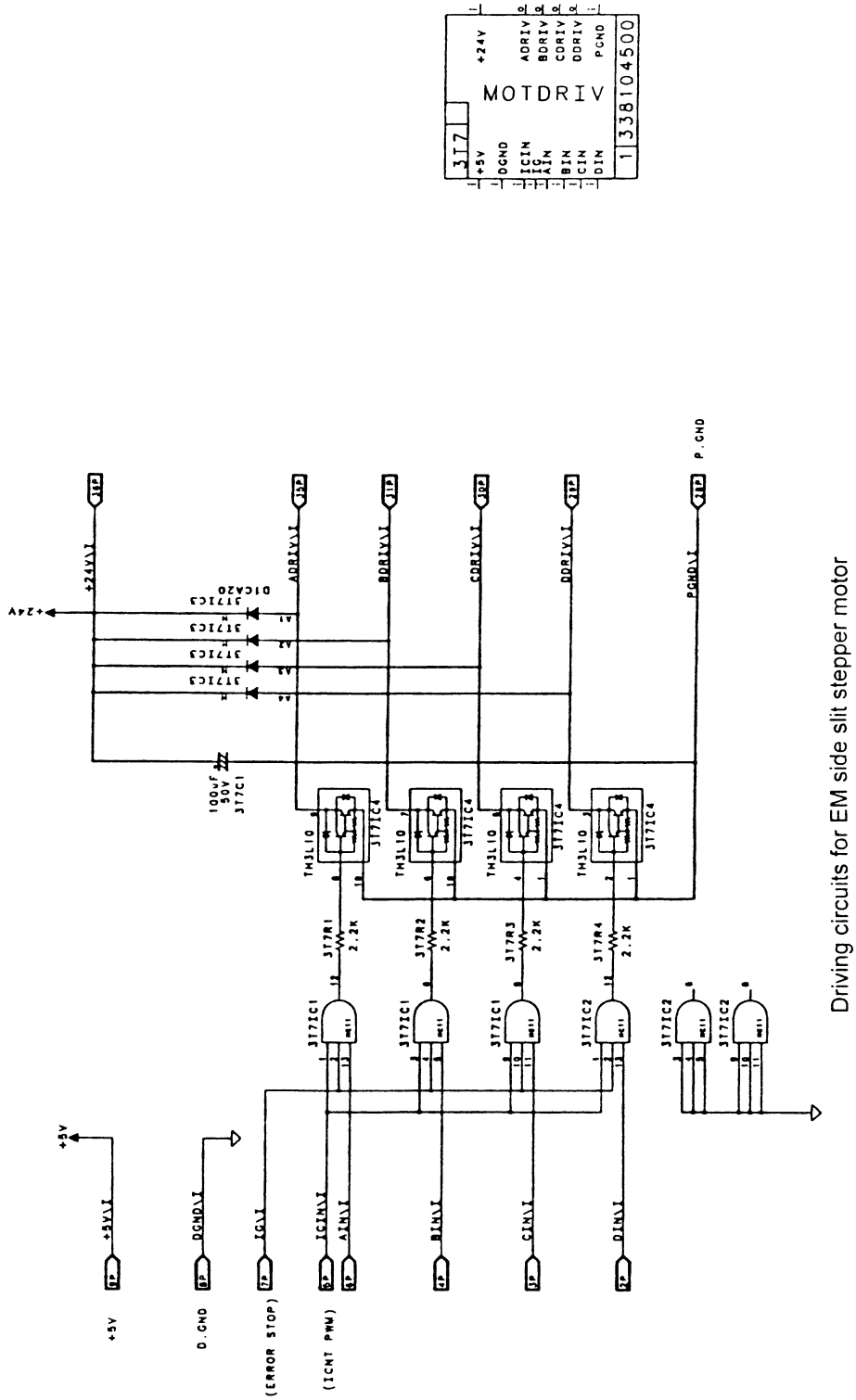
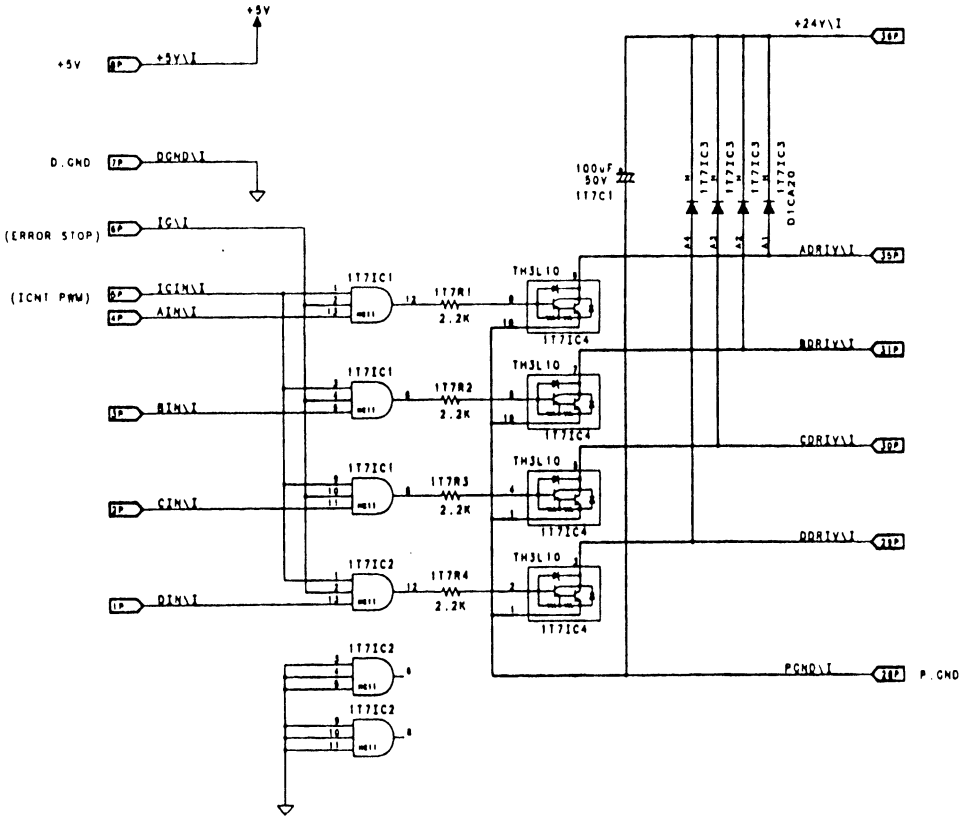


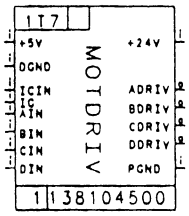
Figure 4-7 FLM PC Board (OP2) of Model L-7485



Driving circuits for EM side slit stepper motor

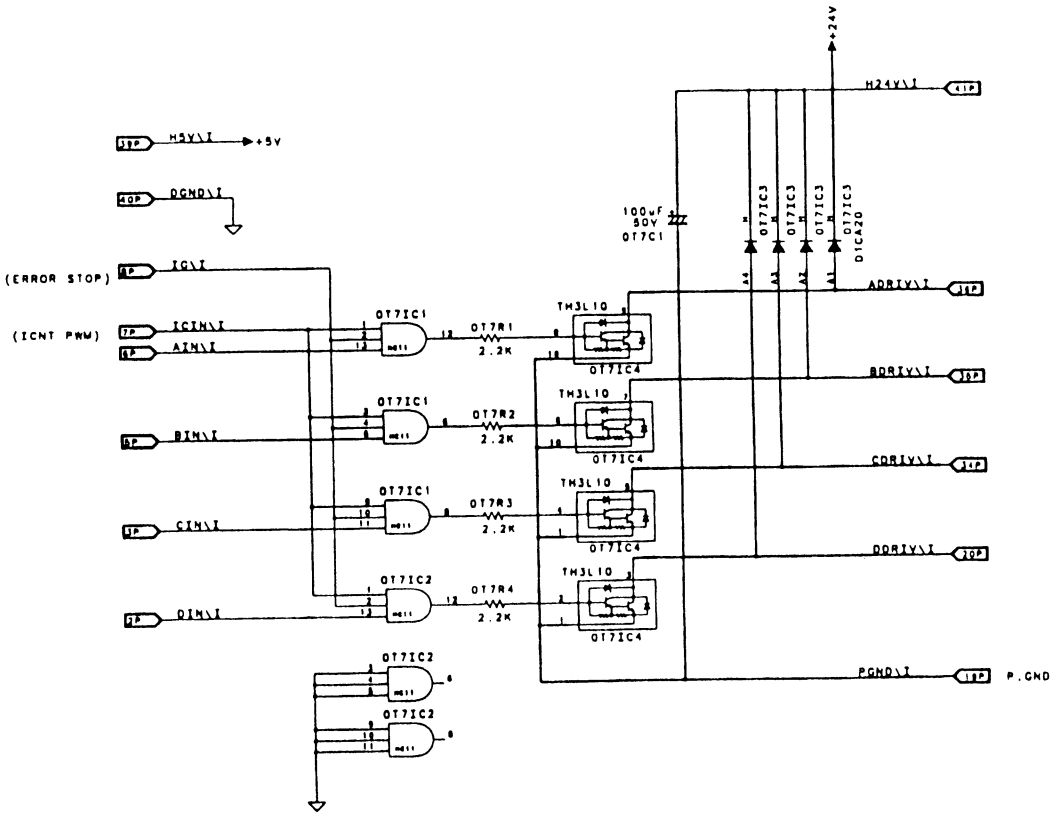
Figure 4-8 FLM PC Board (3T7) of Model L-7485

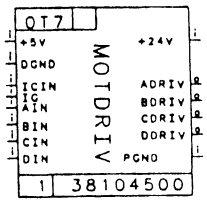




Driving circuits for EM side wavelength stepper motor

Figure 4-9 FLM PC Board (1T7) of Model L-7485





Driving circuits for EX side wavelength stepper motor

Figure 4-10 FLM PC Board (OT7) of Model L-7485

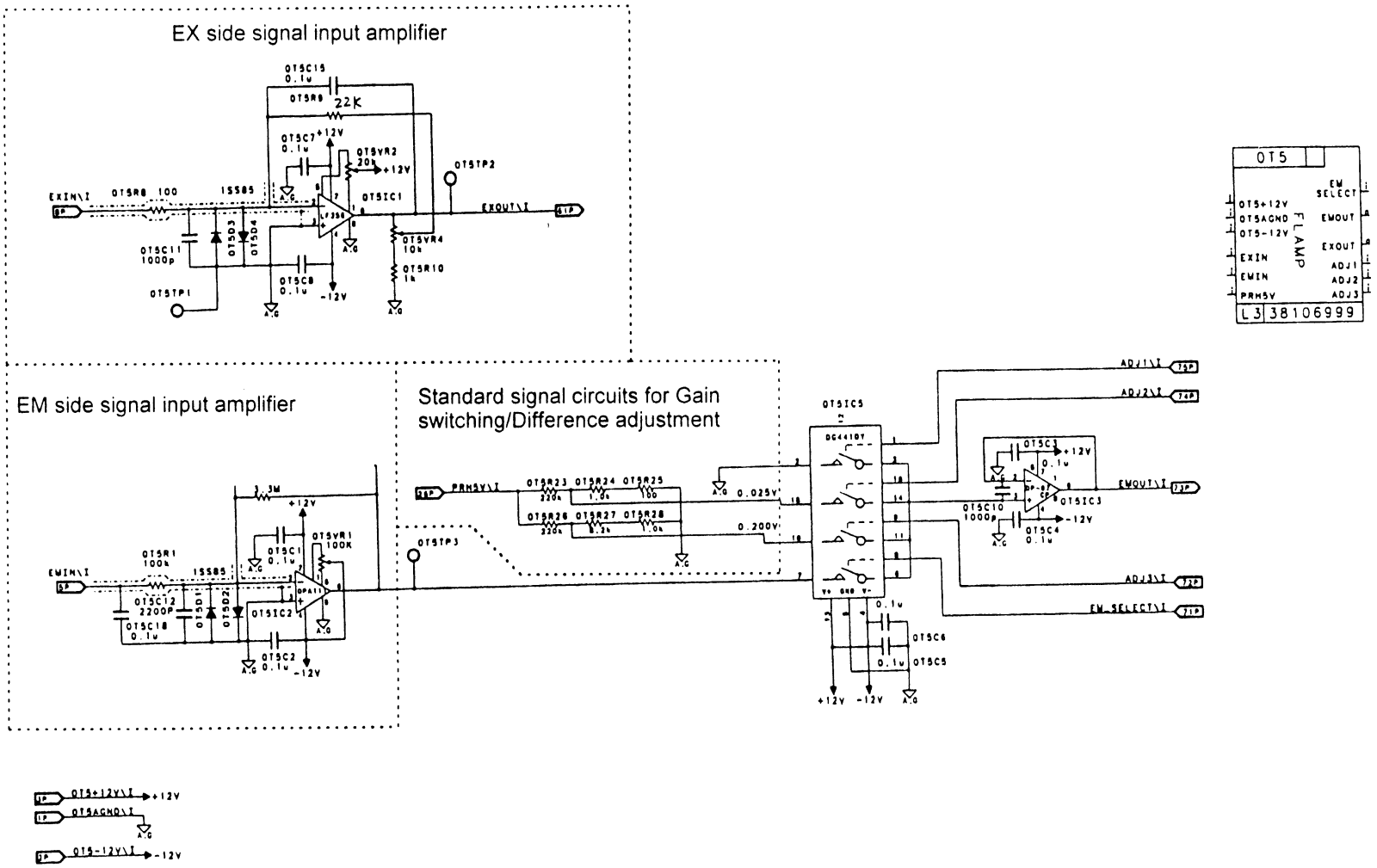


Figure 4-11 FLM PC Board (OT5) of Model L-7485

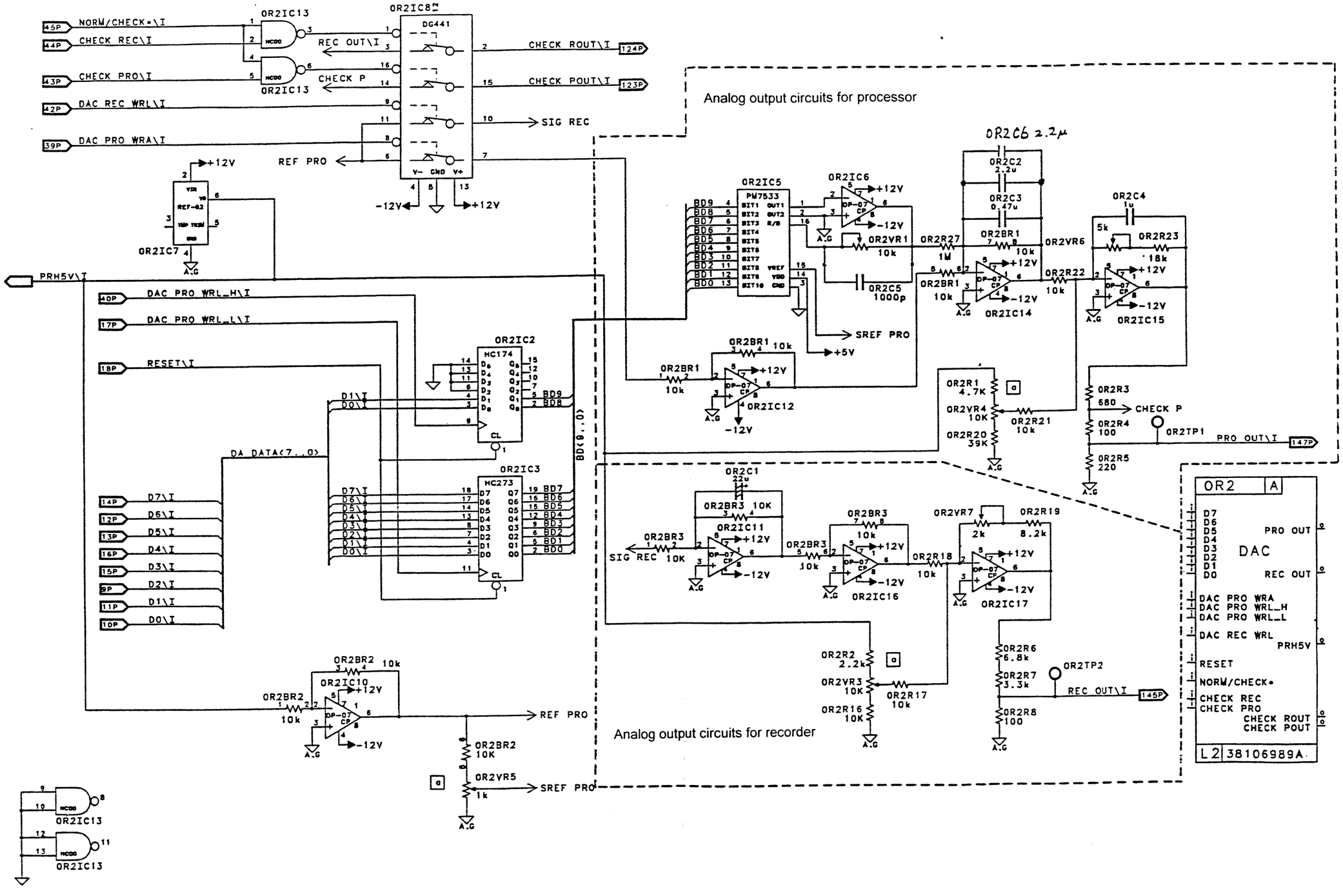
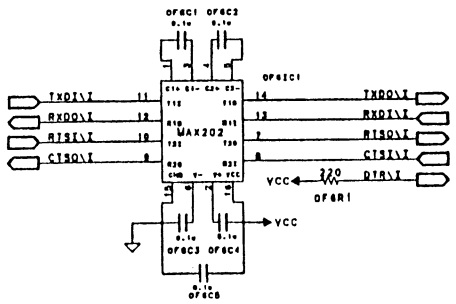
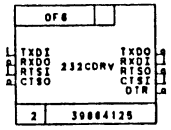
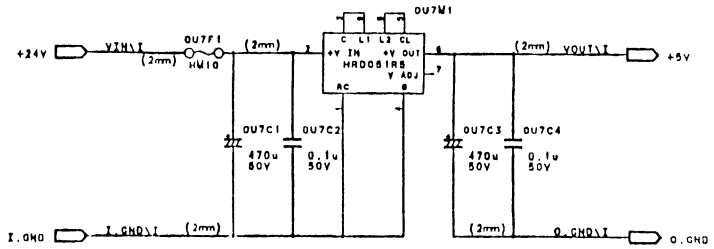


Figure 4-12 FLM PC Board (OR2) of Model L-7485

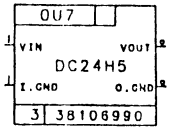


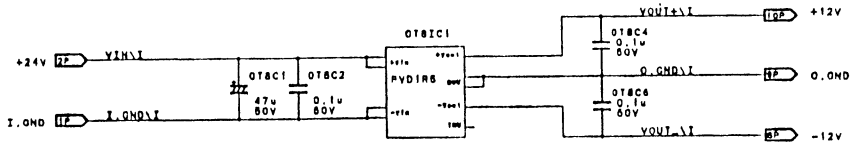
RS-232C I/F circuits





DC-DC converter circuits
+24V input, +5V output





DC-DC converter circuits
+24V input, ±12V output

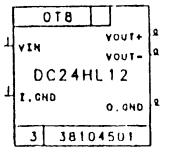
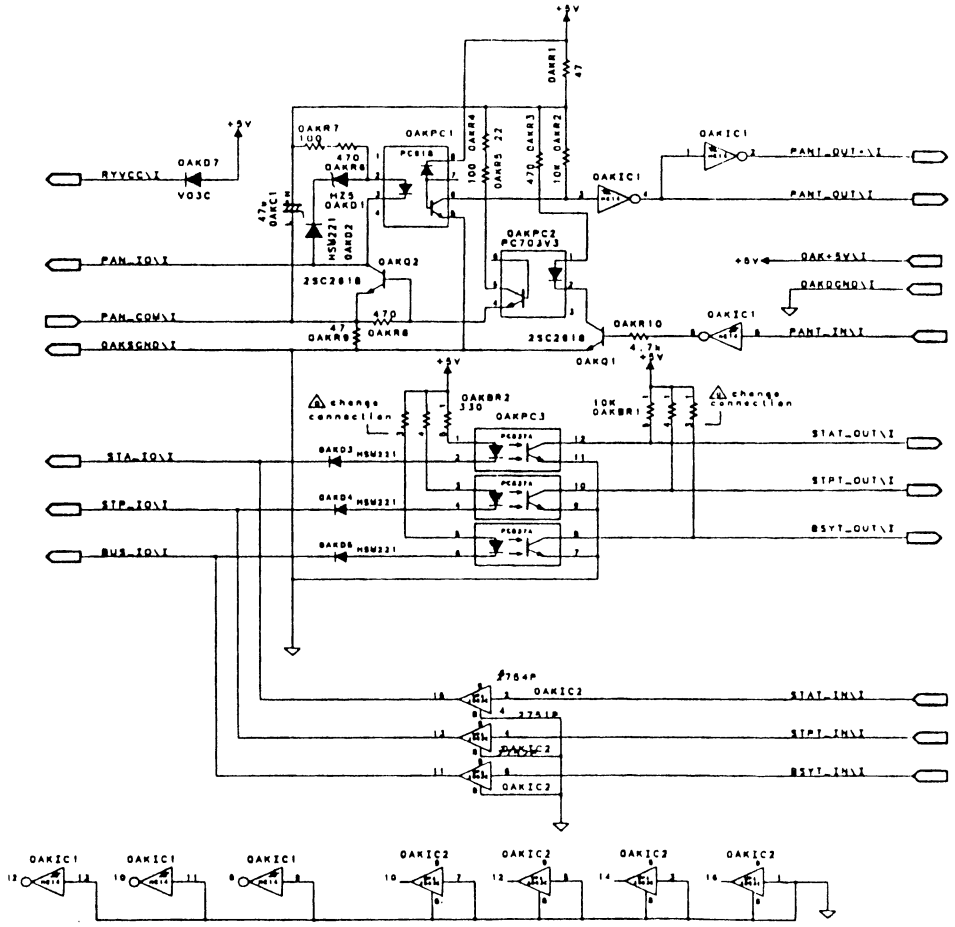


Figure 4-13 FLM PC Board (OT8, OU7, OF6) of Model L-7485



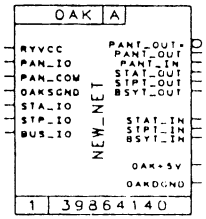


Figure 4-14 FLM PC Board (OAK) of Model L-7485

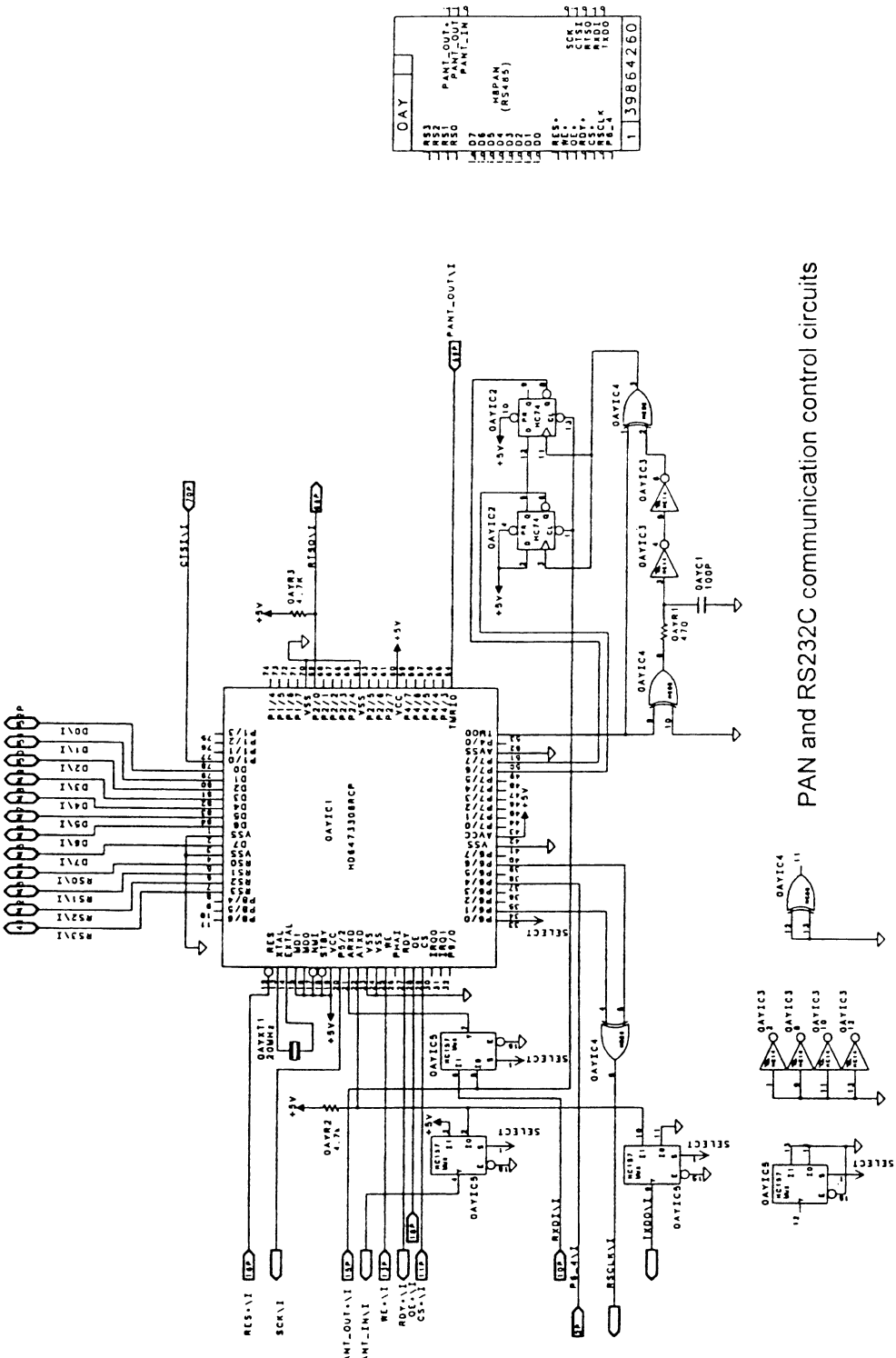


Figure 4-15 FLM PC Board (OAY) of Model L-7485

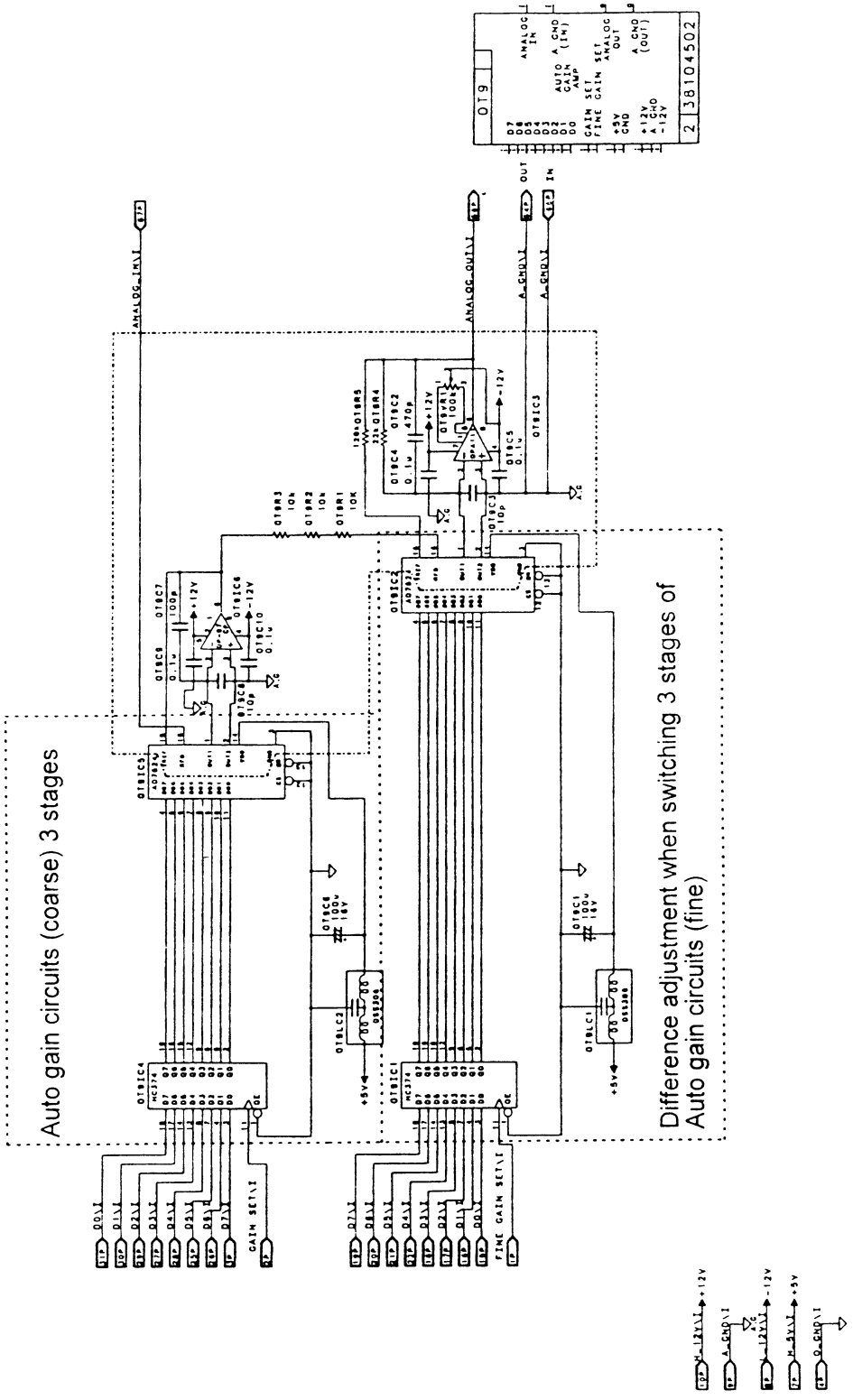
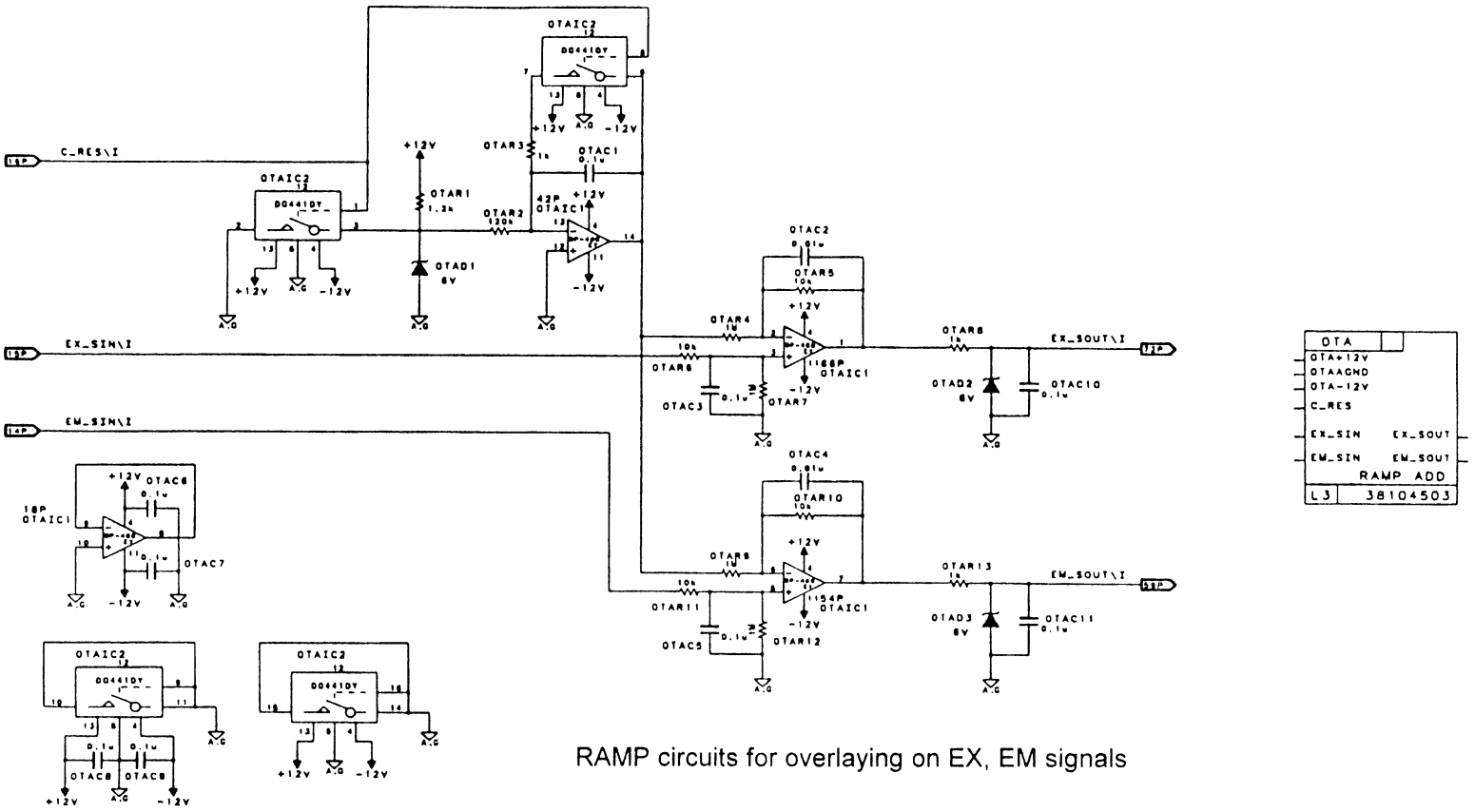


Figure 4-16 FLM PC Board (OT9) of Model L-7485



RAMP circuits for overlaying on EX, EM signals

Figure 4-17 FLM PC Board (OTA) of Model L-7485

5 Adjustment, Maintenance Check

5.1 Adjustment for FLM PC Board

5.1.1 Adjustment for High voltage Circuits for Photomultiplier

Adjust OT1VR1 so that voltage between OT1TP1 and OT1TP2 will be the following when setting photomultiplier voltage;

LOW: −400 V ±20 V
MED: −600 V ±20 V
HIGH: −800 V ±20 V

5.1.2 Adjustment for Preamplifier Zero

Adjustment for EX side Amplifier

1. Set OT5VR4 at the medium position.

2. Short ②③⑥ pins of OT5IC1, adjust OT5VR2 so that voltage between OT5TP2 and OT5TP1 will be 0 V ±0.1 mV.

3. Short ②③⑥ pins of OT5IC2, adjust OT5VR1 so that voltage between OT5TP3 and OT5TP1 will be 0 V ±0.1 mV.

4. Short ②③⑥ pins of OT9IC3, adjust OT9VR1 so that voltage between OT9IC3-3 and ZTP4 will be 0 V ±0.1 mV.

5.1.3 Check for AD Circuits (Prepare false signal)

1. EM side

AD input (ZJ23)(V)(OT5TP3)	Display (EM energy mode)
0.0625 (100.67 mV)	5290
0.5000 (509.8 mV)	25326
4.0000 (20000.6 mV)	101938

1 mV=51 counts

2. EX side

AD input (ZJ22)(V)(OT5TP2)	Display (EX energy mode)
0.0625 (98 mV)	19
0.5000 (504 mV)	102
4.0000 (4008 mV)	821

1 mV=0.2 counts

5.1.6 Adjusting Zero, Span of Recorder Output

1. Press [2] of keyboard.

2. Adjust OR2VR3 so that voltage between ④ (OR2TP2) pin and ⑤ pin of RPS PC board will be 0 mV ±0.05 mV.

3. Press [3] of keyboard.

4. Adjust OR2VR7 so that voltage between ④ (OR2TP2) pin and ⑤ pin of RPS PC board will be 10 mV ±0.05 mV.

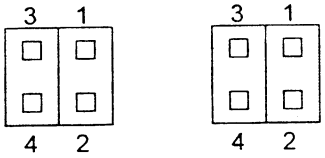
5. Press [2] of keyboard.

6. Make sure the voltage between ④ (OR2TP2) pin and ⑤ pin of RPS PC board is 0 mV ±0.05 mV.

7. Press [4] of keyboard.

8. Make sure the voltage between ④ (OR2TP2) pin and ⑤ pin is about −10 mV.

9. Change the receptacles of ZTP1 and ZTP2.



10. Remove ROM for adjustment.

5.2 Adjustment for Photo-cell Gain and Photomultiplier Voltage

1. Mount Xe-lamp and turn it on.

2. Set EX wavelength at 470 nm from the keyboard. Set LCD display into EX energy mode.

3. Adjust Focus, Horizontal and Vertical of Lamp Holder so that the energy value will be maximum. (Average: 600 counts)

4. Adjust OT5VR4 (Photocell gain) on FLM PC board so that the energy value will be about 800 counts. (At EX 350 nm: About 400 counts)

5. Set EX wavelength at 350 nm, EM wavelength at 600 nm, and press Auto Zero key.

6. Set EX wavelength at 350 nm, EM wavelength at 397 nm, display FL value, set Photomultiplier voltage at Medium.

7. Adjust OT1VR1 (Photomultiplier voltage) on FLM PC board so that FL value will be 15-30.

6 Troubleshooting

When performing troubleshooting, be sure to follow the following warnings.

⚠ Warning

1: Touching the inside of the instrument can cause electric shocks.
Turn off the power, and disconnect the power cord from the receptacle when you remove the cover of the instrument for replacing the parts etc.
2: Touching the high temperature parts causes burns. Do not touch the light source unit especially the lamp mounting part because they are very hot.
If the lamp is on, it is very much heated.
When replacing the Xe-lamp, turn off the Xe-lamp and wait for 2 hours unit it is cooled down to prevent burns caused by high temperature, and then, replace the Xe-lamp, though the safety mechanism turns off the Xe-lamp automatically when the light source cover is removed.

⚠ Caution

1: Looking at the lighting Xe-lamp directly injures your eyes.
The lighting Xe-lamp emits strong ultraviolet rays.
Do not look at it directly.
Wear protection glasses.

6.1 Troubleshooting

Symptom	Possible cause	Check	Repair
1. Initializing is not performed though turning on the power.	Poor contact of power cord plug.	Visually check.	Replug the power cord.
	Fuse is blown.	Conductivity of Fuse.	Replace the Fuse with a new one. (See 6.6*)
	Improper attaching of Lamp cover. (Malfunction of protection circuits.)	Visually check.	Retighten the fixing screws of Lamp cover.
2. No functions though pressing Key of keyboard.	The status is not "Ready".	Monitor screen.	Get "Ready" by pressing "Escape" key.
3. No functions though pressing "Auto Zero" key or "Spect Memo" key.	Data mode on Monitor screen is not "FL".	Monitor screen.	Make Data mode on Monitor screen "FL". (See 3.3(8).*)

* : Section in Instruction Manual

6.2 Error Message

Message	Contents of error	Recovery
D-LINE SYSTEM IS NOT READY	Improper communication setting or D-line cable connection. The other device to communicate with by D-line is not ready.	1. Check D-line conditions on Monitor screen. 2. Check D-line cable connection. 3. Check the conditions of the other device.
A/Z OVER RANGE PRESS "CL" KEY TO CLEAR MESSAGE	Out of Auto Zero range	1. Change wavelength. 2. Change solvent. 3. Clean Flow-cell.
LAMP ERROR	Xe-lamp is turned off, or is not lit. Momentary power failure occurred.	1. Press "CL" key. (for momentary power failure) 2. Turn on the power again. 3. Replace the Xe-lamp with a new one. (Life of Lamp)
Ex (Em) SIDE OF WL DRIVE MECHANISM ERROR	Wavelength could not be set at initializing test.	1. Turn on the power again. 2. Calibrate the wavelength.
ROM ERROR	Trouble of ROM	Replace the FLM PC Board with a new one.
C-RAM ERROR	Trouble of RAM	Replace the FLM PC Board with a new one.
CHECK TIME PROGRAM	Time program setting is over the specified steps.	Remove unnecessary Time program.
OVER HEAT! LAMP WAS TURNED OFF	Fan stops, and Temperature sensor acts.	Replace the Fan with a new one.
	The temperature of Lamp is higher than usual. (Just after Lamp is turned off, no cooling by Fan etc.)	After cooling off the Lamp, turn on the power again.
D-LINE COMMUNICATION ERROR PRESS "CL" KEY TO CLEAR MESSAGE	The other device to communicate with by D-line is not ready.	1. Check D-line cable connection. 2. Check the conditions of the other device.

6.3 Replacement Parts and Articles of Consumption

Table 6-1 shows main replacement parts and articles of consumption for this instrument. Prepare proper quantities of them corresponding to frequency of use.

Table 6-1 Replacement Parts and Articles of Consumption

	Part number	Part name	Remarks
*	650-1500	Xe-lamp 150 W	Guaranteed life : 150 hours
*	250-1600	Xe-lamp long life	Guaranteed life : 500 hours
	J821349	Fuse T5A	Guaranteed life : 1900 hours/1 year
			Guaranteed period : 6 months after the delivery.
	810-3927	Flow-cell (12 µl)	
	F275144	Teflon tube	(10m fixed)
		ID 0.33 × 0.62 T (Outlet)	Outside diameter:1.57 mm
	F274222	Teflon tube	(10m fixed)
		ID 0.25 × 0.66 T (Inlet)	Outside diameter:1.57 mm
	L369053	Ferrule front (Dyflon)	

Note: * means article of consumption.

7 Contact Signal

7.1 Outline

L-7000 Series have the following two kinds of contact signal system.

1. Contact Signal in D-line Connector (Start, Stop, Busy)
This signal is contact with input /output functions commonly used for each equipment. This contact signal consists of three lines of Start (In/Out), Stop (In/Out) and Busy (In/Out).
This contact signal becomes effective when D-line is specified "Off" by the setup function of each unit.

2. Contact signal in Each Equipment, Individually
This signal is Contact to /from which input/output is performed by 3-pin connector. Each equipment has its own name and function. Name to indicate the function is given to each connector.
Example:
Output contact signal: EVENT of Pump
Input contact signal: Lamp Off of Detector (IN). Series Start of Auto Sampler (IN)

7.2 Contact Signal in D-line Connector

Each equipment has 2 D-line connectors on the back of main unit. (Only Data Processor has 1 connector.) Each signal of the two connectors is connected inside each other. Therefore, by connecting each unit in series with D-line cable, synchronization of System of L-7000 Series can be taken easily. (See Figure 7-1.)
When synchronization by contact signal is taken between L-6000 series, Model D-2000/D-2500, and Model D-6000/D-6500, use the following cable to connect.

1. When only synchronization of start is taken:

Part number	Part name	Terminal to be connected	Example of device to be connected
810-7634	SDIO (Start 3P) cable	3P connected	L-6200, D-6000
810-7633	SDIO (Start M3) cable	M3 terminal	L-5000
810-7632	SDIO (Start M4) cable	M4 terminal	D-2500/D-2000

7.3 Contact of Individual Equipment

1. Contact Input Terminal

This is Contact signal input to perform control by contact signal such as external switch or relay.
Any signal is activated by shorting the terminals for 0.1 second or longer.
The input circuits are shown in Figure 7-3.

2. Contact Signal Output Terminal

This is Contact output terminal to perform control of external devices by contact signal. The output circuits are shown in Figure 7-4.
The rating of the Contact is 30 V, 0.1 A. Load to be connected should be within the rating.

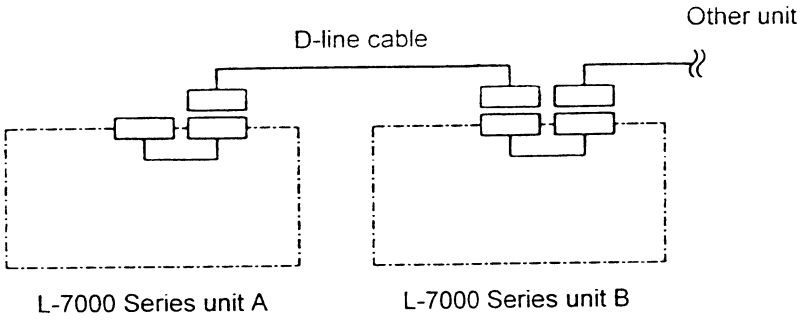


Figure 7-1 D-line Cable Connection

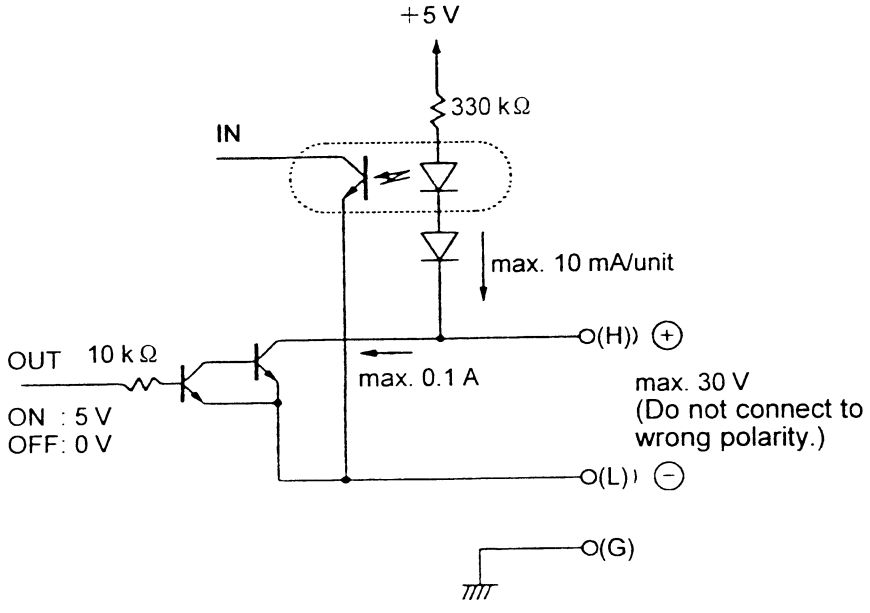
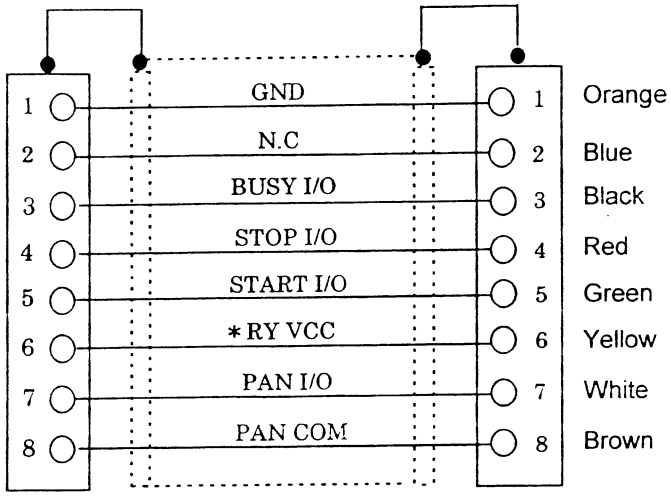


Figure 7-2 Circuits Composition of D-line Contact

7.4 Contact Signals Arrangement in D-line Connector



Connector (a)

P/N: 810-7557

Connector (b)

Part name: Cable D-Line 45

*: +5 V power supply for Relay box

Figure 7-5 D-line Cable wiring Diagram

– GLP –		SOP –	Page 1 of 10

Standard Operating Procedure SOP

Title: Check of Function and Specifications of the Fluorescence Detector L-7485

Valid since: June. 1. 2000
This SOP replaces the version of: New version, issue 1

Policy: Establishing a reliable function of the instruments
Responsibility: Head of Laboratory

Data/signature Copy received by:

Written: ..... Head of Testing Facility
..... Head of Laboratory
..... Laboratory personnel
..... GLP department
Reviewed: .....
Approved: .....

Total number of pages: 10 and 1 pages Test Report
References: Operating Instructions for Fluorescence Detector L-7485.
ASTM E685-79 (1979)

Check Item: Four Items

1 Check of lamp display
2 Check of auto zero function
3 Check of wavelength accuracy
4 Check of sensitivity

Items to be Prepared:

1. Ion exchanged water or distilled water: About 100 mL.
2. Calipers.
3. Calibrated data processor for HPLC (Hitachi Model D-7500 Integrator or equivalent), or recorder (Hitachi Model 056 Recorder or equivalent).
4. Pump for HPLC (Hitachi Model L-7100 Pump or equivalent).
5. Analog signal cable (necessary when a data processor for HPLC except for Model D-7500 or a recorder is used).

Preparation of Instruments:

1. Turn on the Fluorescence Detector and warm it up for about 1 hour.
2. Turn on the data processor for HPLC and recorder. Warm them up for about 10 minutes.

1 Check of Lamp Display

Content of Check:

Lamp display check.

Check Procedure:

1. Turn on the Power switch of the Detector.
2. The screen appears on the liquid crystal display.
3. Self-diagnosis is performed.
   If abnormal, Error message is presented on the liquid crystal display. If normal, Monitor Screen appears.

Actual Example:

FL Detector 8107064-00
Copyright (C) Hitachi, Ltd. 2000

NOTICE: Software version may be changed.

↓ (Self-diagnosis check)

TIME	Ex	Em	FL	PROG	LAMP	[1]
0.0	250	350	0.0	1	Xe	(D1)

NOTICE: This screen is an example.

Specification:

Lamp display on Monitor Screen should be {Xe}.
This means that the Xe lamp is lit normally.

Remarks:

The following items are checked be the self-diagnosis check.

1. Memory check.
2. Function check of wavelength motor.
3. Lighting check of Xe lamp.

2 Check of Auto Zero Function

Content of Check:

Auto zero function is checked.

Check Procedure:

1. Make sure Monitor Screen (FL display) is displayed.
2. Set the excitation wavelength to 350 nm, and fluorescence wavelength to 450 nm with the WAVE LENGTH key.
3. Set the time constant to 2.0s with the PARAM SET key.
4. Press the AUTO ZERO key and read the FL display on Monitor Screen.

Specification:

FL display on Monitor Screen should be -0.1 to +0.1.

NOTICE: When a solution that emits fluorescence of which wavelength is 450 nm with the excitation light of 350 nm is in the cell, the FL display may be out of ±0.1 in some cases. If so, substitute distilled water for the solution in the cell, and perform measurements again.

3 Check of Wavelength Accuracy

Content of Check:

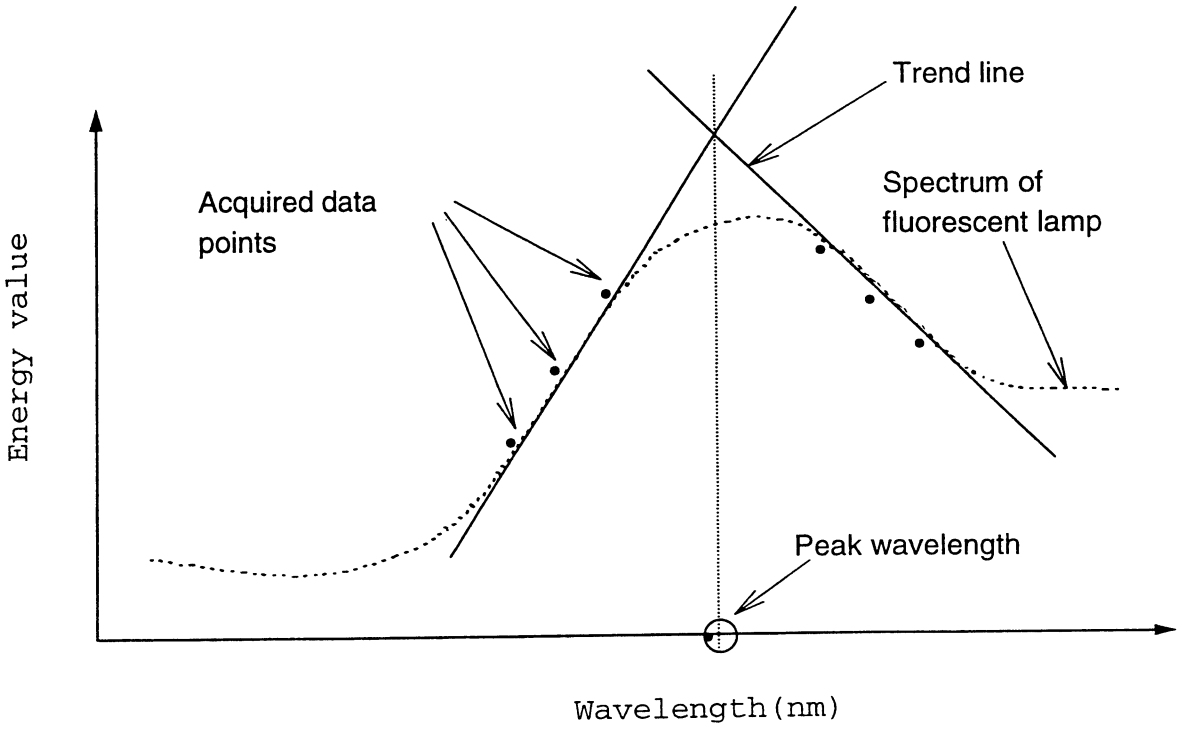
The spectral line of 436 nm emitted from a fluorescent lamp is used.
The light emitted from a fluorescent lamp is introduced into the fluorescence monochromator and the spectral line is used to check wavelength accuracy of the monochromator.
Using the emission monochromator set at the wavelength the bright line is detected, the wavelength accuracy of excitation monochromator is determined by checking the wavelength of excitation light which makes Raman scatter at 436 nm and comparing with theoretical value(380 nm).

Items to be Prepared:

1. Fluorescent room lamp
2. Graph sheet

Check Procedure:

1. Check of wavelength accuracy of fluorescence monochromator
1a. Remove the light sampling screw of the flow cell unit.
1b. Set PMT voltage "LOW" with the PARAM SET key.
1c. Set Em bandwidth "STANDARD" with the PARAM SET key.
1d. Turn off the lamp with the PARAM SET key.
1e. Make the Display Mode be Em < M > with the UTILITY key.
1f. Set the fluorescence wavelength (Em) to 426 nm with the WAVE LENGTH key, and read the energy value.
1g. In the same way, read the energy values at 428nm and 430nm.
1h. Plot these points on a graph sheet and confirm them in a row. If not, add another data point and acquire at least three data points in a row.
1i. Draw a trend line of these points.
1j. In the same way as (f) and (g), read the energy values at 442nm, 444nm and 446nm.
1k. Draw another trend line of these points in the same way of (h) and (i).
1l. Read the wavelength at the cross point of the two trend lines.



NOTICE 1: When checking the accuracy of the fluorescence monochromator, take special precautions to ensure that radiation from other sources cannot enter the instrument (e.g. do not place the unit near a window or near a source of room light).

NOTICE 2: If you move around in front of the sample chamber during the check of the fluorescence wavelength accuracy, the observed intensity of the fluorescent lamp light may vary. This may prevent you from accurately determining the peak wavelength.

NOTICE 3: If the energy level appears to be saturated during the determination of the wavelength accuracy, adjust the amount of light entering the monochromator by turning off some lamps in the laboratory.

NOTICE 4: In wavelength accuracy check, set the emission monochromator bandwidth at the standard (15 nm).

2. Check of wavelength accuracy of excitation monochromator
2a. Attach the light sampling screw of the flow cell unit.
2b. Set the fluorescence wavelength to the position determined in the procedure of 1l. above.
2c. Turn on the lamp with the PARAM SET key.
2d. Set PMT voltage "MED" with the PARAM SET key.
2e. Make the Display Mode be Em < M > with the UTILITY key.
2f. Set the wavelength of the excitation monochromator (Ex) at 380 nm with the WAVE LENGTH key.
2g. Move the wavelength of the excitation monochromator (Ex) with the WAVE LENGTH key to obtain the wavelength where the displayed energy becomes its maximum.

NOTICE: Adjust the Xe lamp position properly, then check the wavelength accuracy of the excitation monochromator.

Specification:

Obtained wavelength should be;

Ex: within ±3 nm of 380 nm
Em: within ±3 nm of 436 nm

4 Check of Sensitivity

Content of Check:

Sensitivity of Fluorescence Detector is measured by measuring S/N value using Raman Spectrum of water.

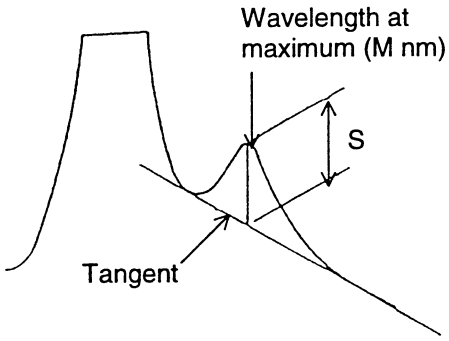
Items to be Prepared:

1. Prepare the following.
1a. A calibrated data processor for HPLC (Hitachi Model D-7500 Integrator or equivalent) or a recorder (Hitachi Model 056 Recorder or equivalent).
1b. Calipers.
1c. Load resistance coil (Teflon tube, inside diameter: 0.25 mm, length: 10 m).
2. Adjust the lamp position.
3. Flow ion exchanged water or distilled water with a flow rate of 1 mL/min for 3 minutes. Make the flow rate be 0 to stop the flow. Close the inlet and outlet of the Flow Cell tube. When flowing, connect a load resistance coil before the Flow Cell.
4. Connect the data processor for HPLC and Detector with the Signal Cable. When a recorder is used, connect the Signal Cable to ÒRecorderÓ terminals.

Check Procedure:

1. Measurement of Raman spectrum of water
1a. Turn on the Power switch and warm up the instrument for more than 1 hour.
1b. Set the wavelength of the excitation monochromator (Ex) at 350 nm with the WAVE LENGTH key.
1c. Set the recorder output speed at 60 nm/min with the RECORD key.
1d. Set the recorder full scale range at 1000 with the RECORD key.
1e. Set the time constant to 2.0 s, set the applied voltage to the photomultiplier to ÒMediumÓ with the PARAM SET key.
1f. Set the scan mode to Em, set the fluorescence spectrum measurement wavelength at 350 nm to 450 nm with the SPECT PARAM key.
1g. Start scanning, and input memory number to be used for storing with the SPECT MEMO key.
1h. Set the spectrum number of output data, and background data with the RECORD key. Output the spectra with the START STOP key.
Start the data processor or recorder at the same time for recording.

1i. Obtain Raman peak intensity (s) and wavelength at the maximum (M nm).



NOTICE 1: Use the Model D-7500 Integrator with the following conditions.
ATT: 5
Chart speed: 60 mm/min
Sampling period: 400 msec

NOTICE 2: When the Detector and Integrator are connected with the D-line (digital), start the output with the ALL START key of the Integrator.

2. Measurement of noise

2a. Keep the excitation wavelength at 350 nm, set the fluorescence wavelength at M nm with the WAVE LENGTH key.

2b. Start the Integrator/Recorder, record for 15 minutes.

2c. From the recorded chart, calculate the noise following ASTM E685-79 (1979).

NOTICE: Use the Model D-7500 Integrator with the following conditions:
ATT: 0
Chart speed: 10 mm/min
Sampling period: 400 msec

3. Calculation of S/N value (sensitivity) of Raman spectrum of water

$$\text{S/N (value)} = \frac{S}{N}$$

Specification:

200 or more

NOTICE: Quality of distilled water and bubbles in water affect Raman spectra of water and noise level.
Select high quality water with no bubbles.
Incomplete adjustment of the optical system, a dirty optical system or Flow Cell may reduce S/N value.
If lamp replacement is not effective to increase S/N value, contact your nearest Service Office to ask adjustments.

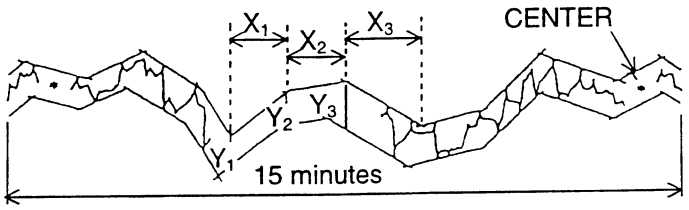
Remarks:

When the Model D-7500 Integrator is used, the voltage value corresponding to ÒSÓ can be calculated from the length of S (L mm) on the chart, and the noise level can be calculated from the noise width (mm) on the chart.

$$S = \frac{L}{152} \times 2^{x}(mV)$$

$$N = \frac{\text{Noise width}}{152} \times 2^{x}(mV)$$

Where; L is the length of S (mm)
X is the ATT (attenuator) setting on the Integrator,



$$\text{Noise level} = \sum_{R=1}^{R=n} Y_R / n \text{(Unit of Xn is 1 min)}$$

Where: Y_R is a length (mm) on chart at each time period.
(Extracted from ASTM E685-79 (1979))

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Module	Fluorescence Detector
Model	L-7485
Instrument number	

Test

No.	Item Tested	Specification	Result	Tester
1	Lamp display	{Xe} should be displayed		
2	Auto zero function	Within ±0.1		
3	Wavelength accuracy ① Excitation wavelength ② Fluorescence wavelength	 Within ±3 nm Within ±3 nm		
4	Sensitivity	S/N of Raman peak of water should be 200 or more		

Tested on: .....

Next test scheduled for: .....

Tested by: .....