



CITY OF SACRAMENTO

DEPARTMENT OF GENERAL SERVICES

OFFICE OF THE DIRECTOR

April 15, 1986
SS:Admin:FM:JJ:bb

FACILITY MAINTENANCE DIVISION
FLEET MANAGEMENT DIVISION
RISK MANAGEMENT & INS. DIVISION
SUPPORT SERVICES DIVISION

City Council
Sacramento, California

Honorable Members in Session:

SUBJECT: Recommendation of Award

CITY MANAGER'S OFFICE
RECEIVED
APR 22 1986

SUMMARY

Attached are tabulations of sealed proposals received by the City Clerk for furnishing equipment in accordance with specifications adopted by the City Council.

RECOMMENDATION

It is recommended that the City Council accept the lowest responsive and responsible proposals submitted as follows:

<u>Bid No.</u>	<u>Bidder</u>	<u>Items Awarded</u>	<u>Contract Amount</u>
944 - Various quantities and types of Sewer Maintenance Tools (Attachment #1)	Arata Equipment Co. 100 California Dr. Burlingame, CA 94010 (P.O. #65132)	6 thru 9, 11 thru 22, 24	\$12,925.00
944 - Various quantities and types of Sewer Maintenance Tools (Attachment #1)	Flexible Systems, Inc. 3221 Carter Ave. 1 Marina Del Rey, CA 90296 (P.O. #65133)	1 thru 5, 10, 23	\$ 3,291.89
946 - Laser Detection System (Attachment #2)	Cooper Lasersonics Inc. 5674 Sonoma Drive Pleasanton, CA 94566 (P.O. #65134)	All	\$24,486.00

APPROVED
BY THE CITY COUNCIL

APR 29 1986

OFFICE OF THE
CITY CLERK

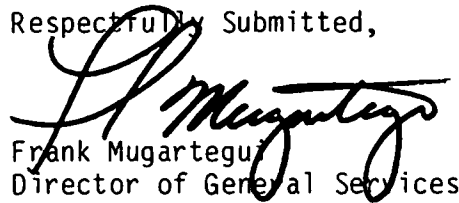
City Council

-2-

6
April 29, 1986

Sufficient funds are available to award the contracts.

Respectfully Submitted,



Frank Mugartegui
Director of General Services

Recommendation Approved:



Walter J. Slype
City Manager

2 Attachments

April 29, 1986
All Districts

ATTACHMENT #1

BID NO. 944 - SEWER MAINTENANCE TOOLS

<u>Bidder</u>	<u>Items 1 - 5</u>	<u>Items 6 - 9</u>	<u>Item 10</u>	<u>Items 11 - 22</u>	<u>Item 23</u>	<u>Item 24</u>
Arata Equipment Company	No Bid	<u>\$571.50</u>	No Bid	<u>\$11,286.90</u>	No Bid	<u>\$335.00</u>
Flexible Systems Co.	<u>\$2,332.76</u>	\$699.16	<u>\$384.00</u>	\$12,523.32	<u>\$388.80</u>	\$365.00
Sacramento Utilities Supply	No Bid	No Bid	No Bid	No Bid	No Bid	No Bid

Award As Indicated Above To: Arata Equipment Co.
100 California Drive
Burlingame, CA 94010

Flexible Systems Inc.
3221 Carter Ave. 1
Marina Del Rey, CA 90296

Total Amount of Award: \$12,925.00

\$3,291.89

Original Estimated Cost: \$15,500.00

User: Sewer Maintenance

Due Date: April 8, 1986

121

1000

1000 1000 1000

1000 1000

1000 1000 1000

ATTACHMENT #2

BID NO. 946 - LASER DETECTION SYSTEM

<u>Bidder</u>	<u>Amount of Bid</u>
Cooper Lasersonics Inc.	<u>\$24,486.00</u>
Continental Laser Corporation	\$30,051.00
Spectra-Physics Inc.	\$33,920.00
Industrial Laser Service	\$37,683.00

Total Award of Contract To: Cooper Lasersonics Inc.
5674 Sonoma Drive
Pleasanton, CA 94566

Total Amount of Contract: \$24,486.00

Original Estimated Cost: \$30,650.00

User: Police Department

Due Date: April 1, 1986



CITY OF SACRAMENTO

DEPARTMENT OF GENERAL SERVICES
SUPPORT SERVICES DIVISION

CONTRACT SPECIFICATIONS FOR:

SEWER MAINTENANCE TOOLS

PROPOSAL NO: 944

PROPOSALS MUST BE RECEIVED

PRIOR TO: 10:30 A.M., APRIL 8, 1986

AT: CITY CLERK

915 I St. RM. 203

SACRAMENTO, CA. 95814

PRE-BID CONFERENCE: Not Required

FILED

APR 8 1986

By the
Office of the City Clerk

BID TO THE
CITY OF SACRAMENTO, CALIFORNIA
PURCHASING DIVISION

BIDS MUST BE RECEIVED BY THE
CITY CLERK, ROOM 203, CITY HALL
PRIOR TO 10:30 A.M., TUESDAY
APRIL 8, 1986

FOR: SEWER MAINTENANCE TOOLS

BID NO: 944

Name of Bidder GRINWELL Telephone _____

Type of Business: ☒ Corporation, ☐ Co-partnership, ☐ Individual doing business under his own name,
☐ Individual doing business using a firm name.

Business Address: 431 RICHARDS BLVD SAC TO CA 95804
Street City State Zip Code

To the City of Sacramento:

The undersigned, as bidder, certifies that the only persons or parties interested in this bid as principals are those named herein as bidder; that this bid is made without collusion with any other person, firm, or corporation; that in submitting this bid he has examined the "General Conditions and Instructions to Bidders" and the specifications; that he proposes and agrees if this bid is accepted, he will execute and fully perform the contract for which bids are called; that he will perform all the work and / or furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements as therein set forth; and that he will take in full payment therefor, the prices set forth in the attached schedule.

DON WRISSERT SALES [Signature]
Typed or Printed Name and Title Signature

Address (If different than above business address)

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (Example)

1. An individual using a firm name, sign: "John Doe an individual doing business as Blank Company."
2. An individual doing business under his own name, sign: your own name only.
3. A co-partnership, sign: "John Doe and Richard Roe, co-partners doing business as Blank Co., By John Doe, co-partner."
4. A corporation, sign: "Blank Company, by John Doe, secretary," (or other title).

FOR CITY USE ONLY

Bid was opened on above date and at prescribed place.

Bid bond required ☒ No ☐ Yes Amount _____

Received: ☐ Cashiers or Certified Check ☐ Surety Bond
drawn on a California bank

Lorraine Magana

City Clerk/Purchasing Agent

Approved as to form and legality

City Attorney

FILED

APR 8 1986

By the
Office of the City Clerk

GENERAL CONDITIONS AND INSTRUCTIONS TO BIDDER

NO BID IS IN LEGAL FORM UNLESS THE FOLLOWING INSTRUCTIONS ARE FULLY COMPLIED WITH

1. Bid must be submitted on this printed bid form and sealed in the envelope supplied.
2. All bids shall be clearly and distinctly written without erasure or interlineation, and properly signed by an authorized party, who shall indicate the capacity in which the signature is executed.
3. Alternate bids are invalid unless invited and covered by the specifications.
4. If required, a bid bond in the amount stated on the front of this form must accompany this bid. Payment must be made by cash, cashier's or certified check, or by surety bond.
5. All bids must be delivered to the designated receipt not later than the time specified on the front of this form.
6. No bidder shall be interested in more than one bid as provided by City Code Section 57.302.
7. The right to reject any and all bids is reserved by the City.
8. The City reserves the right to waive any informalities or minor irregularities in connection with bids received.
9. All provisions of Chapter 57 of the City Code are applicable to any bid submitted or contract awarded pursuant thereto.
10. **Faithful Performance Bond.** The successful bidder will [] will not ~~XXX~~ be required to submit a faithful performance bond, in a form approved by the city attorney, in the amount of _____.
11. **Cash Discounts.** Cash discounts offered for payment in less than ten (10) days will not be considered as a basis of award. Cash discounts offered for payment in ten (10) or more days will be subtracted from the total bid price for the purposes of bid evaluation. Any cash discount offered by the successful bidder will be accepted by the City of Sacramento, whether or not it was considered as a basis of award.
12. Bids will be opened, in public, in the City Council Chambers, City Hall, 915 - Eye Street, Sacramento, California, at ~~10:00~~ ^{10:30} a.m., APRIL 8, 1986. (Bids must be submitted prior to ~~10:00~~ ^{10:30} a.m.)
13. Within thirty (30) days after the bid opening a contract will be awarded by the City to the lowest responsible bidder, subject to the right of the city to reject all bids, as it may deem proper. The time for awarding a contract may be extended an additional thirty (30) days, at the sole discretion of the City, if required to evaluate bids or for such other purpose as the City may determine, unless the Bidder objects to such extension in writing with his bid. The "lowest responsible bidder" is defined as follows:

In addition to price in determining the lowest responsible bidder under the provisions of this chapter, consideration shall be given to: (i) the quality and performance of the supplies to be provided by the bidder; (ii) the ability, capacity and skill of the bidder to perform the contract or effectuate the transaction; (iii) the ability of the bidder to perform the contract or effectuate the transaction within the time specified, without delay; (iv) the character, integrity, reputation, judgement, experience and efficiency of the bidder; (v) the quality of bidder's performance on previous purchases by, or contracts with, the City; and (vi) the ability of the bidder to provide future maintenance, repair parts and services for the supplies provided. (Section 57.102)

In addition to the above considerations, the City will also consider which bids will result in receipt by the City of sales or use tax under the Provisions of Part 1.5 of Division 2 of the California Revenue and Taxation Code and Article III of Chapter 41 of the Sacramento City Code and shall deduct the amount of such sales or use tax which will be received from any such bid. (Ordinance No. 4064)

THE CITY CANNOT ACCEPT A BID FAILING TO COMPLY WITH ANY OF THE ABOVE REQUIREMENTS

12	20 ea.	Pick Up Tool for 5/16" rod (Retriever). PUT-1	<i>No Bid</i>	\$	\$
13	10 ea.	*6" Rootsaw with extra coil, for 5/16" rod. SRC-6		\$	\$
14	10 ea.	*10" Rootsaw with extra coil, for 5/16" rod. SCR-10		\$	\$
15	10 ea.	*12" Rootsaw with extra coil, for 5/16" rod. SCR-12		\$	\$
16	25 ea.	Heavy Duty Cleanup Tool for 4" pipe. Electric Eel HDD-4S		\$	\$
17	25 ea.	Heavy Duty Cleanup Tool for 8" pipe. Electric Eel HDD-7S		\$	\$
18	100 ea.	8' Heavy Duty Dual Cable for Model 325 Electric Eel		\$	\$
19	500 ea.	5/16" Sectional Sewer Rod Coupling. SSR-1-5		\$	\$
20	40 ea.	Bar Turning Handle for 5/16" Rod. BTH-1		\$	\$
21	82 ea.	Assembly Wrench for 5/16" Sectional Rod. AW-1		\$	\$
22	50 ea.	*5/16" Coil Rod Spring Starter Adapter, 20" long, wound out to 3 1/2" diameter, pigtail one end with 5/16" right hand nut. BPR-5		\$	\$
23	10 ea.	Selecto Blade 5/16" Chuck Assembly. SO-1		\$	\$
24	1 ea.	Double Squeegee for 27" pipe.		\$	\$

*NOTE: These are special SRECO catalog numbers assigned to tools modified to meet the special needs of the City of Sacramento.

Sub-Total \$

FILED

6% Sales Tax

APR 8 1986 TOTAL AMOUNT OF BID \$

By the
Office of the City Clerk

Page 4 of 9 Pages

CITY OF SACRAMENTO
SACRAMENTO, CALIFORNIA

For furnishing to the City of Sacramento Sewer Maintenance Tools, in accordance with the following provisions and specifications.

PRICING SCHEDULE

<u>No.</u>	<u>Quantity</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Unit Price</u>	<u>Extension</u>
1	10 sets	*Selecto Blade for 6" pipe (3 blade set). SBA-2-SS	<i>NOBID</i>	\$ _____	\$ _____
2	23 sets	*Selecto Blade for 8" pipe (3 blade set). SBA-3-SS.		\$ _____	\$ _____
3	17 sets	*Selecto Blade for 10" pipe (3 blade set). SBA-4-SS		\$ _____	\$ _____
4	8 sets	*Selecto Blade for 12" pipe (3 blade set). SBA-5-SS		\$ _____	\$ _____
5	9 sets	*Selecto Blade for 15" pipe (3 blade set). SBA-6-SS		\$ _____	\$ _____
6	50 ea.	*Adapter Rod for 5/16" tool, <u>Special Short</u> . SBC-1-3		\$ _____	\$ _____
7	4 ea.	*1" x 36" Coil Rod, less adapter, right hand female coupling on one end, left hand female coupling on other end. SCR-1A-LAR-FCF		\$ _____	\$ _____
8	4 ea.	*1" x 72" Coil Rod, less adapter, right hand female coupling on one end, left hand female coupling on other end. SCR-2A-LAR-FCF		\$ _____	\$ _____
9	20 ea.	1" Coiled Rod Splicer. PF-10		\$ _____	\$ _____
10	10 ea.	Square Bar Corkscrew for 5/16" rod, for 4" pipe. SBC-2A		\$ _____	\$ _____
11	10 ea.	3" x 3" Spirolon sewer hose guide. LHGH-1		\$ _____	\$ _____

FILED

APR 8 1986

By the
Office of the City Clerk

Award

The City reserves the right to reject any and all proposals or alternate proposals as the best interest of the City may require. Consideration will be given in comparing proposals and in awarding a contract, not only to the amount of the proposal, but also the kind and quality of the equipment offered, its suitability for use in the service intended, as well as the lowest ultimate cost to the City. Time required for delivery may influence the award.

Brand Name

- a. Brand names and numbers, when used, are for reference to indicate the character or quality desired.
- b. Equal items will be considered, provided offer clearly describes the merchandise. Offers for equal items shall state the brand and number, or level or quality. The determination of the Purchasing Agent as to what items are equal shall be final and conclusive.
- c. When brand, number, or level of quality is not stated by the bidder, it is understood the offer is exactly as specified.
- d. If bidding on a manufacturer's product other than that specified, bidder must attach descriptive literature and specifications with the proposal.
- e. If necessary, the burden of proof and cost of analysis to determine equality shall be that of the bidder.

Payment and Invoicing

Invoices, in triplicate, shall be mailed or delivered to City of Sacramento, Accounts Payable, 915 I Street, Room 114, Sacramento, CA 95814.

Cash Discount

Payment Discount: _____ % for payment within _____ calendar days.

Bid Inquiries

Questions regarding this bid should be referred to:

Support Services Division
5730 24th Street, Bldg. 4
Sacramento, CA 95822
Attention: Jim Johnston
(916) 449-5344

These inquiries are to be submitted at least 10 days prior to the bid opening date. Any interpretations by the City will be made in the form of a written amendment. The receipt of such an amendment must be acknowledged in accordance with the directions on the amendment. Oral explanations or instructions given before the award of the contract will not be binding.

FILED

APR 8 1986

Page 9 of 9
Office of the City Clerk

Compliance With OSHA

The Contractor shall be responsible for strict compliance with all requirements of the California Occupational Safety and Health Act (OSHA) which are applicable to the work to be accomplished pursuant to this contract. OSHA shall be construed to include, but not be limited to, all applicable safety orders issued by the Division of Industrial Safety, State of California. In the event the Contractor, or any of his employees, shall observe any violation of OSHA in or on the premises on which the Contractor is to perform work pursuant to this contract, the Contractor shall immediately give written notice to the City of such violation.

Delivery

Complete delivery _____ days after receipt of order.

Delivery Hours

Delivery will be accepted from 8:00 A. M. to 3:30 P. M.

Delivery Ticket/Packing Slip

All shipments under this agreement shall be accompanied by a delivery ticket packing slip, or sales slip which shall include the following minimum information:

- (1) Name of supplier
- (2) Contract/purchase order number
- (3) Date of purchase
- (4) Itemized list of supplies or services furnished
- (5) Date of delivery or shipment
- (6) Quantity, unit price and extension of each item, less applicable discounts.

Evaluation (Inspection)

Merchandise will be inspected before acceptance by an authorized representative of the City of Sacramento for workmanship, appearance, proper functioning of all equipment and systems and conformance to all other requirements of this specification. If deficiencies are found, it shall be the responsibility of the contractor to pick up the merchandise, make necessary correction and redeliver the merchandise for re-inspection and acceptance. Payment and/or commencement of discount period (if applicable) will not be made until corrective action has been made.

FILED

APR 8 1986

By the
Office of the City ClerkEvaluation (Samples)

- a. Samples, when required, shall be furnished free of cost of any sort to the City of Sacramento.
- b. Samples selected may be retained for future comparison.
- c. Samples which are not destroyed by testing, or which are not retained for future comparison will be returned upon request at your expense.

Exceptions

The submission of a bid shall be considered an agreement to all the terms, conditions, and specifications provided herein and in the various bid documents, unless specifically noted otherwise in the proposal.

F.O.B.

Prices to be bid F.O.B. destination - as follows:

City of Sacramento
Water and Sewer Division
5730 24th Street, Bldg. 7
Sacramento, CA 95822

Manufacturer's Name

Manufacturer's name, brand and/or product number must be inserted in the proper space on the bid form.

Purchase Agreement Documents

A copy of the Notice Inviting Bids, the Bid and a copy of these General Conditions and the Specifications and Bid will remain on file in the Office of the City Purchasing Agent and it is understood will form the purchase agreement when accepted by the City Manager. All materials or services supplied by the Contractor shall conform to the applicable requirements of the City Charter, City Ordinances, and all applicable State and Federal Laws, as well as conforming to the specifications contained herein.

Quantities (Estimated)

The quantities specified are based upon the best estimates available and are subject to increase or decrease.

Safety Requirements

All services and merchandise must comply with current California State Division of Industrial Safety Orders and O.S.H.A.

Warranty (Commercial)

The contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the contractor gives to any customer for such supplies or services and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the City by any other clause of this contract.

FILED
APR 8 1986
By the
Office of the City Clerk

General Provisions

The attached General Provisions, 1 through 6, are hereby made a part of this request for bids and any resultant contract(s).

BIDDER'S NAME: _____

DO NOT DETACH THIS SHEET - SUBMIT ENTIRE BID PACKAGE AS YOUR PROPOSAL

57 K02
GENERAL PROVISIONS

1. Independent Contractor. At all times during the term of this Contract, Contractor shall be an independent Contractor and shall not be an employee of the City. City shall have the right to control Contractor only insofar as the results of Contractor's services rendered pursuant to this Contract; however, City shall not have the right to control the means by which Contractor accomplishes services rendered pursuant to this Contract.

2. Licenses; Permits; Etc. Contractor represents and warrants to City that he has all licenses, permits, qualifications and approvals of whatsoever nature which are legally required for Contractor to practice his profession. Contractor represents and warrants to City that Contractor shall, at his sole cost and expense, keep in effect at all times during the term of this Contract any licenses, permits, and approvals which are legally required for Contractor to practice his profession.

3. Insurance.

(a) Comprehensive Auto and General Liability. During the term of the Contract, Contractor shall maintain in full force and effect a comprehensive auto and general liability insurance in an amount of no less than \$500,000 single limit per occurrence, issued by an admitted insurer or insurers as defined by the California Insurance Code, providing that the city of Sacramento, its officers, employees and agents are to be named as additional insureds under the policy, and the policy shall stipulate that his insurance effected by the City or other named insured will be called on to contribute to a loss covered thereunder.

(b) Workman's Compensation. During the term of this Contract, Contractor shall fully comply with the terms of the law of California concerning workman's compensation. Said compliance shall include, but not be limited to, maintaining in full force and effect one or more policies of insurance insuring against any liability Contractor may have for workman's compensation.

(c) Errors and Omissions; Malpractice. In the event City requests Contractor to carry errors and omissions insurance or malpractice insurance, Contractor shall take out and keep in full force and effect during the term of this Contract a policy in form and content satisfactory to City which shall indemnify City against errors and omissions or malpractice by Contractor. Said policy or policies shall provide liability coverage in an amount specified by City in its request.

(d) Certificate of Insurance. The Contractor will have a standard "Certificate of Insurance" completed prior to engaging in any operation or activity set forth in this contract/agreement. Said policies shall provide that no cancellation, change in coverage, or expiration by the

GENERAL PROVISIONS - continued

insurance company or the insured shall occur during the term of this contract, without 30 days written notice to the City prior to the effective date of such cancellation or change in coverage.

4. Contractor Not Agent. Except as City may specify in writing, Contractor shall have no authority, express or implied, to act on behalf of City in any capacity whatsoever as an agent. Contractor shall have no authority, express or implied, pursuant to this Contract to bind City to any obligation whatsoever.

5. Assignment Prohibited. No part to this Contract may assign any right or obligation pursuant to this Contract. Any attempted or purported assignment of any right or obligation pursuant to this Contract shall be void and of no effect.

6. Indemnity and Hold Harmless. Contractor agrees to indemnify City against any and all liability, losses, claims, damages, or judgement arising from any act by, or negligence of, Contractor or its subcontractors of the officers, agents, or employees of either while engaged in the performance of this contract or while in or about the building or protected premises for any reason connected in any way whatsoever with the performance of this contract, or arising from any accident or injury, not caused by an act or omission of City, its agents, or employees or anyone employed by the City other than this Contractor, to any person, licensee, Contractor or subcontractor, or any officer, agent, or employee thereof while engaged in the performance of this contract, or while in or about the building or premises for any reason connected therewith.

Should it become necessary for purposes of resisting, adjusting, or compromising any claims or demands arising out of the subject matter with respect to which indemnification is provided by this paragraph or for purposes of enforcement of this paragraph, for City to incur any expenses, or become obligated to pay any attorneys' fees or time, in no event to exceed thirty (30) days, after receiving written notice from the City of the incurring of such expenses, attorneys' fees, or costs.

Contractor shall pay City interest at an annual rate of seven percent (7%) compounded quarterly on all expenses or costs reasonably incurred by City in the enforcement of this paragraph and of any sums City may pay as a result of claims, demands, costs, or judgements with respect to the subject matter of this contract, from the date such sums are actually paid.



WATER AND WASTEWATER EQUIPMENT

801 MAHLER RD., SUITE 204
BURLINGAME, CA 94010
TWX 910-371-7110
415-692-5242

6
42486

March 25, 1986

Sacramento City Council
C/O City Clerk, Room 203
City Hall, 915 1 Street
Sacramento, California 95814

FILED

APR 8 1986

Subject: Proposal No. 944
Sewer Maintenance Tools
Bid Date: April 8, 1986
10:30 AM

By the
Office of the City Clerk

Gentlemen:

We do not have any items to offer for the subject proposal and are returning it herewith.

We appreciate receiving your request for bid and request that we remain on your bidlist for future proposals for water and wastewater equipment.

We are enclosing a product line sheet for your reference indicating the equipment we represent.

Sincerely,

JBI-Water and Wastewater Equipment

Norma Kosik

nk

Enc.

WATER & WASTEWATER EQUIPMENT

Envirex RBC Group

Rotating Biological Contactors
Rex Bio-Screen Process

DAVCO

Field Erected Sewage Treatment Plants
Package Pump Stations; Water Plants
Advanced Wastewater Treatment Systems

Environmental Equipment Engineering

Floating Surface Aerators
Lagoon Baffle Curtains

E & I Corporation

Catenary Bar Screens; Grit Removal
Rectangular Clarifiers; Skimmers
Water Screens, Flocculators

Envirex Industries

Package RBC & Extended Aeration
Plants, Clarifiers, & Filters
Comminutors; Diffusers

Great Lakes Environmental

Oil/Water Separators; Dewatering
Chem & Polymer Feed
Lamella Type Clarification

CPC ENGINEERING

Internalift™ Screw Pumps
Recessed Plate Filters
Rotary Screens, Pneumatic Ejectors

PUMPS

Hydronix* Booster & Sewage Packages
EMU* Submersible "Lift-Out; Storm Pumps
Patterson* Double Suction, Axial/MF & Sewage
Hydromatic* Grinders, Self-Prime & Sump
CPC* Internalift™ Screw Pumps

Wiesemann Engineering

SS Grinders - Macerators
SS Self-Cleaning Bar/Filter Screens



Automatic Self-Cleaning Strainers
Basket Strainers

PERMUTIT

Package Precipitator/Clarifiers; RO
Systems; Demineralizers; Degasifiers;
Filters; Softeners; Deaerating Heaters



Jet Aeration & Disinfection Systems
Sequencing Batch Reactors
Tank Mixing Systems

Mass Transfer, Inc.

Filterpak® Media for Trickling Filters
Aerobic & Anaerobic Bio-Towers
Air Stripping Media

WasTech

Digester Covers & Mixing Systems
Clarifiers, Thickeners & DAF Units
Vacuum Precoat, Drum & Belt Filters

BID TO THE
CITY OF SACRAMENTO, CALIFORNIA
PURCHASING DIVISION

BIDS MUST BE RECEIVED BY THE
CITY CLERK, ROOM 203, CITY HALL
PRIOR TO 10:30 A.M., TUESDAY
APRIL 1, 1986

FOR: LASER DETECTION SYSTEM

BID NO: 946

Name of Bidder Spectra-Physics, Inc., Laser Products Div. Telephone 415/961-2550

Type of Business: ☒ Corporation, ☐ Co-partnership, ☐ Individual doing business under his own name,
☐ Individual doing business using a firm name.

Business Address: 1250 West Middlefield Road, Mountain View CA 94039-7013
Street City State Zip Code

To the City of Sacramento:

The undersigned, as bidder, certifies that the only persons or parties interested in this bid as principals are those named herein as bidder; that this bid is made without collusion with any other person, firm, or corporation; that in submitting this bid he has examined the "General Conditions and Instructions to Bidders" and the specifications; that he proposes and agrees if this bid is accepted, he will execute and fully perform the contract for which bids are called; that he will perform all the work and / or furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements as therein set forth; and that he will take in full payment therefor, the prices set forth in the attached schedule.

J. Michael Scott, Field Sales Engineer

Typed or Printed Name and Title

J. Michael Scott /js
Signature

Address (If different than above business address)

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (Example)

1. An individual using a firm name, sign: "John Doe an individual doing business as Blank Company."
2. An individual doing business under his own name, sign: your own name only.
3. A co-partnership, sign: "John Doe and Richard Roe, co-partners doing business as Blank Co., By John Doe, co-partner."
4. A corporation, sign: "Blank Company, by John Doe, secretary," (or other title).

FOR CITY USE ONLY

Bid was opened on above date and at prescribed place.

Bid bond required ☒ No ☐ Yes Amount _____

Received: ☐ Cashiers or Certified Check ☐ Surety Bond
drawn on a California bank

Lorraine Magana

City Clerk/Purchasing Agent

Approved as to form and legality

City Attorney

FILED

APR 1 1986

By the
Office of the City Clerk

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8. The City reserves the right to waive any informalities or minor irregularities in connection with bids received.
9. All provisions of Chapter 57 of the City Code are applicable to any bid submitted or contract awarded pursuant thereto.
10. **Faithful Performance Bond.** The successful bidder will [] will not ~~XXX~~ be required to submit a faithful performance bond, in a form approved by the city attorney, in the amount of _____.
11. **Cash Discounts.** Cash discounts offered for payment in less than ten (10) days will not be considered as a basis of award. Cash discounts offered for payment in ten (10) or more days will be subtracted from the total bid price for the purposes of bid evaluation. Any cash discount offered by the successful bidder will be accepted by the City of Sacramento, whether or not it was considered as a basis of award.
12. Bids will be opened, in public, in the City Council Chambers, City Hall, 915 - Eye Street, Sacramento, California, at ~~10:30~~ ^{10:30} a.m., APRIL 1, 1986. (Bids must be submitted prior to ~~10:30~~ ^{10:30} a.m.)
13. Within thirty (30) days after the bid opening a contract will be awarded by the City to the lowest responsible bidder, subject to the right of the city to reject all bids, as it may deem proper. The time for awarding a contract may be extended an additional thirty (30) days, at the sole discretion of the City, if required to evaluate bids or for such other purpose as the City may determine, unless the Bidder objects to such extension in writing with his bid. The "lowest responsible bidder" is defined as follows:

In addition to price in determining the lowest responsible bidder under the provisions of this chapter, consideration shall be given to: (i) the quality and performance of the supplies to be provided by the bidder; (ii) the ability, capacity and skill of the bidder to perform the contract or effectuate the transaction; (iii) the ability of the bidder to perform the contract or effectuate the transaction within the time specified, without delay; (iv) the character, integrity, reputation, judgement, experience and efficiency of the bidder; (v) the quality of bidder's performance on previous purchases by, or contracts with, the City; and (vi) the ability of the bidder to provide future maintenance, repair parts and services for the supplies provided. (Section 57.102)

In addition to the above considerations, the City will also consider which bids will result in receipt by the City of sales or use tax under the Provisions of Part 1.5 of Division 2 of the California Revenue and Taxation Code and Article III of Chapter 41 of the Sacramento City Code and shall deduct the amount of such sales or use tax which will be received from any such bid. (Ordinance No. 4064)

THE CITY CANNOT ACCEPT A BID FAILING TO COMPLY WITH ANY OF THE ABOVE REQUIREMENTS

CITY OF SACRAMENTO
SACRAMENTO, CALIFORNIA

For furnishing to the City of Sacramento a Laser with Fiber Optic Detection System in accordance with the following provisions and specifications.

PRICING SCHEDULE

<u>Item No.</u>	<u>Quantity</u>	<u>Description</u>	<u>Manufacturer Model No.</u>	<u>Unit Price</u>
1	1 each	Laser, 5-watt visible Argon-ion, all lines blue-green (458 nm-514nm) with power supply	Spectra-Physics 2020-05	\$ 21,500.00
2	1 each	Fiber Optic Detection System for Item 1 with laser goggles and sheet of filter material	Spectra-Physics 316-01S	\$ 7,350.00
3	1 each	Prism assembly for single line operation at 488.0nm and 514nm	Spectra-Physics 0428-6081	\$ 450.00
4	1 each	5 Year extended warranty	2250-12	\$ 6,500.00
5		Additional equipment <u>XX</u> Yes <u> </u> No <u> </u> (Bidders to enclose attachment)	2290	1,200.00
6	1 lot	Installation		\$ No Charge
				Sub-Total \$ 37,000.00
				Sub-Total with Discount 32,000.00
				6% Sales Tax 1,920.00
				GRAND TOTAL \$ 33,920.00

General Instructions

The intent of this request for bid is to purchase a complete laser detection system capable of detecting latent fingerprints to the satisfaction of the Sacramento Police Department. This is a pre-acceptance condition. Should the above specifications be incomplete, bidders are to enclose an Attachment A with their bid listing any additional equipment necessary to complete the system.

The prices for this additional equipment shall be included in the grand total of the pricing schedule.

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Cash Discount

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Payment Discount: % for payment within calendar days.

TERMS: Net 30

By the
Office of the City Clerk

Delivery Guarantee

Vendor shall guarantee delivery within 63 days after receipt of order (ARO).

Brand Name or Equal

(As used in this clause, the term "brand name" includes identification of products by make and model.)

(a) If items called for by this Invitation for Bids have been identified in the Schedule by a "brand name or equal" description, such identification is intended to be descriptive, but not restrictive, and is to indicate the quality and characteristics of products that will be satisfactory. Bids offering "equal" products including products of the brand name manufacturer other than the one described by brand name will be considered for award if such products are clearly identified in the bids and are determined by the City to meet fully the salient characteristics requirements referenced in the Invitation for Bids.

(b) Unless the bidder clearly indicates in his bid that he is offering an "equal" product, his bid shall be considered as offering a brand name product referenced in the Invitation for Bids.

(c)(1) If the bidder proposes to furnish an "equal" product, the brand name, if any, of the product to be furnished shall be inserted in the space provided in the Invitation for Bids, or such product shall be otherwise clearly identified in the bid. The evaluation of bids and the determination as to equality of the product offered shall be the responsibility of the City and will be based on information furnished by the bidder or identified in his bid, as well as other information reasonably available to the purchasing activity. CAUTION TO BIDDERS. The purchasing activity is not responsible for locating or securing any information which is not identified in the bid and reasonably available to the purchasing activity. Accordingly, to insure that sufficient information is available, the bidder must furnish as a part of his bid all descriptive material (such as cuts, illustrations, drawings, or other information) necessary for the purchasing activity to (i) determine whether the product offered meets the salient characteristics requirements of the Invitation for Bids and (ii) establish exactly what the bidder proposes to furnish and what the City would be binding itself to purchase by making an award. The information furnished may include specific references to information previously furnished or to information otherwise available to the purchasing activity.

(2) If the bidder proposes to modify a product so as to make it conform to the requirements of the Invitation for Bids, he shall (i) include in his bid a clear description of such proposed modifications and (ii) clearly mark any descriptive material to show the proposed modifications.

(3) Modifications proposed after bid opening to make a product conform to a brand name product referenced in the Invitation for Bids will not be considered.



LASER PRODUCTS DIVISION
1250 WEST MIDDLEFIELD ROAD • P.O. BOX 7013
MOUNTAIN VIEW, CALIFORNIA 94039-7013
(415) 961-2550

Quotation

6-9403-MS

Sacramento City Council
c/o City Clerk, Room 203
City Hall
915 - I Street
Sacramento, CA 95814

Page 1 Of 1

This quotation is subject to the terms and conditions hereon and the terms and conditions set forth in the attached statement which is incorporated herein by reference.

A validated export license may be required for shipment of goods outside the territories of the U.S.A.

QUOTATION DATE	CUSTOMER REFERENCE	QUOTE FIRM FOR	TERMS	F.O.B.	SHIPPING RECOMMENDATION-VIA	
3/25/86	Bid #946	60 days	NET 30 DAYS	Destination	Surface	Best
ITEM	QUANTITY	DESCRIPTION	* APPROX. SHIP DATES	UNIT PRICE	TOTAL	
1	1 ea	Model 2020-05 Argon Ion Laser, with Model 2560 Power Supply, 5 Watt, Visible, including Items 1a-1c as standard equipment:	4-9 WKS ARO	\$21,500.00	\$21,500.00	
1a	1 ea	Model 2245 Standard Magnet (included)		N/C		
1b	1 ea	Model 2215 Dummy Passbank (included)		N/C		
1c	1 ea	Model 2225 Auxiliary Panel (included)		N/C		
2	1 ea	Model 316-01S Fiber Optic Coupler, Fingerprint Detection System		7,350.00	7,350.00	
3	1 ea	Model 0428-6081 Prism Assembly, Argon		450.00	450.00	
4	5 lot	Model 2250: 12-Month Warranty Extension for Model 2020, Visible		1,300.00	6,500.00	
5	1 ea	Model 2290 - High Resolution Digital End-Plate		1,200.00	1,200.00	
6	1 lot	Installation of above system		N/C	N/C	
		Sub-Total			\$37,000.00	
		Less Discount			(5,000.00)	
		Sub-Total with Discount			\$32,000.00	
		6% Sales Tax			1,920.00	
		TOTAL:			\$33,920.00	

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TERMS AND CONDITIONS

- Orders are FOB Mountain View unless otherwise indicated and are subject to acceptance only at seller's plant at Mountain View, California.
- Seller shall not be liable for any delay in performance of any order accepted by it or in delivery or shipment of material thereunder when such delay is directly or indirectly caused by or in any manner arises or results from fire, flood, accident, riot, war, governmental interference, rationing, allocations or embargoes, strikes or shortage of labor, delay in delivery of material sub-suppliers, or other difficulties (whether or not similar in nature to any of those specified) beyond its control.
- Stenographical and clerical errors on the face of this form are subject to correction.

REPRESENTATIVE

J. Michael Scott

SPECTRA-PHYSICS, INC. - AUTHORIZATION

Field Sales Engineer

SIGNATURE

J. Michael Scott/js

TITLE

* After receipt of confirming order.



A Significant Contribution

*CUSTOMER

STANDARD TERMS AND CONDITIONS OF SALE

GENERAL: INTERPRETATION AND COMPLETENESS: This contract is deemed made in the state of California and shall be interpreted under the Uniform Commercial Code and other laws of California in force at the date of the contract. The final, entire agreement pertaining to the sale to Buyer of the Goods described herein by Spectra-Physics ("Seller") is set forth on the face and reverse sides hereof; any prior understandings, agreements and representations, oral or written, shall be deemed superseded and merged in this contract. Agents and salesmen of Seller have no authority to make any representations not included herein. Seller hereby rejects any different or additional terms previously or hereafter proposed by Buyer, none of which shall be effective unless embodied in a writing signed by an authorized employee of Seller.

PRICE: The Goods and other items or services covered by this contract shall be sold and invoiced at Seller's prices and charges in effect at the time of each shipment of Goods under this contract. Seller reserves the right to change without notice the published list prices referenced on the face of this contract. Prices do not include sales, excise, use or other taxes (other than taxes based on income) now in effect or hereafter levied by reason of this transaction. Buyer shall pay all such taxes.

PAYMENT TERMS: A. Payment terms are net 30 days from date of invoice. Seller reserves the right to require alternative payment terms, including, without limitation, Sight Draft, Letter of Credit or Payment in Advance. If shipments are delayed by Buyer, payment shall be made based on the contract price and percent of completion. Buyer shall be liable for the price of all products substantially conforming to the contract, notwithstanding that Buyer may not have accepted, or may have revoked acceptance of same.

B. If payment is not received by the due date, a service charge will be added at the rate of 1 1/4% per month (18% per year) or the max. legal rate, whichever is less, to unpaid invoices from the due date thereof.

C. Remittances will be received by a bank simply as clearing agency. The receiving bank has no authority to determine whether or not the amount remitted constitutes payment in full. Remittances marked to indicate payment in full will be deposited by the bank notwithstanding such markings and such deposit shall not indicate our acceptance of the remittance as payment in full unless the remittance actually constitutes payment of all sums owed.

CREDIT: Seller may, at any time and in its sole discretion, limit or cancel the credit of Buyer as to time and amount, and as a consequence, may demand payment in cash before delivery of any unfilled portion of this contract, and may demand assurance of Buyer's due performance. Upon making such demand, Seller may suspend production, shipment and/or deliveries. If, within the period stated in such demand, but in no event longer than 30 days, Buyer fails to agree and comply with such different terms of payment, and/or fails to give adequate assurance of due performance, Seller may (1) by notice to Buyer, treat such failure or refusal as a repudiation by Buyer of the portion of the contract not then fully performed, whereupon Seller may cancel all further deliveries and any amounts unpaid hereunder shall immediately become due and payable or, (2) make shipments under reservation of a security interest and demand payment against tender of documents of title. If Seller retains a collection agency and/or attorney to collect overdue amounts, all collection costs, including attorney's fees, shall be payable to Buyer. Buyer hereby represents to Seller that Buyer is now solvent and agrees that each acceptance of delivery of the Goods sold hereunder shall constitute reaffirmation of this representation at such time.

SEVERAL SHIPMENTS: Seller may make delivery in installments and may render a separate invoice for each installment, which invoice shall be paid when due, without regard to subsequent deliveries. Each installment shall be deemed a separate sale. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept delivery of remaining installments. Any delivery not in dispute shall be paid for on the due date, as provided in this contract, without offset defense or counterclaim and regardless of controversies relating to other delivery or undelivered products.

TITLE, RISK OF LOSS, INSURANCE: Title to each shipment of the Goods sold hereunder and risk of loss thereon shall pass to Buyer when seller or its agent delivers such shipment to a common carrier or licensed trucker consigned to Buyer, or his agent, but such shipment shall remain subject to Seller's rights of stoppage in transit and of reclamation. If a strike, embargo, governmental action, or any other cause beyond Seller's control prevents shipment or delivery to Buyer or his agent, or if shipping instructions for any shipment are not received before shipment date, or if payment is to be made on or before delivery, title and risk of loss shall pass to Buyer (subject to Seller's rights as an unpaid Seller) and payment shall be made in accordance with invoice as though the Goods had been shipped and accepted by Buyer and Seller shall be under no duty to carry insurance thereafter.

CONSIGNEE GOODS: Buyer acknowledges that certain Goods provided by Seller may be supplied on a consignment basis. In the event any Goods are designated on the face of this form as consigned Goods, then Buyer agrees to execute all documents provided by Seller necessary to effectuate the consignor-consignee relationship and, in addition to any terms and conditions of consignment, specifically agrees that Seller shall retain title to all consigned Goods until such time as Buyer sells such goods to its customers. Buyer shall keep a current and accurate inventory and record of all consigned goods and shall permit Seller or Seller's representative to inspect said records and said goods at any reasonable time upon demand.

ACCEPTANCE: (1) Buyer or Buyer's agent may inspect the Goods at the place of manufacture. Buyer shall accept any tender of the Goods by Seller which substantially conform to the description of the Goods set forth herein. (2) Buyer shall be deemed to have accepted any product and Buyer's right to cancel, reject or claim any damages for breach of warranty or breach of Seller's obligation under this contract shall cease,

unless Buyer gives Seller notice in writing of Seller's breach: (a) in the case of defects discoverable through inspection, 14 days after arrival of the shipment or (b) in the case of defects not discoverable through inspection, 30 days after invoice date. (3) In the case of non-conforming goods, Buyer shall immediately notify seller whether or not Buyer will continue to accept similarly non-conforming Goods and acceptance of any non-conforming Goods shall constitute a waiver by Buyer of specification requirements for said goods. (4) In any event, when the product shall have been altered from its original state, Buyer shall be deemed to have accepted the product. Buyer's acceptance of Goods tendered under this contract shall be final and irrevocable.

DELIVERY: Seller will use every reasonable effort to effect shipment on or before the date indicated. Seller shall not be liable, directly or indirectly, for any delay or failure in performance or delivery or inability to perform or deliver where such delay, failure or inability arises or results from any cause beyond Seller's control or beyond the control of Seller's suppliers or contractors, including, but not limited to, strike, boycott or other labor disputes, embargo, governmental regulation, inability or delay in obtaining materials. In no event shall Seller, in the event of delays or otherwise be liable to Buyer or any third parties for any consequential, special, or contingent damages. In the event of any such delay or failure in performance, Seller shall have such additional time within which to perform its obligations hereunder as may reasonably be necessary under the circumstances; and Seller shall also have the right, to the extent necessary in Seller's reasonable judgment, to apportion fairly among its various customers in such manner as Seller may consider equitable, the goods then available for delivery. If, as a result of any such contingency, Seller is unable to perform this contract in whole or in part, then to the extent that it is unable to perform, the contract shall be deemed terminated without liability to either party, but shall remain in effect as to the unaffected portion of the contract, if any.

SELLER'S LIABILITY: If buyer timely notifies Seller under the terms hereof (which notice shall be in writing sent by registered mail) of a claimed defect, Buyer shall concurrently in writing offer seller opportunity to investigate the claim and to inspect allegedly defective Goods. If Seller determines that Buyer's claim is valid, Seller may repair the defective Goods or replace the defective Goods with conforming Goods at the F.O.B. point specified in this contract. Failure to offer Seller such opportunity shall constitute acceptance by Buyer and waiver of all claims for defects. Seller's liability for damages on account of a claimed defect in any product delivered by Seller shall in no event exceed the purchase price of the product on which the claim is based. Replacement of defective Goods or repayment of the purchase price for any such product will be made only upon return of the defective product. Specifically, and without limiting the generality of the foregoing, Seller shall not be responsible or liable to Buyer or to any third party for any lost profits, or incidental, consequential, indirect, special or contingent damages for any breach of warranty or other breach of Seller's obligations under this contract. Seller shall not be liable for damages relating to any instrument, equipment, or apparatus with which the product sold under this agreement is used.

SELLER'S REMEDIES: If Buyer fails, with or without cause, to furnish Seller with specifications and/or instructions for, or refuses to accept deliveries of any of the products sold under this contract, or is otherwise in default under or repudiates this contract or any other contract with Seller or fails to pay when due any invoice under this contract, then in addition to any and all remedies allowed by law, Seller without notice (1) may bill and declare due and payable all undelivered products under this or any other contract between Seller and Buyer and/or (2) may defer shipment under this or any other contract between Buyer and Seller until such default, breach or repudiation is removed and/or (3) may cancel any undelivered portion of this and/or any other contract in whole or in part (Buyer remaining liable for damages).

PACKING: All products shall be suitably packed for air shipment, unless otherwise requested by Buyer and agreed to in writing by Seller.

WARRANTY: Seller specifically excludes all express warranties and makes no implied warranty that the goods sold under this agreement are merchantable or are fit for any particular purpose, except such warranties expressly identified as warranties as are set forth in Seller's current operating manual, catalog or written guarantee covering such product. Seller also makes no warranty that the goods sold under this agreement are delivered free of the rightful claim of any third party by way of patent infringement or the like. If Buyer furnishes specifications to Seller, Buyer agrees to hold Seller harmless against any claim which arises out of compliance with the specifications. Any description of the Goods contained in this contract is for the sole purpose of identifying them, and any such description is not part of the basis of the bargain, and does not constitute a warranty that the goods shall conform to that description. Any sample or model used in connection with this contract is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a warranty that the goods will conform to the sample or model. No affirmation of fact or promise made by Seller, whether or not in this contract, shall constitute a warranty that the goods will conform to the affirmation or promise.

ASSIGNMENT: This contract and Buyer's rights thereunder may not be assigned by Buyer except with the prior written approval of Seller.

WAIVER: Waiver by Seller of any provision of this contract or of a breach by Buyer of any provision of this contract shall not be deemed a waiver of future compliance with this contract, and such provision, as well as all other provisions of this contract, shall remain in full force and effect.

FAIR LABOR STANDARDS ACT COMPLIANCE: Seller represents that these goods were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

Award

The City reserves the right to reject any and all proposals or alternate proposals as the best interest of the City may require. Consideration will be given in comparing proposals and in awarding a contract, not only to the amount of the proposal, but also the kind and quality of the equipment offered, its suitability for use in the service intended, as well as the lowest ultimate cost to the City. Time required for delivery may influence the award.

Bid Inquiries

Questions regarding this bid should be referred to:

Support Services Division
5730 24th Street, Bldg. 4
Sacramento, CA 95822
Attention: Merrily Whiteside
(916) 449-5551

These inquiries are to be submitted at least 10 days prior to the bid opening date. Any interpretations by the City will be made in the form of a written amendment. The receipt of such an amendment must be acknowledged in accordance with the directions on the amendment. Oral explanations or instructions given before the award of the contract will not be binding.

Contract Intent

Specifications on the following pages are written with the intent to meet and comply with all requirements but the final certification to comply shall rest with the vendor and not the City of Sacramento. Should requirements as specified not comply, the manufacturer is required to refigure and revise the specifications to meet all laws, rules and regulations where it applies, and the City of Sacramento is to be notified thereof.

Default By Supplier

In case of default by supplier, the City reserves the right to procure the articles or services from other sources and to hold the supplier responsible for any excess costs occasioned to the City thereby.

Delivery Ticket/Packing Slip

All shipments under this agreement shall be accompanied by a delivery ticket packing slip, or sales slip which shall include the following minimum information:

- (1) Name of supplier
- (2) Contract/purchase order number
- (3) Date of purchase
- (4) Itemized list of supplies or services furnished
- (5) Date of delivery or shipment

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By the
Office of the City Clerk

Evaluation (Demonstration)

City reserves the option for an "on the job demonstration and evaluation" by City personnel before acceptance of contract in the event performance of unit proposed is not familiar to the City. Demonstrator shall be available within 15 days of bid opening. Only units meeting these specifications shall be demonstrated. Time required for the evaluation shall be as determined by the City.

F.O.B.

Prices to be bid F.O.B. destination - as follows:

City of Sacramento
Police Department
631 H Street
Sacramento, CA 95814

General Provisions

The attached General Provisions, 1 and 6 only, are hereby made a part of this request for bids and any resultant contract(s).

Manufacturer's Name

Manufacturer's name, brand and/or product number must be inserted in the proper space on the bid form.

Order of Precedence

In the event of an inconsistency between the provisions of this solicitation, the inconsistency shall be resolved by giving precedence in the following order:

- (a) the Schedule (excluding the Specifications)
- (b) terms and conditions of the solicitation, if any
- (c) General Provisions
- (d) other provisions of the contract, when attached or incorporated by reference, and
- (e) the Specifications

Payment and Invoicing

Invoices, in triplicate, shall be mailed or delivered to City of Sacramento, Accounts Payable, 915 I Street, Room 114, Sacramento, CA 95814.

Payment Terms

Payment terms shall be 50% upon delivery and acceptance of the operational equipment by the Police Department with the balance to be paid upon completion and acceptance of the training by the Police Department. All cash discounts if taken shall be computed from the date of delivery or completion and acceptance of material, or from date of receipt of invoice, which ever is latest. Invoices must be submitted as specified at the time of shipping authorization.

Training

Once the system is operational, the vendor shall provide a minimum of two days (16 hours) of instruction in laser examination of evidence items. Trainer must possess the practical experience and knowledge necessary to provide comprehensive instruction in the utilization of the laser to illuminate latent prints including the use of rhodamine 6G, zinc chloride, and cyanoacrylate to compliment laser illumination. Training shall encompass laser safety, laser theory, examination and application methodologies, chemical formulations, basic operation, optic adjustments, and user level maintenance. A review of the Operator's manual shall also be conducted. Training shall take place in the Identification Unit, as scheduled by the Sacramento Police Department. Training must be completed within 90 days after acceptance of operational equipment by the Sacramento Police Department.

Safety Requirements

All merchandise must comply with current Federal laser product performance standards of the Bureau of Radiological Health, U. S. Department of Health, Education and Welfare.

Purchase Agreement Documents

A copy of the Notice Inviting Bids, the Bid and a copy of these General Conditions and the Specifications and Bid will remain on file in the Office of the City Purchasing Agent and it is understood will form the purchase agreement when accepted by the City-Manager. All materials or services supplied by the Contractor shall conform to the applicable requirements of the City Charter, City Ordinances, and all applicable State and Federal Laws, as well as conforming to the specifications contained herein.

Warranty/Guarantee

Contractor delivering merchandise against this specification shall guarantee that they meet the minimum requirements set forth herein. If it is found that the merchandise delivered does not meet the minimum requirements of this specification, the contractor will be required to correct the same at contractor's expense.

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APR 1 1986

By the
Office of the City Clerk

BIDDER'S NAME: Spectra-Physics, Inc., Laser Products Division

DO NOT DETACH THIS SHEET - SUBMIT ENTIRE BID PACKAGE AS YOUR PROPOSAL

*Note: addendum
not acknowledged*

DATE BID OPENED <u>4-1-86</u>	
EMPLOYEE INITIALS <u>mb</u>	
MARK ONE BOX FOR EACH ITEM ONLY	
BID SECURITY	
☒ NONE REQUIRED	
☐ PROPERLY SIGNED	
BID DEPOSIT TYPE	
☐ BID BOND	
☐ CALIF. BANK CASHIER'S CHECK	
☐ CERTIFIED CHECK	
☐ CASH	
☐ CALIF. BANK MONEY ORDER	
AFTER AWARD OF BID	
☐ SECURITY RETURNED	
☐ SECURITY ACCEPTED	
EMPLOYEE INITIALS	
DATE	

1. What is the purpose of the study?
 2. What are the research questions?
 3. What are the hypotheses?
 4. What are the variables?
 5. What are the methods?
 6. What are the results?
 7. What are the conclusions?
 8. What are the implications?
 9. What are the limitations?
 10. What are the future directions?

[illegible]

GENERAL PROVISIONS

1. Independent Contractor. At all times during the term of this Contract, Contractor shall be an independent Contractor and shall not be an employee of the City. City shall have the right to control Contractor only insofar as the results of Contractor's services rendered pursuant to this Contract; however, City shall not have the right to control the means by which Contractor accomplishes services rendered pursuant to this Contract.

2. Licenses; Permits; Etc. Contractor represents and warrants to City that he has all licenses, permits, qualifications and approvals of whatsoever nature which are legally required for Contractor to practice his profession. Contractor represents and warrants to City that Contractor shall, at his sole cost and expense, keep in effect at all times during the term of this Contract any licenses, permits, and approvals which are legally required for Contractor to practice his profession.

3. Insurance.

(a) Comprehensive Auto and General Liability. During the term of the Contract, Contractor shall maintain in full force and effect a comprehensive auto and general liability insurance in an amount of no less than \$500,000 single limit per occurrence, issued by an admitted insurer or insurers as defined by the California Insurance Code, providing that the city of Sacramento, its officers, employees and agents are to be named as additional insureds under the policy, and the policy shall stipulate that his insurance effected by the City or other named insured will be called on to contribute to a loss covered thereunder.

(b) Workman's Compensation. During the term of this Contract, Contractor shall fully comply with the terms of the law of California concerning workman's compensation. Said compliance shall include, but not be limited to, maintaining in full force and effect one or more policies of insurance insuring against any liability Contractor may have for workman's compensation.

(c) Errors and Omissions; Malpractice. In the event City requests Contractor to carry errors and omissions insurance or malpractice insurance, Contractor shall take out and keep in full force and effect during the term of this Contract a policy in form and content satisfactory to City which shall indemnify City against errors and omissions or malpractice by Contractor. Said policy or policies shall provide liability coverage in an amount specified by City in its request.

(d) Certificate of Insurance. The Contractor will have a standard "Certificate of Insurance" completed prior to engaging in any operation or activity set forth in this contract/agreement. Said policies shall provide that no cancellation, change in coverage, or expiration by the

GENERAL PROVISIONS - continued

insurance company or the insured shall occur during the term of this contract, without 30 days written notice to the City prior to the effective date of such cancellation or change in coverage.

4. Contractor Not Agent. Except as City may specify in writing, Contractor shall have no authority, express or implied, to act on behalf of City in any capacity whatsoever as an agent. Contractor shall have no authority, express or implied, pursuant to this Contract to bind City to any obligation whatsoever.

5. Assignment Prohibited. No part to this Contract may assign any right or obligation pursuant to this Contract. Any attempted or purported assignment of any right or obligation pursuant to this Contract shall be void and of no effect.

6. Indemnity and Hold Harmless. Contractor agrees to indemnify City against any and all liability, losses, claims, damages, or judgement arising from any act by, or negligence of, Contractor or its subcontractors of the officers, agents, or employees of either while engaged in the performance of this contract or while in or about the building or protected premises for any reason connected in any way whatsoever with the performance of this contract, or arising from any accident or injury, not caused by an act or omission of City, its agents, or employees or anyone employed by the City other than this Contractor, to any person, licensee, Contractor or subcontractor, or any officer, agent, or employee thereof while engaged in the performance of this contract, or while in or about the building or premises for any reason connected therewith.

Should it become necessary for purposes of resisting, adjusting, or compromising any claims or demands arising out of the subject matter with respect to which indemnification is provided by this paragraph or for purposes of enforcement of this paragraph, for City to incur any expenses, or become obligated to pay any attorneys' fees or time, in no event to exceed thirty (30) days, after receiving written notice from the City of the incurring of such expenses, attorneys' fees, or costs.

Contractor shall pay City interest at an annual rate of seven percent (7%) compounded quarterly on all expenses or costs reasonably incurred by City in the enforcement of this paragraph and of any sums City may pay as a result of claims, demands, costs, or judgements with respect to the subject matter of this contract, from the date such sums are actually paid.

EQUIPMENT SPECIFICATIONS
FOR
5-WATT VISIBLE ARGON-ION LASER

All lines blue green (458nm-514nm)

Prism assembly to allow single line operation at 488.0nm and 514.5nm

Produce 95%-100% full power within 10 minutes of turn on.

Plus or minus 5% power accuracy at all individual wave lengths.

Power drift of less than 3% over a 10 hour period.

Electrical requirement not to exceed: 208 volt, 3 phase, 22kw, 60 amp.

Water requirement not to exceed: 9.5 I/M; 2.5 GPM; 15-50 PSI

(Vendors who exceed water requirement may present their requirement to City for determination as to whether they can be accommodated).

Power supply to include:

Fully instrumented front panel.

Master key switch to prevent unauthorized use.

Power on and off switch.

Low pressure indicator.

Malfunction meter.

AC phase lamps to indicate that power lines are properly connected.

Current and power adjustment switch.

Function selection switch.

Audible alarm and status fault indicator.

Microprocessor based control system to monitor and maintain:

plasma tube current; plasma tube voltage; output power;
magnetic field; water flow; water temperature; safety interlock
status; utility status; automatic shutdown capability; memory
of fault that caused shutdown; memory of current or most recent
operating status; pre-light check off list to ensure that
components are working prior to power turn on; full digital
readout of operating wavelength.

Fiber Optic Coupler to include:

Key activated control box.

Adjustable beam divergence (6° to 20+°)

Coupler assembly with X-Y adjustment lens.

Shielded fiber, 20' in length, with slack box.

Footswitch controlled electronically activated beam shutter.

Beam attenuator.

Adaptor ring.

5-year extended warranty to include:

Parts and labor to cover all mechanical, electrical, and optional
parts and assemblies, including plasma tube, unconditionally
warranted to be free from defects in workmanship and materials.

Must be able to work with a refrigerated re-circulating heat exchanger.

Successful bidder will be required to approve the cooling system to be supplied by the City.



CITY OF SACRAMENTO

DEPARTMENT OF GENERAL SERVICES
SUPPORT SERVICES DIVISION

RECEIVED
CONTINENTAL LASER
CORPORATION
DATE 3/10/86 BY CF

CONTRACT SPECIFICATIONS FOR:

LASER DETECTION SYSTEM

PETE PETERSON
PRESIDENT

CONTINENTAL LASER CORPORATION

805 E. MIDDLEFIELD ROAD
MOUNTAIN VIEW, CALIFORNIA 94043
(415) 962-8402 TELEX/TWX 882 076
FAX (415) 962-0173

PROPOSAL NO: 946

PROPOSALS MUST BE RECEIVED

PRIOR TO: 10:30 A.M., APRIL 1, 1986

AT: CITY CLERK

915 I St. RM. 203

SACRAMENTO, CA. 95814

PRE-BID CONFERENCE: Not Required

FILED

APR 1 1986

By the
Office of the City Clerk

100-100000

RECEIVED
FEDERAL BUREAU OF INVESTIGATION
U.S. DEPARTMENT OF JUSTICE

DATE

BY

RECEIVED
FEDERAL BUREAU OF INVESTIGATION
U.S. DEPARTMENT OF JUSTICE

DATE BY

**BID TO THE
CITY OF SACRAMENTO, CALIFORNIA
PURCHASING DIVISION**

**BIDS MUST BE RECEIVED BY THE
CITY CLERK, ROOM 203, CITY HALL
PRIOR TO 10:30 A.M., TUESDAY
APRIL 1, 1986**

FOR: LASER DETECTION SYSTEM

BID NO: 946

Name of Bidder CONTINENTAL LASER CORPORATION Telephone (415) 962-8402

Type of Business: ☒ Corporation, ☐ Co-partnership, ☐ Individual doing business under his own name,
☐ Individual doing business using a firm name.

Business Address: 805 E MIDDLEFIELD RD., MT. VIEW, CA 94043
Street City State Zip Code

To the City of Sacramento:

The undersigned, as bidder, certifies that the only persons or parties interested in this bid as principals are those named herein as bidder; that this bid is made without collusion with any other person, firm, or corporation; that in submitting this bid he has examined the "General Conditions and Instructions to Bidders" and the specifications; that he proposes and agrees if this bid is accepted, he will execute and fully perform the contract for which bids are called; that he will perform all the work and / or furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements as therein set forth; and that he will take in full payment therefor, the prices set forth in the attached schedule.

ROYAL D. PETERSON, PRESIDENT

Typed or Printed Name and Title

[Signature]
Signature

SAME

Address (If different than above business address)

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (Example)

1. An individual using a firm name, sign: "John Doe an individual doing business as Blank Company."
2. An individual doing business under his own name, sign: your own name only.
3. A co-partnership, sign: "John Doe and Richard Roe, co-partners doing business as Blank Co., By John Doe, co-partner."
4. A corporation, sign: "Blank Company, by John Doe, secretary," (or other title).

FOR CITY USE ONLY

Bid was opened on above date and at prescribed place.

Bid bond required ☒ No ☐ Yes Amount _____

Received: ☐ Cashiers or Certified Check ☐ Surety Bond
drawn on a California bank

Lorraine Magana

City Clerk/Purchasing Agent

Approved as to form and legality

City Attorney

FILED

APR 1 1986

By the
Office of the City Clerk

GENERAL CONDITIONS AND INSTRUCTIONS TO BIDDER

NO BID IS IN LEGAL FORM UNLESS THE FOLLOWING INSTRUCTIONS ARE FULLY COMPLIED WITH

1. Bid must be submitted on this printed bid form and sealed in the envelope supplied.
2. All bids shall be clearly and distinctly written without erasure or interlineation, and properly signed by an authorized party, who shall indicate the capacity in which the signature is executed.
3. Alternate bids are invalid unless invited and covered by the specifications.
4. If required, a bid bond in the amount stated on the front of this form must accompany this bid. Payment must be made by cash, cashier's or certified check, or by surety bond.
5. All bids must be delivered to the designated recipient not later than the time specified on the front of this form.
6. No bidder shall be interested in more than one bid as provided by City Code Section 57.302.
7. The right to reject any and all bids is reserved by the City.
8. The City reserves the right to waive any informallties or minor irregularities in connection with bids received.
9. All provisions of Chapter 57 of the City Code are applicable to any bid submitted or contract awarded pursuant thereto.
10. **Faithful Performance Bond.** The successful bidder will [] will not ~~XXX~~ be required to submit a faithful performance bond, in a form approved by the city attorney, in the amount of _____.
11. **Cash Discounts.** Cash discounts offered for payment in less than ten (10) days will not be considered as a basis of award. Cash discounts offered for payment in ten (10) or more days will be subtracted from the total bid price for the purposes of bid evaluation. Any cash discount offered by the successful bidder will be accepted by the City of Sacramento, whether or not it was considered as a basis of award.
12. Bids will be opened, in public, in the City Council Chambers, City Hall, 915 - Eye Street, Sacramento, California, at ~~10:00~~ ^{10:30} a.m., APRIL 1, 1986. (Bids must be submitted prior to ~~10:00~~ ^{10:30} a.m.)
13. Within thirty (30) days after the bid opening a contract will be awarded by the City to the lowest responsible bidder, subject to the right of the city to reject all bids, as it may deem proper. The time for awarding a contract may be extended an additional thirty (30) days, at the sole discretion of the City, if required to evaluate bids or for such other purpose as the City may determine, unless the Bidder objects to such extension in writing with his bid. The "lowest responsible bidder" is defined as follows:

In addition to price in determining the lowest responsible bidder under the provisions of this chapter, consideration shall be given to: (i) the quality and performance of the supplies to be provided by the bidder; (ii) the ability, capacity and skill of the bidder to perform the contract or effectuate the transaction; (iii) the ability of the bidder to perform the contract or effectuate the transaction within the time specified, without delay; (iv) the character, integrity, reputation, judgement, experience and efficiency of the bidder; (v) the quality of bidder's performance on previous purchases by, or contracts with, the City; and (vi) the ability of the bidder to provide future maintenance, repair parts and services for the supplies provided. (Section 57.102)

In addition to the above considerations, the City will also consider which bids will result in receipt by the City of sales or use tax under the Provisions of Part 1.5 of Division 2 of the California Revenue and Taxation Code and Article III of Chapter 41 of the Sacramento City Code and shall deduct the amount of such sales or use tax which will be received from any such bid. (Ordinance No. 4064)

THE CITY CANNOT ACCEPT A BID FAILING TO COMPLY WITH ANY OF THE ABOVE REQUIREMENTS

CITY OF SACRAMENTO
SACRAMENTO, CALIFORNIA

For furnishing to the City of Sacramento a Laser with Fiber Optic Detection System in accordance with the following provisions and specifications.

PRICING SCHEDULE

Item No.	Quantity	Description	Manufacturer Model No.	Unit Price
1	1 each	Laser, 5-watt visible Argon-ion, all lines blue-green (458 nm-514nm) with power supply	* OEM W1050	\$14,850.00
2	1 each	Fiber Optic Detection System for Item 1 with laser goggles and sheet of filter material	**	\$
3	1 each	Prism assembly for single line operation at 488.0nm and 514nm		\$1,000.00
4	1 each	5 Year extended warranty		\$1,000.00
5		Additional equipment <u>Yes</u> <u>X</u> No (Bidders to enclose attachment)		
6	1 lot	Installation		\$ 1,500.00
Sub-Total				\$28,350.00
6% Sales Tax				1,701.00
GRAND TOTAL				\$30,051.00

General Instructions

SEE ATTACHMENT "A"

The intent of this request for bid is to purchase a complete laser detection system capable of detecting latent fingerprints to the satisfaction of the Sacramento Police Department. This is a pre-acceptance condition. Should the above specifications be incomplete, bidders are to enclose an Attachment A with their bid listing any additional equipment necessary to complete the system.

The prices for this additional equipment shall be included in the grand total of the pricing schedule.

Cash Discount

Payment Discount: N/A % for payment within N/A calendar days.

APR 1 1986

By the
Office of the City Clerk

* - See attached specification sheets - This bid is based on an OEM Laser.

***-- We do not manufacture these items - We can put you in contact with a company that can provide this portion of bid request.
Item #2 is not included in bid.

Delivery Guarantee

Vendor shall guarantee delivery within 30 days after receipt of order (ARO).

Brand Name or Equal

(As used in this clause, the term "brand name" includes identification of products by make and model.)

(a) If items called for by this Invitation for Bids have been identified in the Schedule by a "brand name or equal" description, such identification is intended to be descriptive, but not restrictive, and is to indicate the quality and characteristics of products that will be satisfactory. Bids offering "equal" products including products of the brand name manufacturer other than the one described by brand name will be considered for award if such products are clearly identified in the bids and are determined by the City to meet fully the salient characteristics requirements referenced in the Invitation for Bids.

(b) Unless the bidder clearly indicates in his bid that he is offering an "equal" product, his bid shall be considered as offering a brand name product referenced in the Invitation for Bids.

(c)(1) If the bidder proposes to furnish an "equal" product, the brand name, if any, of the product to be furnished shall be inserted in the space provided in the Invitation for Bids, or such product shall be otherwise clearly identified in the bid. The evaluation of bids and the determination as to equality of the product offered shall be the responsibility of the City and will be based on information furnished by the bidder or identified in his bid, as well as other information reasonably available to the purchasing activity. CAUTION TO BIDDERS. The purchasing activity is not responsible for locating or securing any information which is not identified in the bid and reasonably available to the purchasing activity. Accordingly, to insure that sufficient information is available, the bidder must furnish as a part of his bid all descriptive material (such as cuts, illustrations, drawings, or other information) necessary for the purchasing activity to (i) determine whether the product offered meets the salient characteristics requirements of the Invitation for Bids and (ii) establish exactly what the bidder proposes to furnish and what the City would be binding itself to purchase by making an award. The information furnished may include specific references to information previously furnished or to information otherwise available to the purchasing activity.

(2) If the bidder proposes to modify a product so as to make it conform to the requirements of the Invitation for Bids, he shall (i) include in his bid a clear description of such proposed modifications and (ii) clearly mark any descriptive material to show the proposed modifications.

(3) Modifications proposed after bid opening to make a product conform to a brand name product referenced in the Invitation for Bids will not be considered.

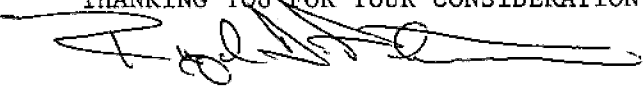
ATTACHMENT A

THIS BID IS SUBMITTED FOR OUR MODEL O.E.M. W1050 AND DOES NOT INCLUDE ITEM #2. THE LASER WOULD HAVE TO BE FITTED WITH ITEM #2 AND THE ENTIRE SYSTEM CERTIFIED BY ANOTHER COMPANY OR THE CITY, AS WE ARE SUBMITTING A BID BASED ON AN O.E.M. LASER SYSTEM PER THE ATTACHED SPECIFICATION SHEETS.

OUR BID DOES NOT INCLUDE EVERYTHING REQUESTED FOR ON PAGE 10 of 10. SEE OUR ATTACHED SPECIFICATION SHEETS. IF YOU HAVE ANY QUESTIONS, PLEASE FEEL FREE TO CONTACT US.

WE FEEL THAT THIS ALTERNATIVE TO YOUR BID REQUEST WOULD SERVE THE BEST INTEREST OF THE CITY AT A VERY ECONOMICAL PRICE.

THANKING YOU FOR YOUR CONSIDERATION.



ROYAL D. PETERSON
PRESIDENT
CONTINENTAL LASER CORPORATION

FILED

APR 1 1986

By the
Office of the City Clerk

Award

The City reserves the right to reject any and all proposals or alternate proposals as the best interest of the City may require. Consideration will be given in comparing proposals and in awarding a contract, not only to the amount of the proposal, but also the kind and quality of the equipment offered, its suitability for use in the service intended, as well as the lowest ultimate cost to the City. Time required for delivery may influence the award.

Bid Inquiries

Questions regarding this bid should be referred to:

Support Services Division
5730 24th Street, Bldg. 4
Sacramento, CA 95822
Attention: Merrily Whiteside
(916) 449-5551

These inquiries are to be submitted at least 10 days prior to the bid opening date. Any interpretations by the City will be made in the form of a written amendment. The receipt of such an amendment must be acknowledged in accordance with the directions on the amendment. Oral explanations or instructions given before the award of the contract will not be binding.

Contract Intent

Specifications on the following pages are written with the intent to meet and comply with all requirements but the final certification to comply shall rest with the vendor and not the City of Sacramento. Should requirements as specified not comply, the manufacturer is required to refigure and revise the specifications to meet all laws, rules and regulations where it applies, and the City of Sacramento is to be notified thereof.

Default By Supplier

In case of default by supplier, the City reserves the right to procure the articles or services from other sources and to hold the supplier responsible for any excess costs occasioned to the City thereby.

Delivery Ticket/Packing Slip

All shipments under this agreement shall be accompanied by a delivery ticket packing slip, or sales slip which shall include the following minimum information:

- (1) Name of supplier
- (2) Contract/purchase order number
- (3) Date of purchase
- (4) Itemized list of supplies or services furnished
- (5) Date of delivery or shipment

FILED

APR 1 1986

By the
Office of the City Clerk

Evaluation (Demonstration)

City reserves the option for an "on the job demonstration and evaluation" by City personnel before acceptance of contract in the event performance of unit proposed is not familiar to the City. Demonstrator shall be available within 15 days of bid opening. Only units meeting these specifications shall be demonstrated. Time required for the evaluation shall be as determined by the City.

F.O.B.

Prices to be bid F.O.B. destination - as follows:

City of Sacramento
Police Department
631 H Street
Sacramento, CA 95814

General Provisions

The attached General Provisions, 1 and 6 only, are hereby made a part of this request for bids and any resultant contract(s).

Manufacturer's Name

Manufacturer's name, brand and/or product number must be inserted in the proper space on the bid form.

Order of Precedence

In the event of an inconsistency between the provisions of this solicitation, the inconsistency shall be resolved by giving precedence in the following order:

- (a) the Schedule (excluding the Specifications)
- (b) terms and conditions of the solicitation, if any
- (c) General Provisions
- (d) other provisions of the contract, when attached or incorporated by reference, and
- (e) the Specifications

Payment and Invoicing

Invoices, in triplicate, shall be mailed or delivered to City of Sacramento, Accounts Payable, 915 I Street, Room 114, Sacramento, CA 95814.

Payment Terms

Payment terms shall be 50% upon delivery and acceptance of the operational equipment by the Police Department with the balance to be paid upon completion and acceptance of the training by the Police Department. All cash discounts if taken shall be computed from the date of delivery or completion and acceptance of material, or from date of receipt of invoice, which ever is latest. Invoices must be submitted as specified at the time of shipping authorization.

Training *

Once the system is operational, the vendor shall provide a minimum of two days (16 hours) of instruction in laser examination of evidence items. Trainer must possess the practical experience and knowledge necessary to provide comprehensive instruction in the utilization of the laser to illuminate latent prints including the use of rhodamine 6G, zinc chloride, and cyanoacrylate to compliment laser illumination. Training shall encompass laser safety, laser theory, examination and application methodologies, chemical formulations, basic operation, optic adjustments, and user level maintenance. A review of the Operator's manual shall also be conducted. Training shall take place in the Identification Unit, as scheduled by the Sacramento Police Department. Training must be completed within 90 days after acceptance of operational equipment by the Sacramento Police Department.

Safety Requirements **

All merchandise must comply with current Federal laser product performance standards of the Bureau of Radiological Health, U. S. Department of Health, Education and Welfare.

Purchase Agreement Documents

A copy of the Notice Inviting Bids, the Bid and a copy of these General Conditions and the Specifications and Bid will remain on file in the Office of the City Purchasing Agent and it is understood will form the purchase agreement when accepted by the City Manager. All materials or services supplied by the Contractor shall conform to the applicable requirements of the City Charter, City Ordinances, and all applicable State and Federal Laws, as well as conforming to the specifications contained herein.

Warranty/Guarantee

Contractor delivering merchandise against this specification shall guarantee that they meet the minimum requirements set forth herein. If it is found that the merchandise delivered does not meet the minimum requirements of this specification, the contractor will be required to correct the same at contractor's expense.

CONTINENTAL LASER CORPORATION

BIDDER'S NAME: _____

DO NOT DETACH THIS SHEET - SUBMIT ENTIRE BID PACKAGE AS YOUR PROPOSAL

* This training would have to be provided by company supplying Item #2 of bid. We are not bidding on Item #2.

** This bid is based on an OEM system which would have to be certified by the City or the company supplying Item #2, not CLC.

FILED

APR 1 1986

By the
Office of the City Clerk Page 7 of 10 Pages

over

DATE BID OPENED 4-1-86
EMPLOYEE INITIALS mls
MARK ONE BOX FOR EACH ITEM ONLY

BID SECURITY

- ☒ NONE REQUIRED
☐ PROPERLY SIGNED

BID DEPOSIT TYPE

- ☐ BID BOND
☐ CALIF. BANK CASHIER'S CHECK
☐ CERTIFIED CHECK
☐ CASH
☐ CALIF. BANK MONEY ORDER

AFTER AWARD OF BID

- ☐ SECURITY RETURNED
☐ SECURITY ACCEPTED

EMPLOYEE INITIALS _____

DATE _____

*addendum
acknowledged*

160



CITY OF SACRAMENTO

DEPARTMENT OF GENERAL SERVICES

SUPPORT SERVICES DIVISION

March 7, 1986
SS:Admin:86024:LT:mw:bb

PURCHASING
CENTRAL STORES
CENTRAL SERVICES

ADDENDUM NO. 1 TO BID NO. 946 FOR LASER DETECTION SYSTEM

1. Any equipment purchased from the bid should be able to work with a refrigerated re-circulating heat exchanger.
2. All other terms, conditions and specifications of the bid remain unchanged.
3. If a bid package is not being submitted, it is not necessary to return this addendum or acknowledge receipt of such.
4. Bidders submitting a bid package must acknowledge receipt of this addendum prior to the hour and date specified in the bid request by one of the following methods:
 - (a) By signing and returning one (1) copy of this addendum with the bid package if not previously submitted; or
 - (b) By separate letter or telegram which includes a reference to the bid request and addendum number if the bid package has been previously submitted. Failure of your acknowledgement to be received at the City Clerk's Office, 915 - I - Street, Room 203, Sacramento, California prior to the hour and date specified, may result in rejection of your offer. If, by virtue of this addendum you decide to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the bid request number, your company name and this addendum, and is received prior to the opening hour and date specified.

Linda Tretheway
Linda Tretheway
Support Services Administrator

Attachments

BIDDER'S NAME

By: *Royal D. Peterson* Royal D. Peterson, President
Signature and Typed or Printed Name

Company: CONTINENTAL LASER CORPORATION

Date: March 19, 1986

FILED

APR 1 1986

By the
Office of the City Clerk

GENERAL PROVISIONS

1. Independent Contractor. At all times during the term of this Contract, Contractor shall be an independent Contractor and shall not be an employee of the City. City shall have the right to control Contractor only insofar as the results of Contractor's services rendered pursuant to this Contract; however, City shall not have the right to control the means by which Contractor accomplishes services rendered pursuant to this Contract.

2. Licenses; Permits; Etc. Contractor represents and warrants to City that he has all licenses, permits, qualifications and approvals of whatsoever nature which are legally required for Contractor to practice his profession. Contractor represents and warrants to City that Contractor shall, at his sole cost and expense, keep in effect at all times during the term of this Contract any licenses, permits, and approvals which are legally required for Contractor to practice his profession.

3. Insurance.

(a) Comprehensive Auto and General Liability. During the term of the Contract, Contractor shall maintain in full force and effect a comprehensive auto and general liability insurance in an amount of no less than \$500,000 single limit per occurrence, issued by an admitted insurer or insurers as defined by the California Insurance Code, providing that the city of Sacramento, its officers, employees and agents are to be named as additional insureds under the policy, and the policy shall stipulate that his insurance effected by the City or other named insured will be called on to contribute to a loss covered thereunder.

(b) Workman's Compensation. During the term of this Contract, Contractor shall fully comply with the terms of the law of California concerning workman's compensation. Said compliance shall include, but not be limited to, maintaining in full force and effect one or more policies of insurance insuring against any liability Contractor may have for workman's compensation.

(c) Errors and Omissions; Malpractice. In the event City requests Contractor to carry errors and omissions insurance or malpractice insurance, Contractor shall take out and keep in full force and effect during the term of this Contract a policy in form and content satisfactory to City which shall indemnify City against errors and omissions or malpractice by Contractor. Said policy or policies shall provide liability coverage in an amount specified by City in its request.

(d) Certificate of Insurance. The Contractor will have a standard "Certificate of Insurance" completed prior to engaging in any operation or activity set forth in this contract/agreement. Said policies shall provide that no cancellation, change in coverage, or expiration by the

GENERAL PROVISIONS - continued

insurance company or the insured shall occur during the term of this contract, without 30 days written notice to the City prior to the effective date of such cancellation or change in coverage.

4. Contractor Not Agent. Except as City may specify in writing, Contractor shall have no authority, express or implied, to act on behalf of City in any capacity whatsoever as an agent. Contractor shall have no authority, express or implied, pursuant to this Contract to bind City to any obligation whatsoever.

5. Assignment Prohibited. No part to this Contract may assign any right or obligation pursuant to this Contract. Any attempted or purported assignment of any right or obligation pursuant to this Contract shall be void and of no effect.

6. Indemnity and Hold Harmless. Contractor agrees to indemnify City against any and all liability, losses, claims, damages, or judgement arising from any act by, or negligence of, Contractor or its subcontractors of the officers, agents, or employees of either while engaged in the performance of this contract or while in or about the building or protected premises for any reason connected in any way whatsoever with the performance of this contract, or arising from any accident or injury, not caused by an act or omission of City, its agents, or employees or anyone employed by the City other than this Contractor, to any person, licensee, Contractor or subcontractor, or any officer, agent, or employee thereof while engaged in the performance of this contract, or while in or about the building or premises for any reason connected therewith.

Should it become necessary for purposes of resisting, adjusting, or compromising any claims or demands arising out of the subject matter with respect to which indemnification is provided by this paragraph or for purposes of enforcement of this paragraph, for City to incur any expenses, or become obligated to pay any attorneys' fees or time, in no event to exceed thirty (30) days, after receiving written notice from the City of the incurring of such expenses, attorneys' fees, or costs.

Contractor shall pay City interest at an annual rate of seven percent (7%) compounded quarterly on all expenses or costs reasonably incurred by City in the enforcement of this paragraph and of any sums City may pay as a result of claims, demands, costs, or judgements with respect to the subject matter of this contract, from the date such sums are actually paid.

EQUIPMENT SPECIFICATIONS *
FOR
5-WATT VISIBLE ARGON-ION LASER

All lines blue green (458nm-514nm)

Prism assembly to allow single line operation at 488.0nm and 514.5nm

Produce 95%-100% full power within 10 minutes of turn on.

Plus or minus 5% power accuracy at all individual wave lengths.

Power drift of less than 3% over a 10 hour period.

Electrical requirement not to exceed: 208 volt, 3 phase, 22kw, 60 amp.

Water requirement not to exceed: 9.5 I/M; 2.5 GPM; 15-50 PSI

(Vendors who exceed water requirement may present their requirement to City for determination as to whether they can be accommodated).

Power supply to include:

Fully instrumented front panel.

Master key switch to prevent unauthorized use.

Power on and off switch.

Low pressure indicator.

Malfunction meter.

AC phase lamps to indicate that power lines are properly connected.

Current and power adjustment switch.

Function selection switch.

Audible alarm and status fault indicator.

Microprocessor based control system to monitor and maintain:

plasma tube current; plasma tube voltage; output power;

magnetic field; water flow; water temperature; safety interlock

status; utility status; automatic shutdown capability; memory

of fault that caused shutdown; memory of current or most recent

operating status; pre-light check off list to ensure that

components are working prior to power turn on; full digital

readout of operating wavelength.

Fiber Optic Coupler to include:

Key activated control box.

Adjustable beam divergence (6° to 20+°)

Coupler assembly with X-Y adjustment lens.

Shielded fiber, 20' in length, with slack box.

Footswitch controlled electronically activated beam shutter.

Beam attenuator.

Adaptor ring.

5-year extended warranty to include:

Parts and labor to cover all mechanical, electrical, and optional

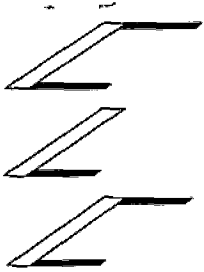
parts and assemblies, including plasma tube, unconditionally

warranted to be free from defects in workmanship and materials.

Must be able to work with a refrigerated re-circulating heat exchanger.

Successful bidder will be required to approve the cooling system to be supplied by the City.

* See attachment "A" and attached specification sheets.



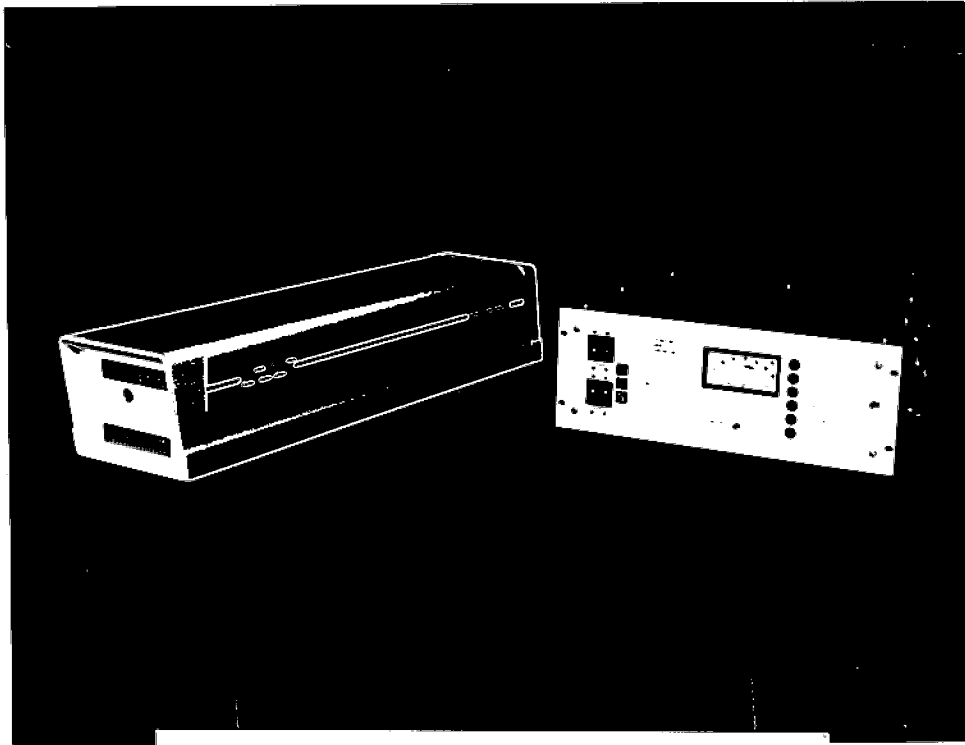
CONTINENTAL LASER CORPORATION

1000 SERIES OEM LASERS

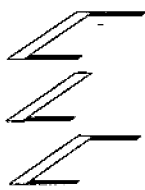
SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

BEAM DIAMETER (@1/e ² points)	1.4 mm
BEAM DIVERGENCE (full angle)	0.7 mrad
BEAM POLARIZATION RATIO	>100:1, E-vector vertical
AMPLITUDE POWER STABILITY (variation in any one hour period)	
LIGHT REGULATION	± 0.5%
CURRENT REGULATION (after 30 min. warm up)	± 3.0%
OPTICAL NOISE (10Hz to 2MHz)	
LIGHT REGULATION	± 0.2%rms
CURRENT REGULATION	± 1.0%rms
CAVITY CONFIGURATION	spherical
OPTICAL RESONATOR *	Non-orthogonal large diameter, solid invar rods for superior beam pointing and length stability.
CAVITY LENGTH	
WITH PRISM WAVELENGTH SELECTOR	770 mm
WITH MULTILINE MIRROR HOLDER	730 mm
LONGITUDE MODE SPACING	
WITH PRISM WAVELENGTH SELECTOR	195 MHz
WITH MULTILINE MIRROR HOLDER	205 MHz

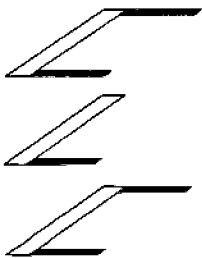


PETE PETERSON
PRESIDENT



CONTINENTAL LASER CORPORATION

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ALPHARETTA, GEORGIA 30201
(404) 442-0079 TELEX/TWX 882 076
FAX (404) 442-0416



CONTINENTAL LASER CORPORATION

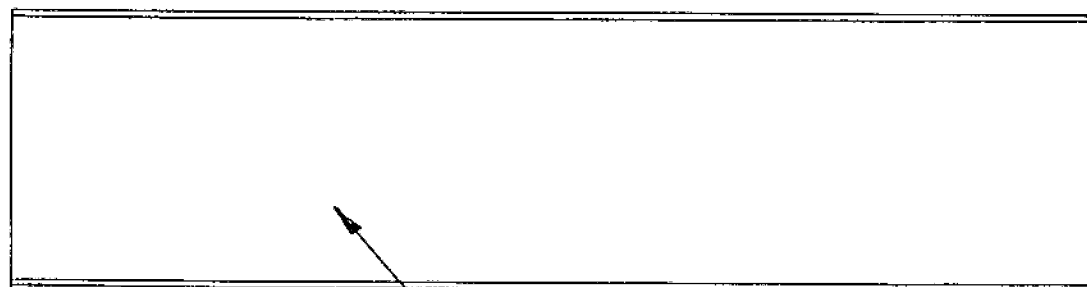
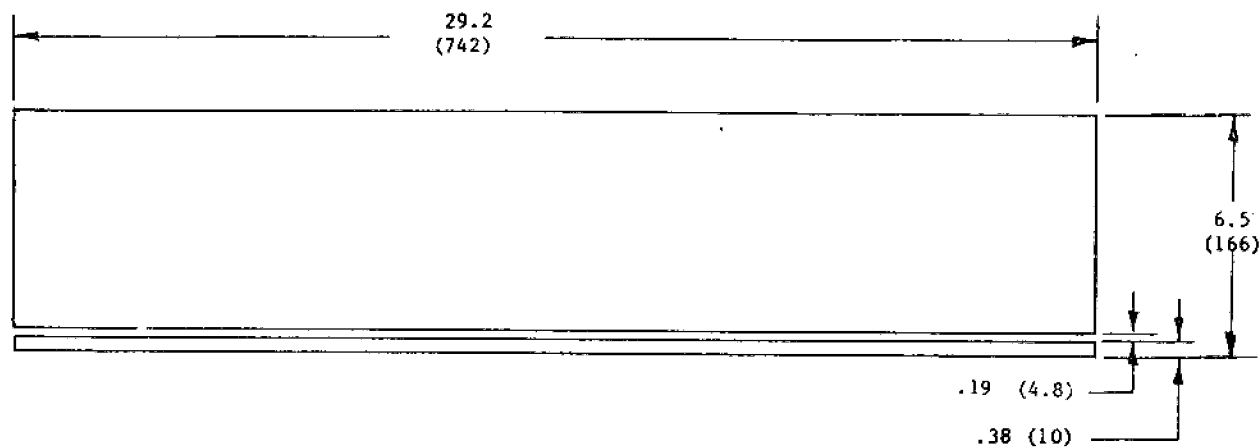
SPECIFICATIONS CONTINUED

PLASMA TUBE BORE MATERIAL	BeO, metallic-ceramic construction
ELECTRICAL SERVICE REQUIRED **	220 VAC, 1-phase/3-phase, 50/60 Hz
MAXIMUM LINE CURRENT	40 amps
COOLING	Air or Water
LASER HEAD SIZE *** (H x W x L)	5.9 x 7.2 x 29.2 inches (150 x 185 x 741 mm)
LASER HEAD WEIGHT	80 lbs. (36 kg)
POWER SUPPLY SIZE *** (H x W x D)	6.9 x 17.4 x 14.2 inches (176 x 443 x 362 mm)
POWER SUPPLY WEIGHT	44.5 lbs. (20 kg)

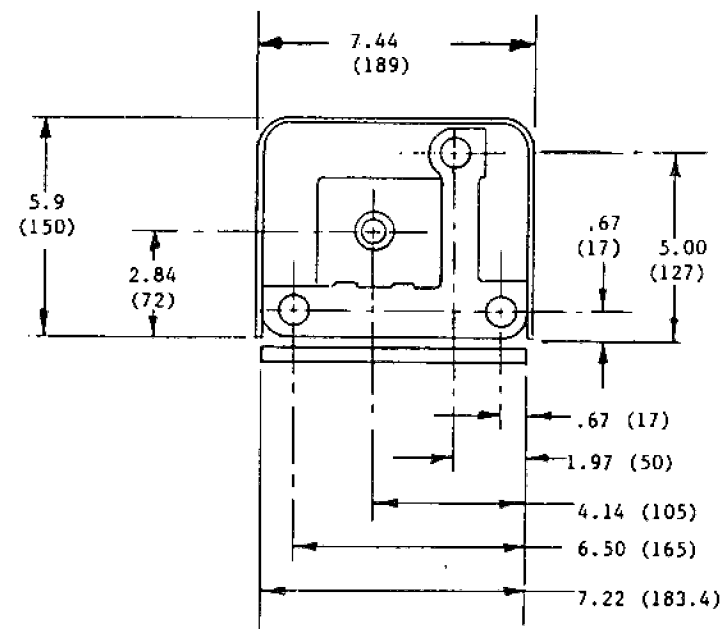
* Resonator rods and/or base plate may be extended beyond front of laser to accommodate any special requirements by the customer.

** Incoming line voltages in some areas may necessitate the use of an optional boost transformer.

*** Dimensions may be changed to accommodate any special requirements by the customer.



OPTIONAL MOUNTING HOLE
SIZE AND PATTERNS WILL
BE PROVIDED TO MEET
CUSTOMER'S REQUIREMENTS

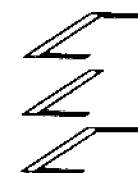


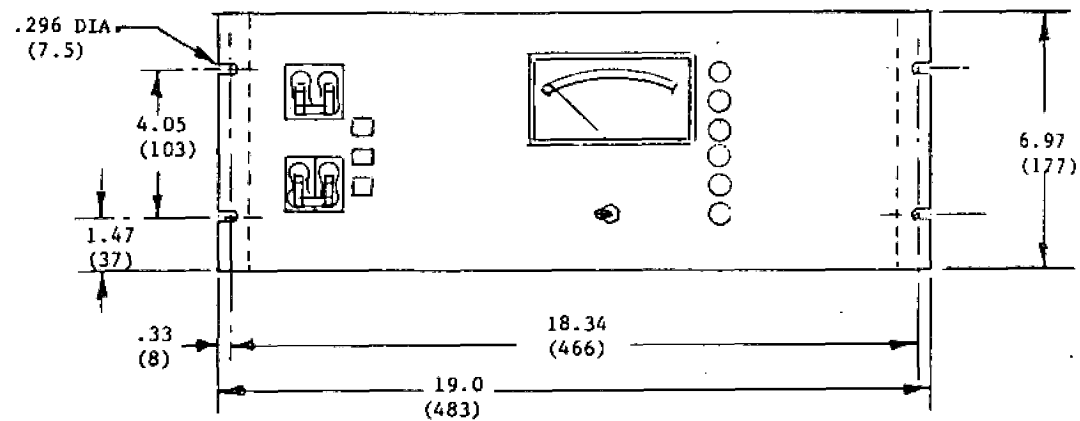
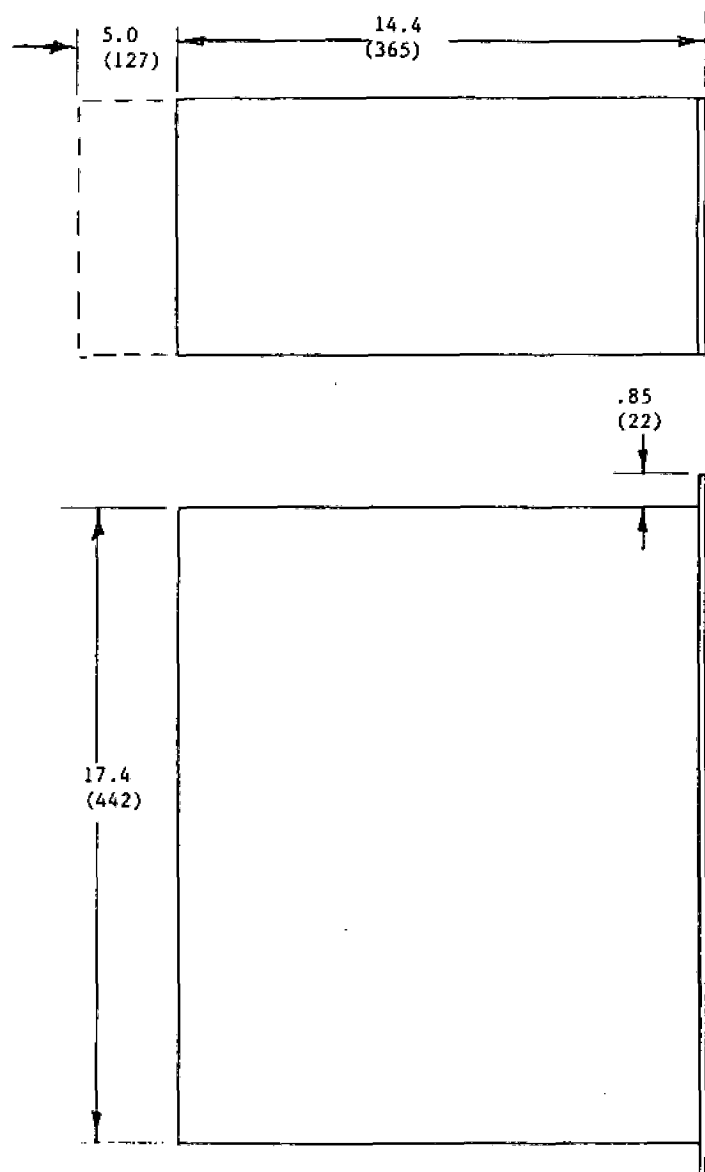
NOTE: ALL DIMENSIONS ARE IN INCHES
WITH METRIC EQUIVALENTS IN
PARENTHESIS.

1000 SERIES

LASER HEAD

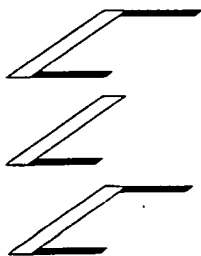
OUTLINE DIAGRAM

 **CONTINENTAL
LASER
CORPORATION**



NOTE: ALL DIMENSIONS ARE IN INCHES
WITH METRIC EQUIVALENTS IN
PARENTHESIS.

1000 SERIES
POWER SUPPLY OUTLINE DIAGRAM



CONTINENTAL LASER CORPORATION

POWER SPECIFICATIONS

<u>ARGON MODELS</u>	<u>1020/3020</u>	<u>1030/3030</u>	<u>1040/3040</u>	<u>1050/3050</u>
<u>WAVELENGTH</u>				
MULTILINE	2.000	3.000	4.000	5.000
528.7	0.150	0.200	0.250	0.350
514.5	0.800	1.400	1.700	2.000
501.7	0.100	0.200	0.300	0.400
496.5	0.300	0.400	0.500	0.700
488.0	0.700	1.000	1.300	1.500
476.5	0.300	0.400	0.500	0.750
472.7	-----	0.060	0.120	0.300
465.8	-----	0.050	0.100	0.200
457.9	0.150	0.200	0.250	0.350
454.5	-----	-----	0.050	0.120

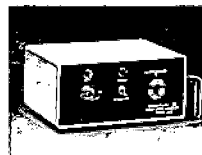
NOTES: 1 - THE ABOVE ARE MULTILINE AND SINGLE LINE POWERS FOR OEM AND SCIENTIFIC MODELS.

2 - ALL ARE TYPICAL BUT SPECIAL OPTICS MAY BE REQUIRED FOR LINES OTHER THAN 488.0 AND 514.5.

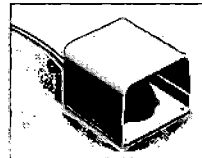
3 - POWER IS IN WATTS.

Model 316-01 Specifications

Fiber Composition	Fused Silica
Fiber Type	Multimode/Homogeneous Core
Fiber Diameter	600 microns
Cable/Fiber Length	6.1 m (20 ft.)
Wavelength Range	.370 to 1.5 microns
Input Power Maximum	25 Watts (@ 458-514 nm)
Power Transmitted Through Fiber (@ 514 nm)	
Without Attenuator in Beam	>75% of Input Power
With Attenuator in Beam	<2.0% of Input Power
Beam Divergence	6° to >20° (adjustable)
Electrical Requirements	110 VAC/220 VAC



Key Activated Control Box provides power to the shutter/attenuator solenoids and voltage to the plasma tube current modulator on the laser power supply. This allows "aiming beam only" on/off operation when the switch is in the *standby* position, and full power on/off control when the switch is in the *ready* position. Indicator lights glow for power on and ready activation.



Footswitch allows hands-off control of beam shutter and attenuator. A metal shield inhibits accidental activation.

Laser Safety

Spectra-Physics has worked closely with federal agencies to promote the safe use of lasers, and has designed these products to comply with the Bureau of Radiological Health (BRH) standards now in effect in the United States.

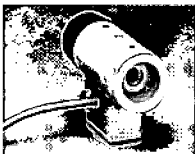
BRH warning logotypes, similar to that shown below, appear on each laser to indicate the BRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype.



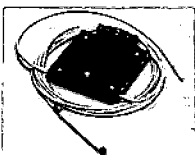
Warranty

Spectra-Physics products are protected by a one-year warranty unless otherwise noted. All mechanical, electronic, and optical parts and assemblies, including plasma tubes, are unconditionally warranted to be free from defects in workmanship and material for the first year following delivery. This warranty is in lieu of all other warranties, expressed or implied, and does not cover incidental or consequential loss.

Model 316-01 Product Components



Coupler Assembly contains a lens with X-Y adjustments for proper fiber alignment, an electronically activated beam shutter which is footswitch controlled, and a beam attenuator which provides a weak "aiming beam" for alignment of sample before full exposure, also footswitch activated.



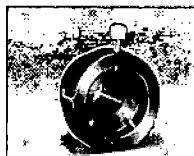
Shielded Fiber gives low loss power throughout with flexible yet rugged protection. The slack box contains coiled fiber to give strain relief to the cable and provides a convenient point for beam divergence control operation.

Simple Operation Procedure

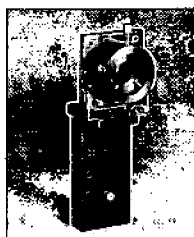
Not intended for instructional use. See product manual for complete operating instructions.

1. Switch on ion laser and Model 316 Power Supply. Set power control knob to minimum.
2. Set fiber controller switch to "STAND BY" mode
3. Point fiber wand in safe direction and depress footswitch
4. Using attenuated output, align wand with sample to be illuminated and set beam divergence using divergence control.
5. Reset fiber controller switch to "READY" mode
6. Depress footswitch and illuminate sample
7. Adjust ion laser power with controller knob

Ordering Information



Model 317 Adaptor Ring



Model 318 Dye Laser Adaptor

- Model 316-01 Fiber Optic Coupler includes: coupler assembly, shielded fiber, control box, footswitch, and BNC cable.
- Model 317 Adaptor Ring attaches to the accessory plate of a high power ion laser to support the fiber optic.
- Model 318 Dye Laser Adaptor bolts to the end of the Model 377/378 optical rail and allows use of the fiber optic coupler with a standing wave dye laser (adaptor ring not included).
- Model 316-01S Fingerprint Detection Kit includes: Model 316-01, Model 317, *Fingerprint Detection With Lasers* by E. Roland Menzel, two pairs of argon safety goggles, sheet of argon filter material.

Spectra-Physics

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Mountain View, CA 94039-7013
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(800) 631-5693 (outside NJ)

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Other Europe, Africa, Near East, Middle East, contact your local Spectra-Physics representative or **Spectra-Physics, GmbH**
Siemensstrasse 20
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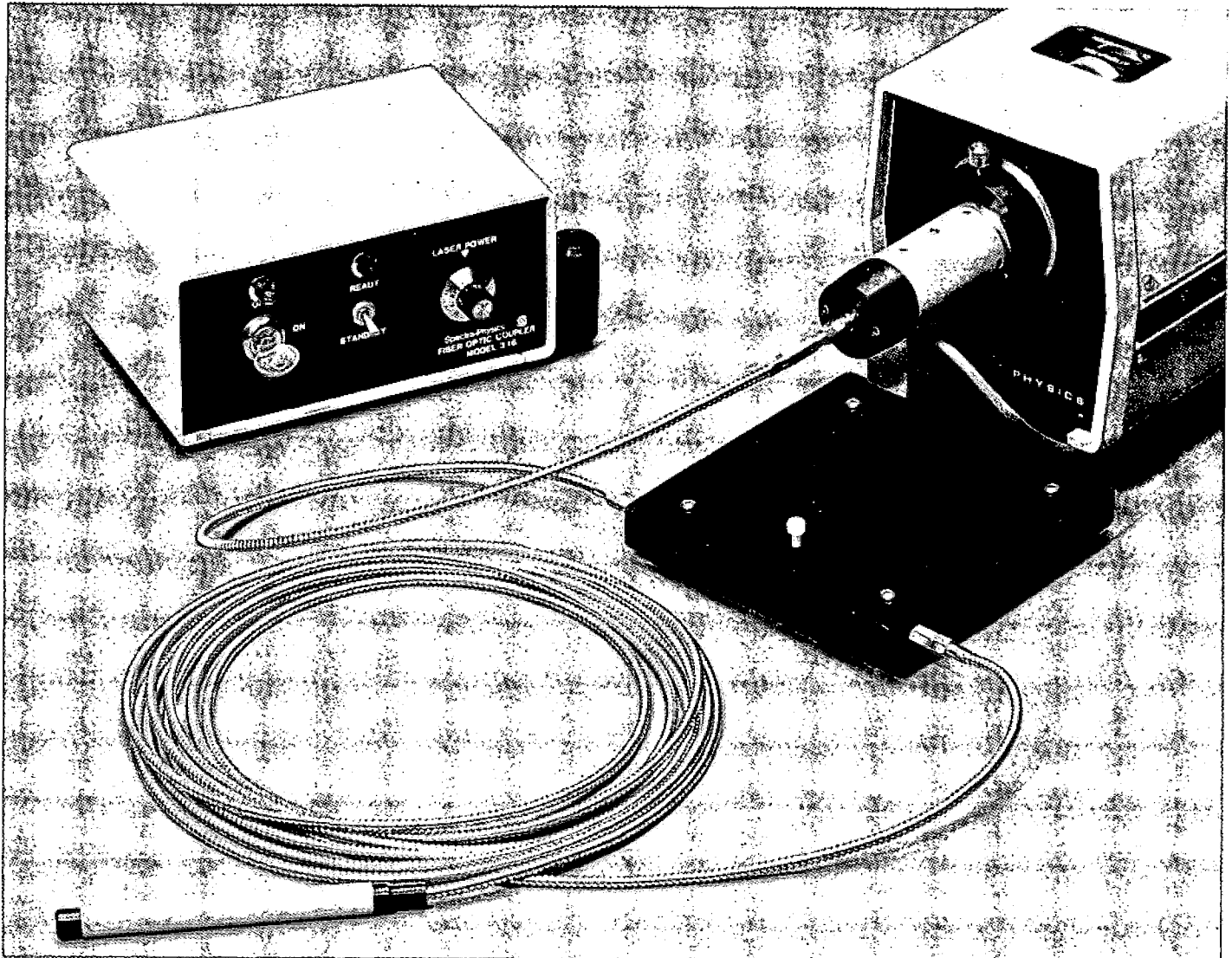
Canada, Latin America, Pacific Areas

Spectra-Physics International
1250 West Middlefield Road
P.O. Box 7013
Mountain View, CA 94039-7013, USA
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Spectra-Physics

Models 316/317/318

Fiber Optic Coupler Accessories



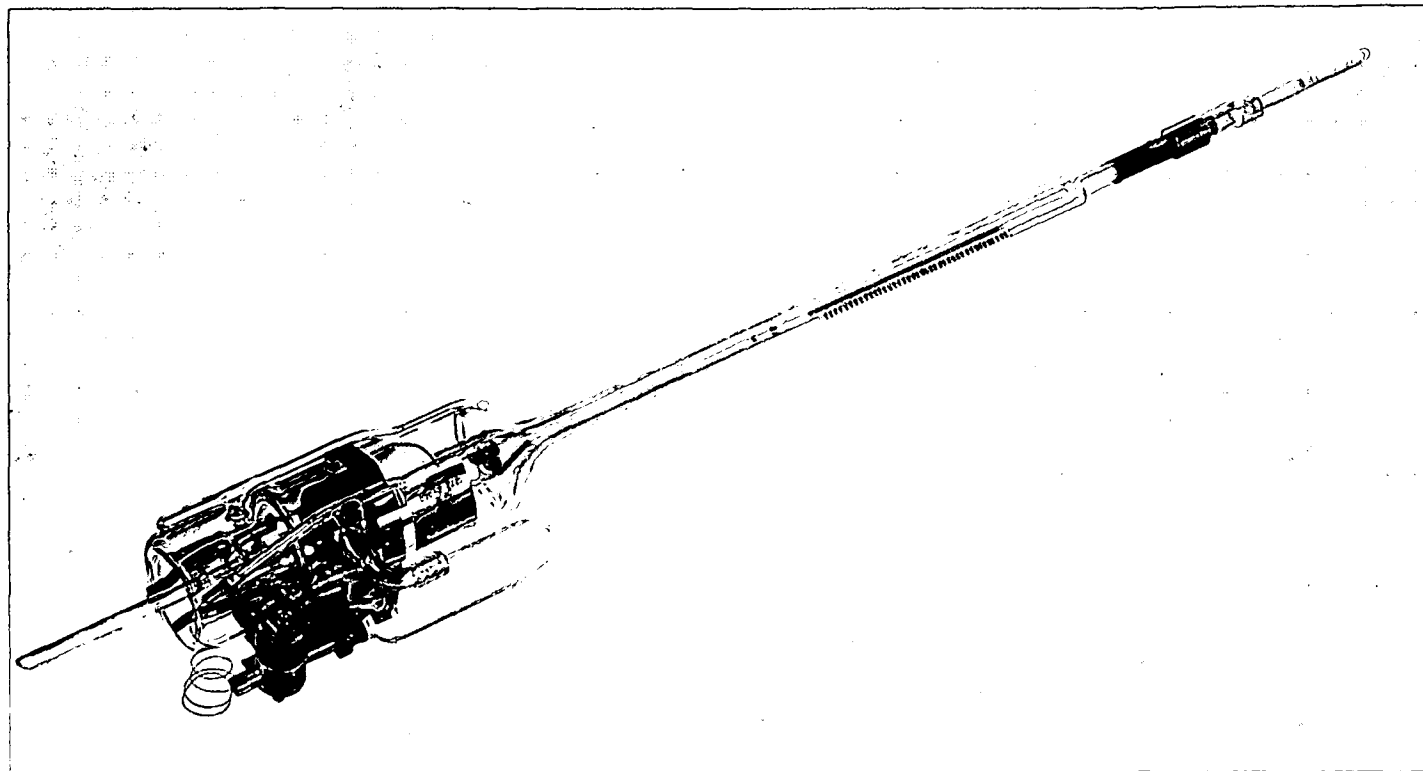
Features

- Stable Alignment
- Flexible Metal Fiber Casing
- Beam Shutter and Attenuator
- Adjustable Beam Divergence
- Foot-Activated Shutter Control
- Remote Laser Current Control
- Fiber Strain Relief

The Model 316 Laser Fiber Optic Coupler safely and efficiently couples laser light into an optical fiber for applications requiring remote, directable illumination with high-intensity laser output. An electronically operated beam shutter/beam attenuator assembly and a remote laser plasma current control allow the user to precisely determine the direction and amount of light output both before and during exposure. A flexible metal casing around the fiber and a slack box containing additional loops of fiber provide protection against damage from impact or stress in situations requiring rugged handling. Output beam divergence can be adjusted to accommodate different sample sizes with the turn of a fiber-compressing knob. An ultraprecise, three-point mounting ring (Model 317) eliminates the need for realignment or adjustment after installation.

The fiber optic coupler is adaptable to any Spectra-Physics high power ion laser with the Model 317 Adaptor Ring, and to any Spectra-Physics standing wave dye laser with the Model 318 Dye Laser Adaptor.

Plasma Tube



BERYLLIUM OXIDE BORE

- **Low Operating Temperature**
Stable Output Power
Fast Warm-up and Cool-down
Low Frequency Jitter
Safe Operation
Low Bore Light Continuum
- **Stable Operating Pressure**
Stable Long-term Output Power
Extended Lifetime
- **Low Plasma Discharge Erosion**
No Dust or Flakes
Downward Window Orientation
Allows Vertical Mounting

LARGE DIAMETER EXTERNAL GAS RETURN

- **Uniform Gas Pressure**
- **Easy, Reliable Start-up**

HARD SEAL DESIGN

- **Indefinite Shelf Life**
- **No Epoxy Contamination**

The plasma tube is the most critical component of any ion laser. It must provide the optical gain necessary for lasing by sustaining a high-current density arc discharge through its bore. This necessitates a rugged and reliable design capable of dissipating large amounts of heat and maintaining ultra-high-purity vacuum conditions. Years of design and manufacturing experience at Spectra-Physics have resulted in a plasma tube well recognized for performance and reliability.

BERYLLIUM OXIDE BORE

The primary consideration in plasma tube design is choice of the bore material. The material utilized must provide the optimum combination of the following properties:

High Thermal Conductivity

Ion lasers by nature are low-efficiency devices. For each watt of light output generated, 1.5 kW or more of electrical power must be dissipated as heat in the plasma tube bore. This heat must be efficiently transferred from the inside diameter of the bore to the cooling water.

Low Porosity

Porosity is important for three reasons. First, the bore must be vacuum-tight. Porous materials do not fill this requirement. Second, porous materials provide traps for contaminants which will slowly and continuously outgas under operating con-

ditions and contaminate the fill-gas. Third, porosity significantly increases the internal surface area of the bore, thus increasing the rate at which the fill-gas of the tube is depleted.

High Mechanical Strength

To withstand mechanical and thermal shock, the bore must be constructed of a material with excellent properties of mechanical strength. In addition, the bore material must be able to withstand severe discharge conditions without flaking or powdering, to avoid contamination of the Brewster window surfaces.

Electrical Insulation

To start and maintain an arc discharge, the electrical conductivity of the gas must be higher than the conductivity of the surrounding walls.

High Dielectric Strength

In order to start an arc discharge, a high-voltage pulse must be applied across the gas. The bore material must be able to withstand this start pulse without breakdown.

High Purity and Low Vapor Pressure

As with all ultra-high-vacuum materials, the bore material must have an extremely low vapor pressure and be free of extraneous materials with higher vapor pressures.

Of all the possible materials or combinations of materials which are available to

address these requirements, time and experience have proven Beryllium Oxide (BeO) to be the best choice for state-of-the-art bore designs.

— The thermal conductivity of BeO is .45 cal/cm/sec/°C, a value higher than that of most metals.

— Porosity of BeO is extremely low. BeO is hot-pressed ceramic with densities typically 97% of the theoretical value.

— BeO has long been known for its strength, rigidity, and dimensional stability. Its modulus of rupture is greater than 28,000 psi, while its modulus of elasticity is in excess of 50×10^6 psi. In addition, BeO is highly resistant to abrasion.

— BeO is an excellent electrical insulator with a resistivity of 10^{18} ohm-cm.

— The dielectric strength of BeO is 700 volts per one thousandth of an inch.

— The BeO specified in Spectra-Physics lasers, is guaranteed to be greater than 99.5% pure. The vapor pressure of BeO is less than 10^{-11} mm Hg at 120° C.

This unique combination of physical properties provided by beryllium oxide results in Spectra-Physics bore designs which offer unmatched performance features.

Low Operating Temperature

- Stable Output Power
- Fast Warm-Up and Cool-Down
- Low Frequency Jitter
- Safe Operation
- Low Bore Light Continuum

Under the most severe operating conditions, the inside bore temperature is less than 120°C. This low operating temperature is the result of two properties of BeO. First, its high thermal conductivity results in a low temperature difference across the BeO wall. Second, the low porosity of BeO allows it to be used as the vacuum wall of the plasma tube without requiring an intermediate vacuum wall. Consequently, the BeO bore is conduction-cooled by being in direct contact with the cooling water. This low operating temperature results in several advantages.

The efficient removal of heat by the cooling water leaves little heat to affect the alignment of the resonator, thus ensuring highly stable output power. In addition, since the plasma tube temperature is virtually constant with respect to changes in tube operating current, no waiting period is required to let the plasma tube and the resonator adjust to a new equilibrium operating temperature.

The low operating temperature of the BeO bore enables the plasma tube to

reach thermal equilibrium 60 seconds after turn-on. The low heat storage in the plasma tube also allows the cooling water to be turned off without a waiting period after electrical shutdown.

The high thermal conductivity of the BeO material results in uniform cooling along its length. Since there are no hot spots to cause local boiling of the cooling water, microphonics and resultant frequency jitter are low. This is very important in single frequency applications which require minimizing frequency jitter.

Energy stored in the BeO bore after electrical shutdown is never enough to boil the cooling water. Thus, in case of an unexpected interruption in water flow, an interlock is tripped which turns off electrical power and safe shutdown is achieved. No steam is generated to create dangerous high pressures within the cooling jacket.

Since the low operating temperature of the BeO bore material allows low temperature operation of the plasma discharge, the background continuum from spontaneous emission of the discharge is low.

Stable Operating Tube Pressure

The low porosity of BeO and the low temperature of the plasma discharge minimize changes in gas pressure due to interactions between the gas and the bore wall. Spectra-Physics ion lasers are capable of stable operation for periods up to several hundred hours without requiring a gas-fill. Since laser output power is a function of gas pressure, this results in excellent long-term power stability.

Low Plasma Discharge Erosion

- No Dust or Flakes
- Downward Window Orientation
- Allows Vertical Mounting

Beryllium oxide is extremely resistant to erosion by the plasma discharge. Also, since BeO is an insulator, the inside diameter of the bore can be designed as a continuous surface and can be accurately contoured to match the profile of the plasma discharge.

These features of BeO prevent generation of dust or flakes within the plasma tube, which can land on the Brewster windows and reduce or prevent lasing.

Since no dust or flakes are generated inside the plasma tube, the Brewster windows can be oriented so that the external surface is facing downward, thus preventing external dust from settling on the window.

The absence of loose internal particulates also allows Spectra-Physics lasers

to be mounted in any orientation, even vertically!

LARGE-DIAMETER GAS RETURN

Uniform Gas Pressure Easy, Reliable Start-Up

In all ion lasers, the high current density in the bore tends to pump the fill-gas toward the anode. To compensate for this, some path external to the bore must be provided for the gas to return to the cathode end of the tube, thus equalizing pressure. This gas return path must fill two requirements: high gas conductance for free gas flow, and low electrical conductance to prevent the discharge from striking down the return path.

Spectra-Physics plasma tubes utilize a large-diameter pipe for free gas flow. A proprietary discharge isolator within the pipe guarantees confinement of the discharge to the main bore. Thus, reliable start-up and confinement of the discharge to the main bore is ensured for thousands of operating hours.

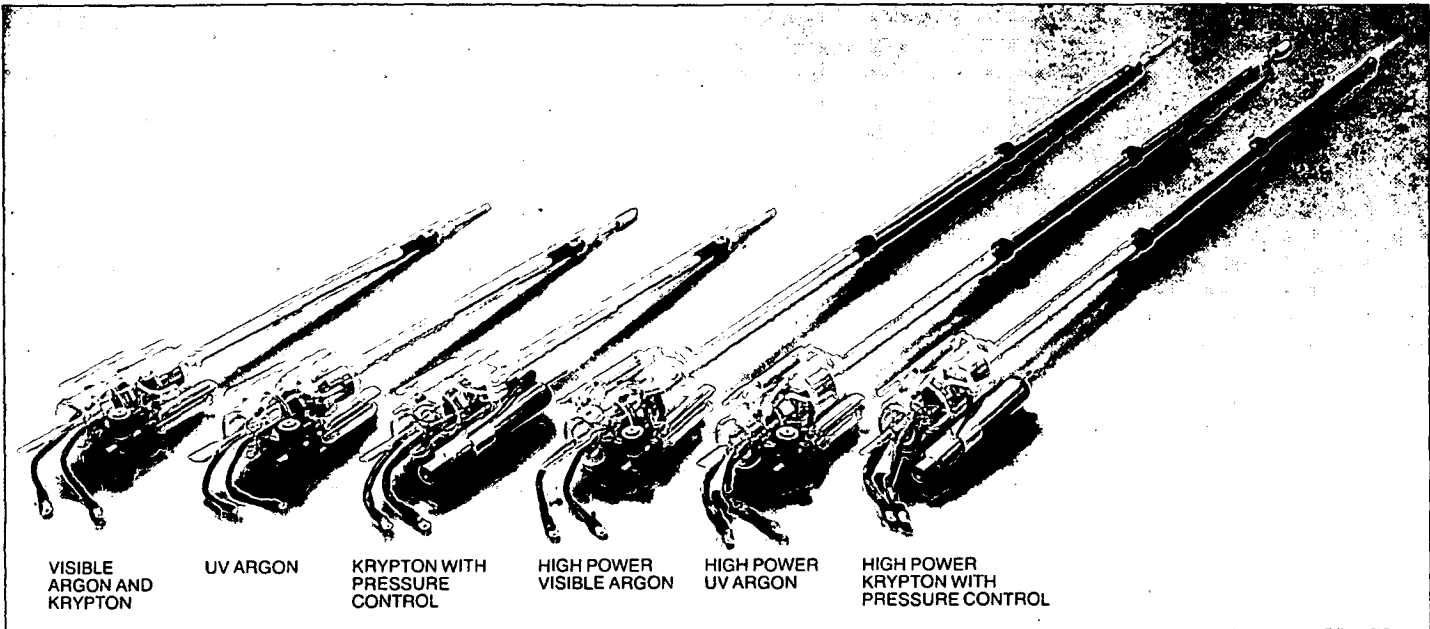
HARD-SEAL DESIGN

Indefinite Shelf Life No Epoxy Contamination

All vacuum seals on Spectra-Physics ion laser plasma tubes, including the window seals, utilize hard-seal technology. Since there are no epoxy seals to allow water vapor to permeate into the plasma tube, the purity of the fill-gas is maintained indefinitely.

The hard-seal window design also eliminates the possibility of epoxy migration onto the internal window surfaces, thus assuring long-term power, mode purity, and stability.

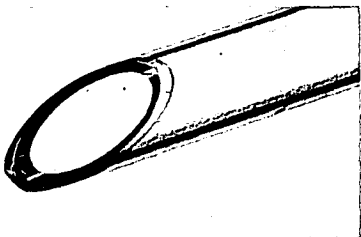
Plasma Tube Models



Spectra-Physics manufactures seven different plasma tubes, each with unique design features to meet the specific performance requirements of its associated ion laser model. The major features differentiating these seven tubes are:

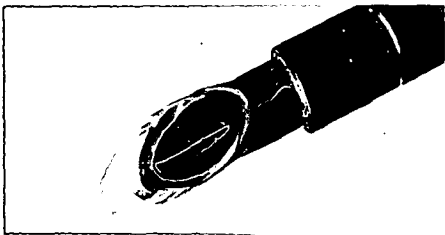
WINDOW MATERIAL

The visible argon and krypton models utilize the highest grade of optical fused quartz available. For visible operation, fused quartz is the optimum choice due to its high purity, uniform optical and mechanical properties, and ability to be polished to a superb optical finish.



Hard Seal Fused Quartz Window

The enhanced UV models incorporate crystalline quartz as the window material. While fused quartz provides excellent optical properties in the visible, it is not the optimum material choice for operation in the UV lines. Fused quartz windows have a tendency to form color centers when bombarded by the vacuum ultraviolet radiation of the plasma tube discharge. These color centers do not affect visible operation, but absorb laser light in the 334 to 364 nm region and cause power fluctuation and mode distortion. Crystalline quartz does not form these color centers and is ideal for use on UV lasers.



Hard Seal Crystalline Quartz Window

Since crystalline quartz is birefringent, special care must be taken to align the optical axis of the two windows with respect to each other. At Spectra-Physics, this is accomplished by special optical means on each individual plasma tube as it is manufactured. The birefringent nature of crystalline quartz also results in a different coefficient of expansion in each crystalline axis. This means that the crystalline windows cannot be hard-sealed by conventional means.

Spectra-Physics has developed a unique hard-seal design for use with crystalline quartz windows. All Spectra-Physics UV ion lasers are hard sealed.

FILL-GAS

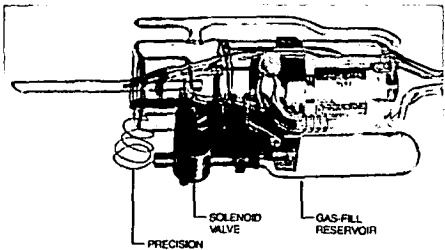
Two fill-gases, argon and krypton, are used in Spectra-Physics ion lasers. Argon provides excellent high power operation in the blue, green, and UV regions. Krypton provides operation primarily in the red region with somewhat lower power operation in the yellow, green, deep blue, and UV regions.

PRESSURE CONTROL MECHANISM

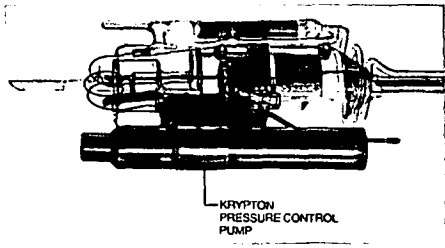
All argon models utilize a gas-fill reservoir connected to the plasma tube by a solenoid-actuated valve and precision tubing

which precisely control gas flow from the reservoir to the plasma tube. The solenoid valve is actuated by control electronics in the laser power supply.

Most krypton laser lines are sensitive to gas pressure. On krypton models intended for use at these lines, the unique Spectra-Physics pressure control pump is included on the plasma tube. This device is a combined pump and fill-mechanism providing the ability to both raise and lower the pressure in the plasma tube. In normal operation, the pump is automatically controlled by the power supply electronics. Manual operation can also be utilized to select tube pressure for optimum operation at a specific pressure-sensitive krypton line.

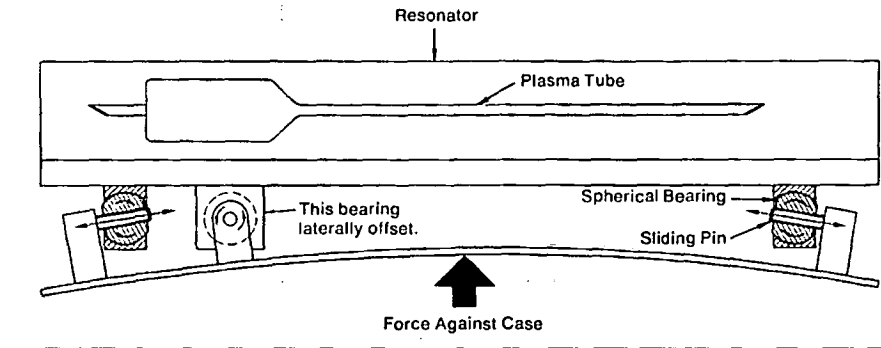


Argon Gas Fill Reservoir

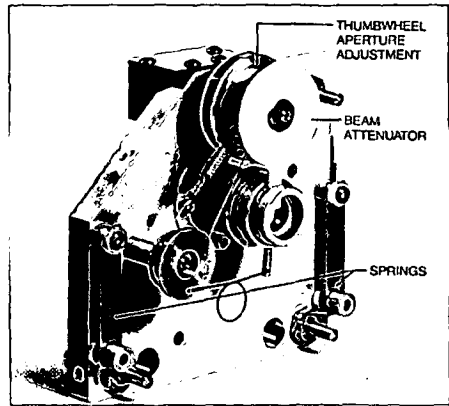


Krypton Pressure Control Pump

Kinematic Isolation of Optical Cavity



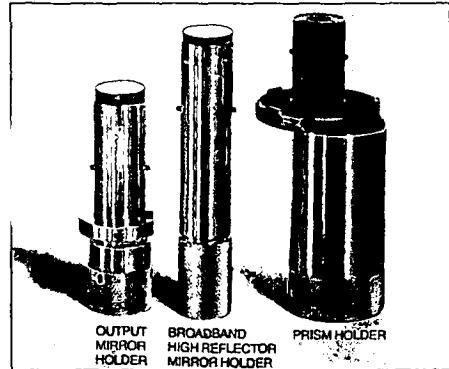
mirror end-plates, which define the optical cavity, are held solidly against the end of the resonator structure with stiff springs. The combination of stiffness of the springs and mass of the rugged mirror end-plates reduces the mechanical resonances of the structure. Sensitivity to external microphonic vibrations is extremely low, thus minimizing frequency jitter in the laser output. Jitter specifications for individual models are given on page 13.



Mirror End Plate Assembly

QUICK, CONVENIENT OPTICS CHANGES

The Spectra-Physics ion lasers have been designed to provide quick, easy mirror

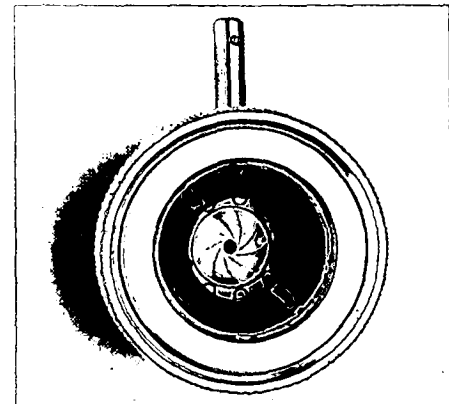


Snap-In Bayonet Mounts

and prism changes so that optimized reflective mirror coatings can be used to obtain maximum output power from the UV to the far red. The optics are held in snap-in bayonet mounts which can be changed in seconds. Upon insertion, the bayonet mirror and prism holders seal the optical cavity to ensure a dust-free space between the Brewster angle windows of the plasma tube and the mirrors. Mirrors are easily removed, and are readily accessible for routine cleaning.

ADJUSTABLE INTRA-CAVITY APERTURE

Most applications require laser operation in the fundamental TEM₀₀ mode. The Spectra-Physics ion laser is designed with an adjustable intra-cavity aperture which limits the diameter of the transverse mode and serves as a diffraction loss mechanism to eliminate undesired modes



Adjustable Aperture Assembly

and ensure optimal TEM₀₀ performance at any operating wavelength. The laser is engineered to allow precise alignment of the plasma tube to the aperture for greatest possible TEM₀₀ output power.

A convenient thumbwheel control smoothly adjusts the aperture diameter from 0.5 mm to 2.5 mm to allow selection of the optimal diameter for each wavelength. In

the event that TEM₀₀ performance is not required, an increase in output power of up to 30% can be obtained on some lines by fully opening the aperture.

The aperture also provides a convenient means of controlling output power of the laser without changing the plasma tube current.

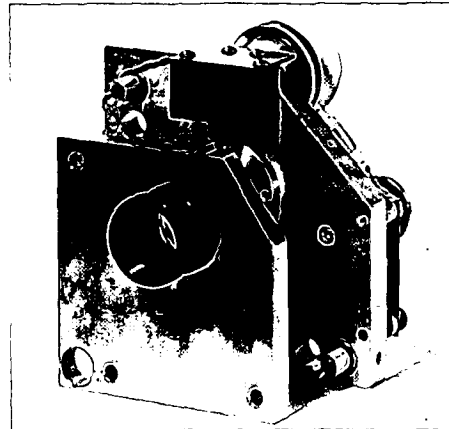
STABLE, REPEATABLE WAVELENGTH SELECTION

The prism assembly used for wavelength selection is designed to precisely compensate for the refractive index changes in the prism caused by variations in ambient temperature. A bimetallic element changes the position of the prism mirror to maintain constant laser wavelength and output power and to minimize angular beam drift.

CONVENIENT MOUNTING OF LASER AND ACCESSORIES

Four adjustable feet with locking thumb nuts can be used to mount the laser to almost any surface.

A threaded accessory mount, 1"-32 thread, on the output end of the laser will accept standard optical accessories.



Accessory Mount

BEAM ATTENUATOR

All Spectra-Physics ion lasers include an intra-cavity beam attenuator which complies with requirements of the Bureau of Radiological Health. It provides a quick, convenient method to stop or prevent lasing while the unit is operating.

Resonator Structure: Ultimate in Design and Construction

ULTRA-STABLE RESONATOR STRUCTURE

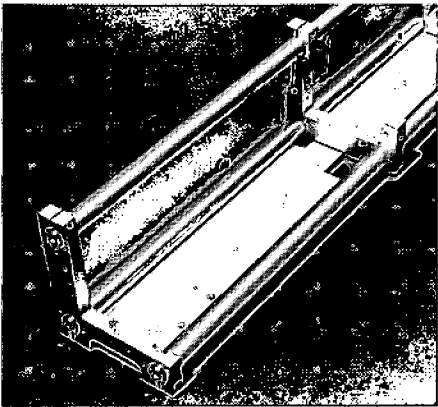
- Patented Stabilite™ design
- Thermally compensated
- Rigid construction—reduced vibration

CONVENIENT OPTICAL DESIGN

- Temperature corrected wavelength tuning
- Snap-in bayonet mirror mounts
- Sealed optical path
- Intra-cavity aperture for mode control
- Intra-cavity space for etalon
- Threaded accessory mount
- Safety shutter

KINEMATIC MOUNTING

- Eliminates mechanical stress
- Accommodates thermal expansion
- Isolates optical cavity from laser housing
- Provides instant turn-on at 75% of specified power.



Quartz Rod Resonator Structure

RESONATOR DESIGN

The primary resonator design consideration is maintaining the precise angular alignment of the optical cavity, to provide optimum amplitude and beam-pointing stability. For single-frequency operation, a second requirement is frequency or length stability of the resonator. Spectra-Physics addresses both these requirements.

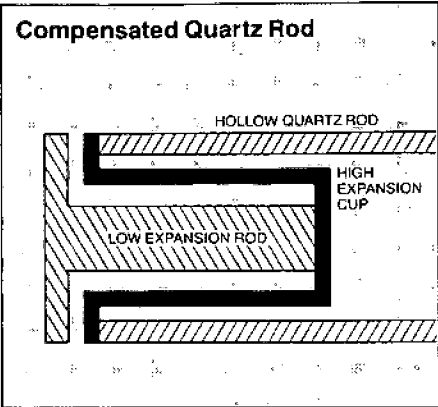
The Model 171 family utilizes the temperature-compensated quartz rod resonator structure to offer excellent beam-pointing stability and frequency-stable operation. This resonator design is ideal for applications such as holography, Brillouin scattering, long-path interferometry, and other research applications where both stable output power and long-term frequency stability are required.

Quartz Rod Resonator Structure

The high-performance quartz rod resonator structure combines the length stability of low-expansion quartz rods which define the optical cavity of the laser with the rigidity and high thermal conductivity of an aluminum heat shield to provide the ultimate in overall resonator stability. Three hollow quartz rods, of appropriate wall thickness and diameter for optimum stiffness, are surrounded by aluminum shields which maintain an even temperature across and along the rods. Heat-flow plates are welded to the heat shields to ensure that all three quartz rods have a uniform thermal environment. Bimetallic temperature compensation is designed into the ends of the quartz rods to correct for expansion and contraction with changing temperature.

Long-Term Frequency Stability

With the temperature-compensated quartz rod resonator design, length changes are reduced to one part in 10⁷, equivalent to a frequency stability of 60 MHz per °C change in ambient temperature.



KINEMATIC ISOLATION OF OPTICAL CAVITY

In all Spectra-Physics Stabilite™ resonator designs, the structure is kinematically mounted so that thermal and mechanical stresses cannot be coupled from the laser housing into the resonator to disturb the mirror or plasma tube alignment. Three spherical bearings kinematically isolate the entire optical cavity from mechanical stress applied to the outer case, end plates, or feet of the laser. These bearings also relieve any thermally generated mechanical stresses which might originate in the resonator structure. The stability of the three-bearing design is confirmed by the superb turn-on and warm-up performance of all Spectra-Physics Stabilite™ lasers. Typically, at fixed current, the laser turns on at more than 80% of full power and produces 95–100% of full power within ten minutes. Power drift, without light control, is a direct measure of the stability of the resonator structure. In Spectra-Physics ion lasers, this power drift is less than 3% over a ten hour period.

SINGLE-FREQUENCY OPERATION

An intra-cavity space is provided for simple installation and quick alignment of an etalon. The etalon provides extremely stable single-frequency output power for applications requiring long coherence lengths or very narrow linewidths.

EXCELLENT BEAM-POINTING STABILITY

The superb angular stability of the resonator and the temperature compensation of the prism assembly combine to provide minimum angular drift of the laser beam. Beam-pointing stability of the laser is typically better than five microradians per °C.

LOW JITTER

Frequency jitter is caused by minute changes in the length of the optical cavity of the laser. These length changes are usually caused by vibration of the mirror mounts. In the Spectra-Physics lasers the

Ion Laser Optics

All Spectra-Physics optics are fabricated from Schlieren grade fused silica. Spectra-Physics' ultra-hard, durable, low loss dielectric coatings are provided on all re-

flective surfaces. These coatings are optimized for maximum power in various spectral regions from ultraviolet to the far red.

CW Operation

Laser Model	Wavelength (nm)	Output Coupler	Broadband HR	Prism HR	Remarks
171 (Argon) -06, -07, -08, -09	454 to 514.5	G3814-016*	G3802-009*	G3801-010*	
	528.7	G3814-028	N/A	G3801-013	
	457.9	G3873-003 ¹	N/A	G3801-010*	
	333.6 to 363.8	G3814-019	G3802-016	N/A	
	454.5 to 514.5	G3814-016*	G3802-009*	G3801-010*	
	528.7	G3814-028	N/A	G3801-013	
-17, -18, -19	457.9	G3873-003 ¹	N/A	G3801-010*	
	333.6 to 363.8	G3873-004* ²	G3802-016*	N/A	
		G3814-019* ²			
	330 to 360	G3873-004 ²	G3802-016	N/A	
		G3814-019 ²			
	406 to 415	G3814-027	G3802-025	G3801-025	
171 (Krypton) -01	468 to 482	G3814-009	G3802-009	G3801-010	
	520 to 568	G3814-028	G3802-026	G3801-024	
	647 to 676	G3814-026*	G3814-025*	G0001-004*	
	647 to 676	G3814-024 ³	G3814-025	G0001-004	
	752 to 799	G3861-008	G3861-007	G0001-005	

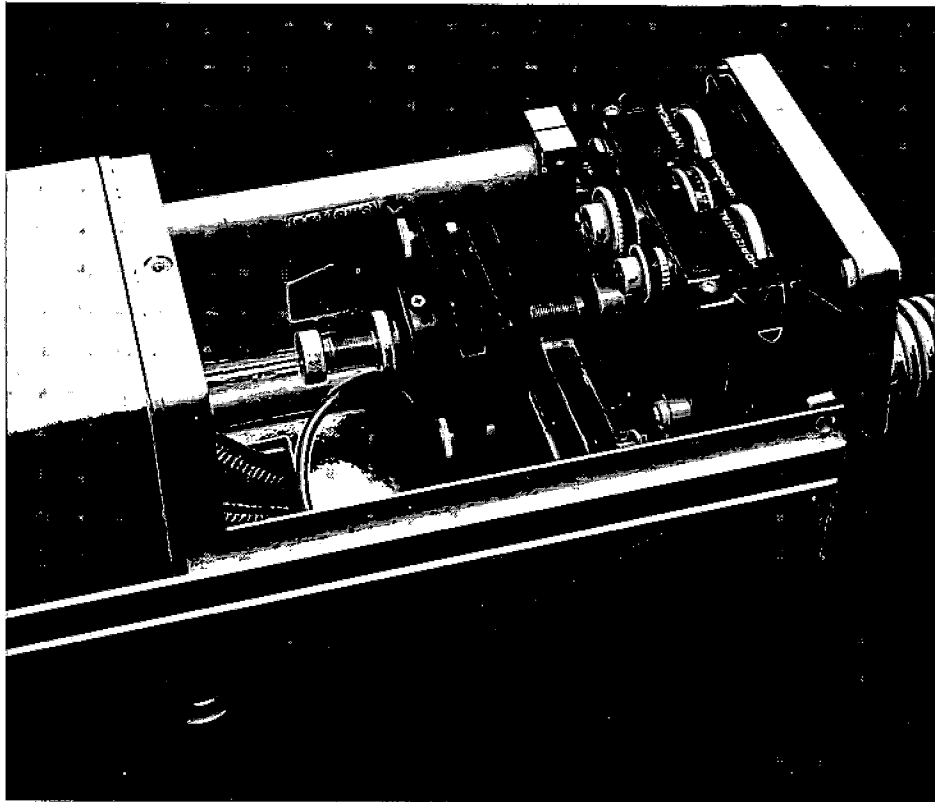
Optics Holders

Laser Model	Beamsplitter Assy.	Prism Mount Assy.	Broadband HR Holder
171	411-807 Holds 15 mm diameter output coupler at front of laser and splits off a small portion of the beam to the light stabilizer and power meter. Common to single line and multiline operation.	411-803 Holds 7.75 mm diameter high reflector mirror at back end of laser for single line operation. It is recommended that the prism mount assembly be ordered with the appropriate prism HR mirror installed. Prism is included with prism mount assembly.	411-802 Holds 15 mm diameter high reflector at back end of laser for multi-line operation.

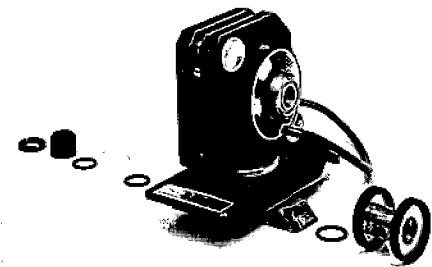
Notes

- * Supplied with Standard Laser.
- ¹ Optimizes TEM₀₀ performance at 457.9 only.
- ² Two output couplers indicated are supplied with each laser to allow optimization of UV performance for specific customer applications.
- ³ This output coupler optimizes the low power red lines in this wavelength range.

Etalons: Single-Frequency Operation



**Model 583
Temperature-Stabilized Etalon**



The Spectra-Physics Model 583 etalon series offers extremely stable single-frequency operation at the lower gain lines, the 457.9nm line of argon, and the 413.1nm and 647.1nm lines of krypton.

A Model 583 etalon system consists of a solid fused silica element, an etalon housing with a stabilized and tunable oven, and the Model 482 Oven Temperature Controller.

The solid fused silica etalon element is ideal for these lower gain lines. Optical insertion loss is low because a solid etalon element has only two optical surfaces. Reflection losses, which are a primary consideration when gain is low, are minimized and single-frequency conversion efficiency is maximized.

The temperature controller maintains the temperature of the etalon element within .01°C during normal ambient temperature fluctuations. This translates to a frequency stability of better than ±20MHz. This is less than 28% of the longitudinal mode spacing $c/2L$ for the models 164 and 165, and less than 50% of the mode spacing for the Model 171. Thus the probability of mode hops due to etalon shift is minimized.

In addition, the temperature controller provides a convenient means of tuning the etalon over three free spectral ranges.

The Model 583 Temperature Stabilized Etalon Specifications

Etalon Material
Solid Fused Silica

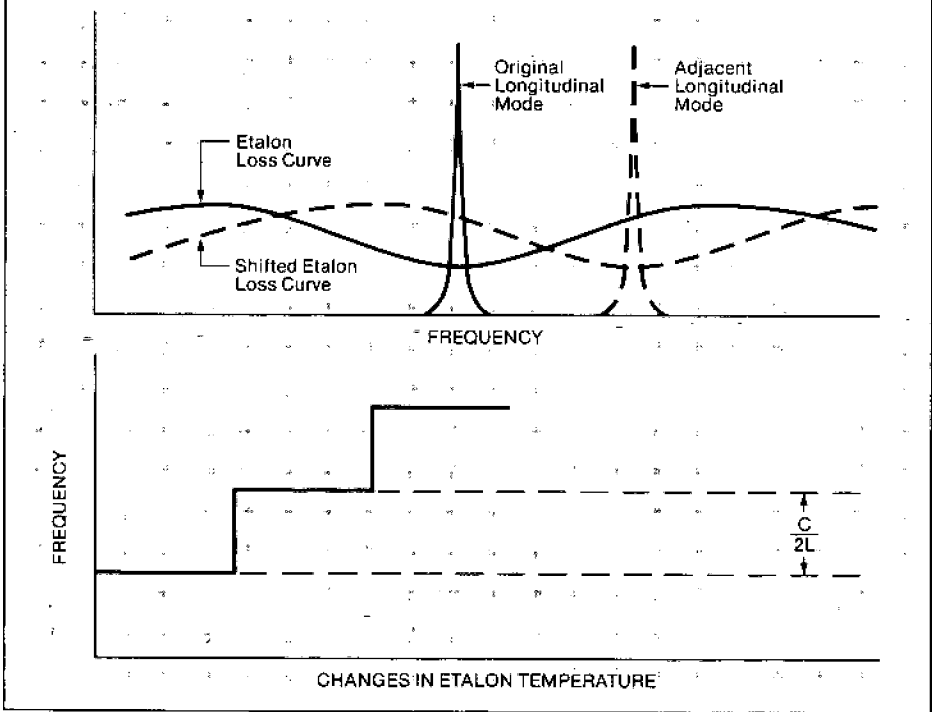
Etalon Control
Temperature Tuned
Ten-turn calibrated potentiometer

Etalon Tuning Range
≈30 GHz (3 Free Spectral Ranges)

FRONT PANEL CONTROLS

- METER Control Knob**
 - Tube operating current 0–60 amps
 - Power supply regulation range
 - Tube pressure
- CURRENT Control Knob**
Adjusts operating tube current over the allowed current range.
- CONTROL MODE Switch**
Activates either current control or light control circuits.
- LIGHT Control Knob**
Adjusts the operating level of the automatic light stabilizer.
- POWER Switches and Indicators**
Start or stop laser. OFF switch lights red, ON switch lights white when active.
- LINE Indicator Lights**
Indicate that all three phases of power line are properly connected.
- WATER ON Light**
Indicates a satisfactory flow rate.
- WATER HOT Light**
Indicates a laser shut-off due to overheating of exhaust water.
- PRESSURE CONTROL Button**
Fills the plasma tube when necessary as indicated by PRESSURE CONTROL light.
- MASTER CONTROL KEY SWITCH**
Prevents unauthorized operation of laser.
- EXTERNAL LIGHT CONTROL**
Accepts 0 to 2.0 VDC signal to modulate or remotely control the output of laser.

Etalon Frequency Stability



KRYPTON PRESSURE CONTROL PUMP VERSION

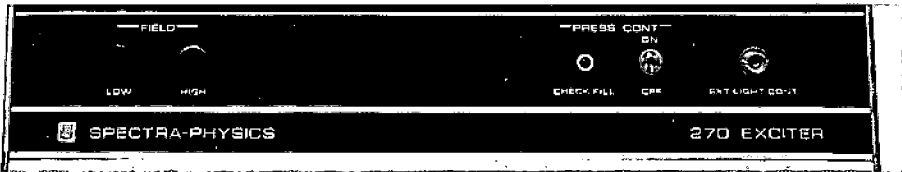
The Spectra-Physics Model 270-1 contains all of the electronics necessary to power and control the Model 171 Krypton Ion Laser. Two special features are added to the standard Model 270 power supply to maximize the performance of the krypton version.

Variable Magnetic Field

Several krypton ion laser lines are enhanced by decreasing the magnetic field. The Model 270-1 has a high field and a low field setting. Field level is selected by pushing the appropriate switch on the control panel.

Automatic Pressure Control

Special electronics are included in the Model 270-1 to monitor plasma tube pressure and to automatically control the pump/gas-fill system on the plasma tube. This system can raise or lower the gas pressure, as required, to restore the tube to its optimum operating pressure.



Krypton Pump Front Panel Control

Convenient Mounting Design

The Model 270 is designed to stand alone, however, screw holes are provided on the side of the power supply for rack mounting.

As an additional convenience, the umbilical which connects the laser head to the power supply is equipped with quick-disconnect fittings at the base of the power supply. This design allows the head to be disconnected from the power supply while the head is being mounted or transported.

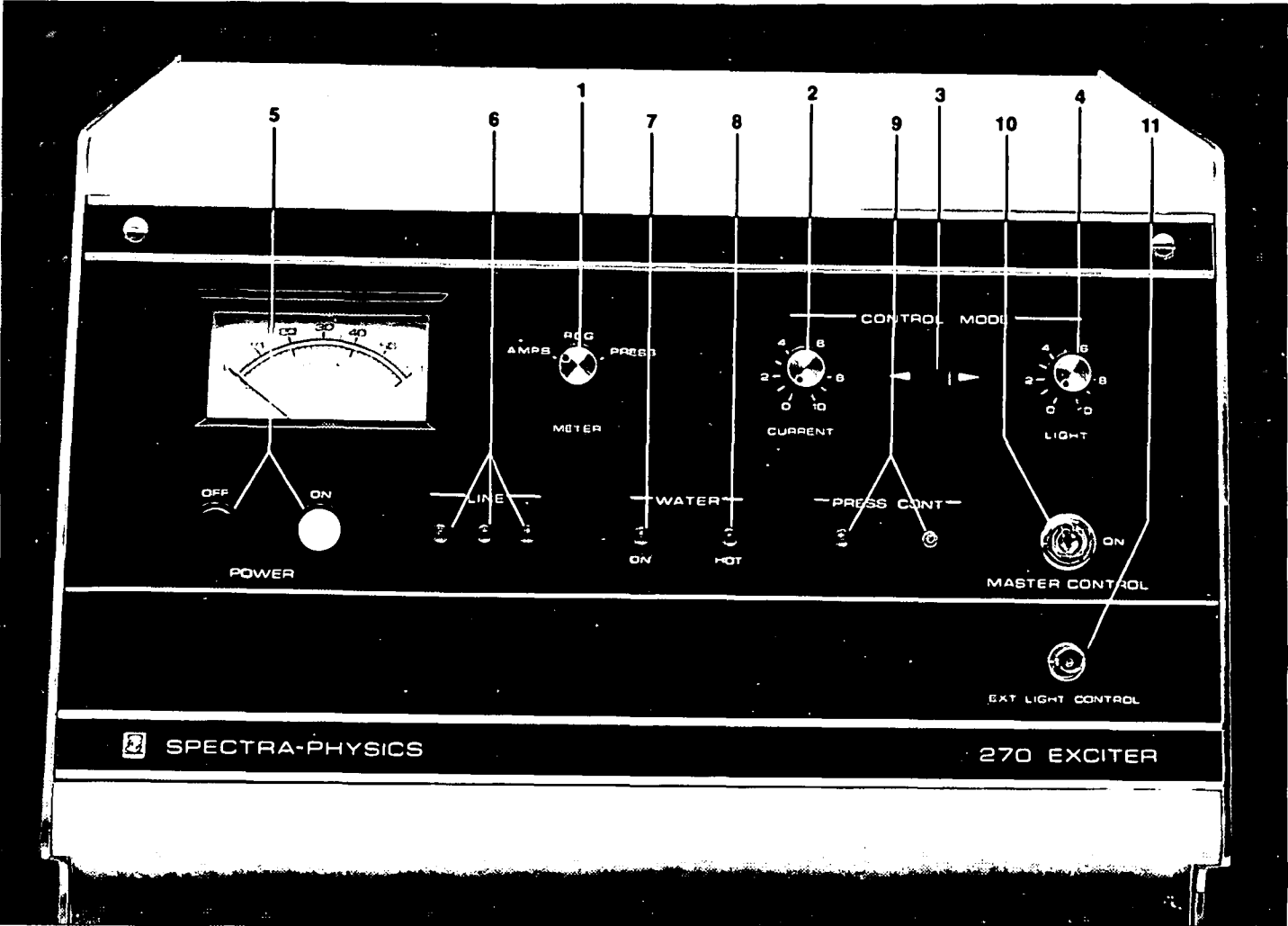
Line Voltage Requirements

The Model 270 connects directly to a three-phase, 460 volt line. The power supply is fully regulated to provide consistent laser performance and reliable operation during line voltage changes from 425 to 495 volts.

Cooling Water Requirements

The cooling system requires a water flow rate of 13.25 lpm (3.5 gpm) at a pressure of 4.6 kg/cm² (65 psi). Maximum inlet pressure is 5.3 kg/cm² (75 psi). Cooling water connectors are standard hose fittings.

Model 270 Power Supply



- Full regulated power supply
- Wide range light stabilization
- Continuous power readout
- Gas-fill system
- System safeguard features
- Conservative design
- Easy maintenance

The Spectra-Physics Model 270 contains all of the electronics necessary to power and control the Model 171 Argon Ion Laser. The stabilization and control circuits are conservatively designed to ensure the greatest reliability and performance. Features which are unique to the Model 270 are discussed below.

Built-In Wide Range Light Stabilizer

A unique wide-range light stabilizer, standard on the Model 270, regulates the output of the laser over the entire power range and across the spectrum of UV to far red. In the light stabilization mode, the feedback electronics limit output power variations to less than $\pm 0.5\%$ over periods of days or even weeks.

A BNC input on the control panel of the Model 270 allows the user to remotely control the plasma tube current with input signals of 0 to 2 VDC. The input signal can be used to modulate the laser output at frequencies up to 2 kHz.

Continuous Power Readout

A separate power meter continuously monitors the output power of the laser on any of five ranges from 0.3 watts to 30 watts. The meter has its own detachable 1.8 m (6-foot) cable which plugs into a connector in the laser head. The meter can be placed or mounted at any convenient location in the laboratory.

Gas Refill System

Low tube pressure is indicated by a signal light on the front panel of the Model 270 Power Supply. A push of the gas-fill button initiates an automatic gas-fill sequence. When the proper gas pressure is obtained, the signal light is automatically switched off and the fill circuit is deactivated.

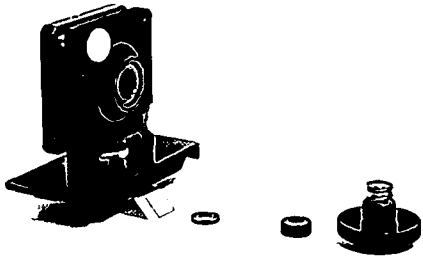
Tuning Control Calibration
 ≈ 3 GHz/Turn 30 MHz/Division
Etalon Temperature Regulation
 0.01°C
Etalon Frequency Stability
 ± 20 MHz
Conversion Efficiency
 $>50\%$ of Specified
TEM₀₀ single line power.

Model 583 Etalon Series

Argon Wavelengths (nm)	457.9	488.0	514.5
For Use with Argon Laser Model			
171-06, -07, -08, -09	583-92	N/A	N/A
171-17, -18, -19	583-72	N/A	N/A
Krypton Wavelengths (nm)	413.1	647.1	
For Use with Krypton Laser Model			
171-01	583-52	583-42*	

*Output Laser Mirror G 3814-031 included

Model 589 Air-Spaced Etalon



The Spectra-Physics Model 589 Etalon series provides the optimum in stable single-frequency operation at the two major argon lines, 488.0nm and 514.5nm.

The Model 589 Etalon includes an air-spaced etalon element and an etalon housing with separate manual adjustment for tilt angle and frequency tuning.

The etalon element consists of two thin dielectric coated windows separated by a hollow low-expansion cylinder. Etalons intended for use at high gain lines typically require relatively high-reflectivity coatings which absorb a minute amount of the intra-cavity power. With a solid etalon element this absorbed power heats the solid spacer, changing the index of refraction which in turn detunes the etalon.

By using a hollow spacer between the two etalon windows, these detuning effects are eliminated. The etalon frequency stability is determined solely by the expansion coefficient of the spacer.

The Model 589 Etalon utilizes an ultra-low-expansion titanium silicate spacer which has a thermal expansion coefficient of $.03 \times 10^{-6}$ per $^\circ\text{C}$. This translates to a frequency stability of better than 18 MHz per $^\circ\text{C}$ change in etalon temperature. This means that in an environment controlled to within 1°C , the frequency shift of the Model 589 Etalon is less than 13% of the longitudinal mode spacing for ion laser Models 164 and 165, and less than 22% for the Model 171. Thus mode hops caused by etalon frequency shift are minimized.

Stable, high resolution frequency tuning of Model 589 is accomplished by compressing a spring over a 5 mm range which changes the length of the etalon spacer. This adjustment allows tuning over one free spectral range of the etalon or approximately 10GHz. The tilt angle of the element is optimized with a separate adjustment for maximum efficiency.

The Model 589 Air-Spaced Etalon is always ready for immediate use. No waiting is required for component warm-up or oven temperature stabilization. The Model 589 is easy to install, adjust, and remove. Once properly aligned, it can be removed and reinstalled readily without additional adjustment to obtain single-frequency operation.

Model 589 Air-Spaced Etalon Specifications

Etalon Material
Titanium Silicate Spacer Fused Silica Windows
Etalon Control
Compression Tuned Spacer
Etalon Tuning Range
 ≈ 10 GHz (1 Free Spectral Range)
Tuning Control Calibration
 ≈ 1 GHz/turn
Etalon Frequency Stability
18 MHz/ $^\circ\text{C}$ of Ambient Change
Conversion Efficiency
50% of specified TEM₀₀ Single-Line Power.

Model 589 Etalon Series

Argon Wavelengths (nm)	488.0	514.5
For Use with Argon Laser Model		
171-06, -07, -08, -09	589-32	589-32
171-17, -18, -19	589-82	589-82

Ion Laser Single-Frequency Performance

	Model 171
Resonator Design	Compensated Quartz Rod
Thermal Frequency Stability	60 MHz/ $^\circ\text{C}$
Long Term Coherence Length ¹ (up to 10 hours)	
A with Model 583 Etalon	2.8M
B with Model 589 Etalon (ambient controlled within 1°C)	2.8M
Short Term (< 1 sec) Frequency Stability ^{1,2} (Jitter)	± 22 MHz ($1.5 \times 10^{-3} \text{ cm}^{-1}$)
Short Term Coherence Length ^{1,2}	7M
Longitudinal Mode Spacing	85 MHz

1. Values based on data taken in Spectra-Physics laboratory. Actual performance figures will depend on user's environment.
2. Measured at specified minimum water flow and normal operating current. Jitter can be reduced further by special modifications allowing low flow and current.

Spectra-Physics Ion Lasers
Power Specifications

ARGON ION LASER POWER, TEM₀₀

Wavelength (nm)	Model 171						
Multi-Line	-06	-07	-08	-09	-17	-18	-19
457.9 - 514.5	9 watts	12 watts	15 watts	18 watts	12 watts	15 watts	18 watts
351.1 - 363.8	2	400 mW ¹	600 mW ¹	750 mW ¹	1.5 watts	2.0 watts	2.5 watts
Single-Line ³							
1090 ¹	2	2	2	2	2	2	2
528.7 ¹	.70	.80	.90	1.0	.8	.9	1.0
514.5	3.75	5.2	6.4	7.5	5.2	6.4	7.5
501.7	.65	1.0	1.4	1.5	1.0	1.4	1.5
496.5	1.2	1.75	2.25	2.5	1.75	2.25	2.5
488.0	3.25	4.7	6.0	6.5	4.7	6.0	6.5
476.5	1.25	1.95	2.5	2.7	1.95	2.5	2.7
472.7	.08	.55	1.0	1.2	.55	1.0	1.2
465.8	.05	.35	.60	.75	.35	.60	.75
457.9	.75	.95	1.2	1.35	.95	1.2	1.35
454.5 ¹	.20	.60	1.0	1.1	.60	1.0	1.1

KRYPTON ION LASER POWER, TEM₀₀

Wavelength (nm)	Model 171
Multi-Line	-01
	Pump Control
752.5 - 799.3 ¹	1.6
647.1 - 676.4	4.6
520.8 - 568.2 ¹	3.6
468.0 - 530.9 ¹	2.5
406.7 - 422.6 ¹	1.3
337.4 - 356.4 ¹	1.1
Single-Line	
799.3 ¹	.30
752.5 ¹	1.2
676.4	.90
647.1	3.5
568.2 ¹	1.1
530.9 ¹	1.5
520.8 ¹	.70
482.5 ¹	.40
476.2 ¹	.40
468.0 ¹	.30
415.4 ¹	2
413.1 ¹	.50
406.7 ¹	2

¹Special optics and testing required. Refer to page 11 for optics selection. Specified power, to be in effect, requires special testing in addition to optics listed on page 11; available only at time of original purchase or with major service at a Spectra-Physics Service Center.
²Not specified.
³Single line powers for argon lasers are specified at 514.5 nm and 488.0 nm only. Other powers indicated are nominal; firm specifications are available with special testing.

KRYPTON VERSION
The output power of the krypton ion laser (Model 171-01) is sensitive to plasma tube pressure and magnetic field strength. The Model 171 Krypton Ion Laser, therefore, has the additional features of automatic pressure control and selectable magnetic field levels to provide the highest possible stable output power.

The pressure-control pump mounted on the plasma tube is capable of removing or adding gas to the plasma tube to reduce or increase pressure to the optimum operating level. Electronics in the power supply control the pressure control pump to maintain plasma tube pressure at a factory-set level. Alternatively, tube pressure can be manually controlled and optimized for a single lasing line.

UV VERSIONS
The Models 171-17, -18, and -19 are optimized for operation in the ultraviolet region of the spectrum. At the same time, these models provide excellent visible performance equal to the performance of the visible argon models. These models include a high field magnet optimized for the lower gain UV lines, and a plasma tube equipped with crystalline quartz windows.

Single-line UV operation can be obtained by using a prism external to the cavity to separate the desired line from the all-lines UV output. Typical values for the fraction of total UV power found in each line are given below:

- 334 nm 10-20%
- 351 nm 40-50%
- 364 nm 35-45%

MODEL 171 RESONATOR
The Model 171 laser head is designed to take full advantage of the superb operating characteristics of the BeO plasma tube, producing maximum output power with minimum size and weight.

The Model 171 utilizes the temperature-compensated quartz rod resonator design for maximum frequency stability, minimum alignment and length change with temperature, excellent warm-up characteristics, and superb beam-pointing stability. Additional product details on this resonator are discussed on pages 6 and 7.

Operating Controls
Wavelength selection controls and readout are mechanically isolated thumbwheels allowing 1.0 nm resolution. These thumbwheels, flush with the top cover and conveniently located away from the output beam, provide fine control of the ori-

entation of the rear mirror plate through reduction gears. The Model 171 has been engineered for convenient control of all laser cavity parameters. All power control adjustments are completely orthogonal, allowing power optimization in a convenient, straightforward fashion.

Laser Optics
A set of optics for both single-line and all-lines operation is supplied with each Model 171. (The krypton Model 171 is supplied with a set of optics for single-line and all-lines operation in the red. The UV models are supplied with a set of optics for all-lines operation in the UV as well as a set of optics for all-lines operation in the blue and green.) The optics are held in snap-in bayonet mounts which can be changed in seconds. The output mirror assembly includes the beamsplitter for the built-in power meter and light stabilizer. Single-line operation is achieved using a full Brewster prism and high reflector. All-lines operation is obtained using only a high reflector. Separate bayonet mounts are provided for these optics to allow convenient switching from all-lines to single-line operation.

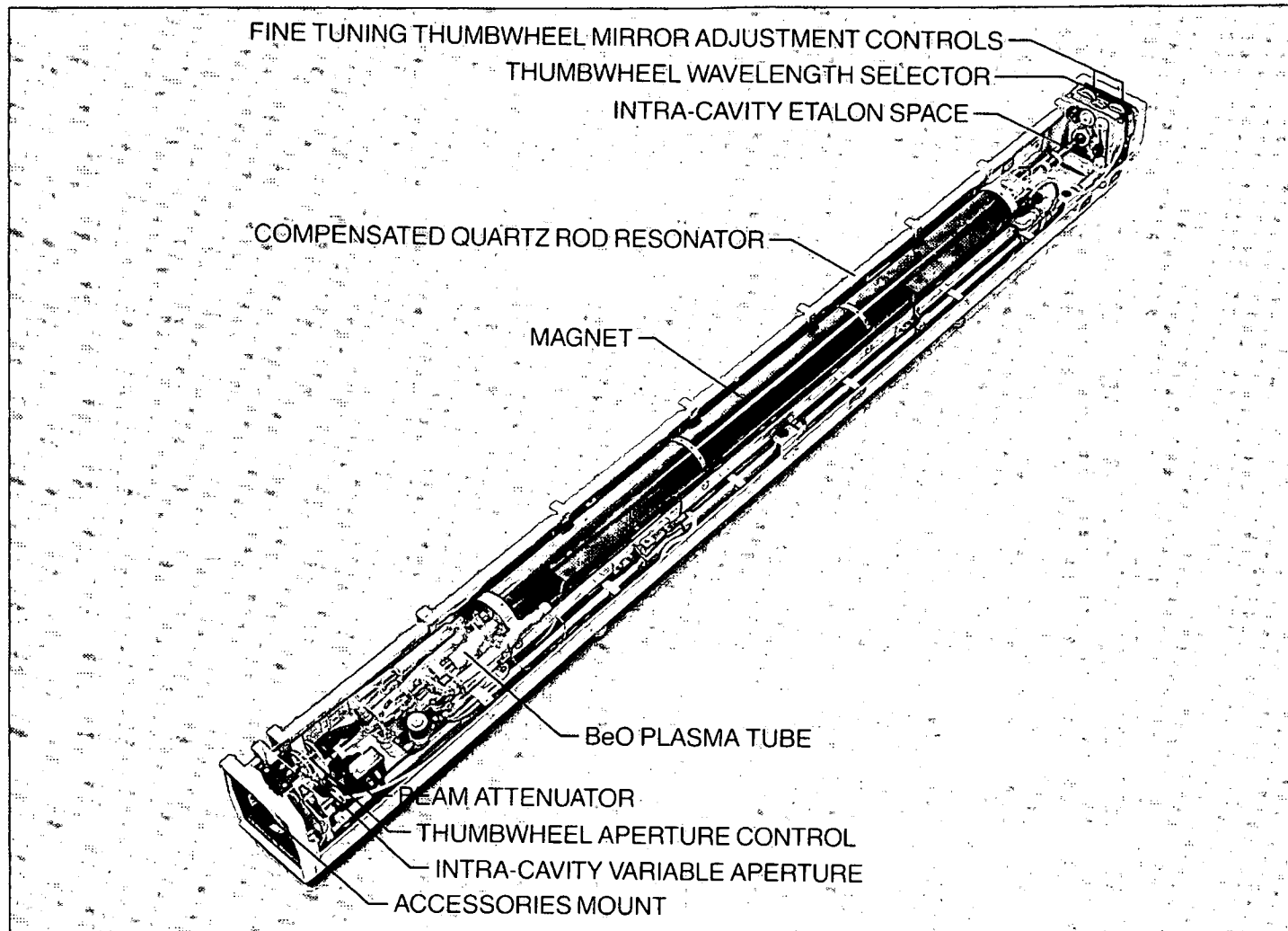
Intra-Cavity Space
A 3-inch space in the optical cavity is available for the insertion of a single-frequency etalon or intra-cavity experiments. The intra-cavity space has its own separate cover for easy access. The plasma tube is firmly mounted to positioning brackets so it will not be disturbed when intra-cavity apparatus is installed.

MODEL 171 PLASMA TUBE
All Model 171 plasma tubes utilize beryllium oxide for their base material to take advantage of its superb cooling properties, light weight, small size, strength, reduced gas absorption, and fast warm-up. All incorporate hard seal window technology. These hard seals are strong and impervious to moisture and gas diffusion. They are free of organics such as epoxy, which can contaminate the optical surfaces of the window. Hard-seal windows also allow high-temperature processing of the plasma tube to provide clean operation and long life.

The Model 171-01 krypton plasma tube includes the unique Spectra-Physics automatic pressure control pump which precisely controls plasma tube pressure. The UV models 171-17, -18 and -19 are equipped with hard-sealed crystalline quartz windows for optimum power and stability performance in the 334 nm to 364 nm region of the spectrum. Additional features of the plasma tube are discussed on pages 8 and 9.

MODEL 270 POWER SUPPLY
The Model 171 Argon Ion Laser uses the Model 270 power supply. The Model 171 Krypton Ion Laser uses the Model 270-1 power supply, which has the additional magnetic field and pressure control features discussed on page 5. Included with the power supply is a full-range power meter which continuously monitors output power. The meter is calibrated in both the visible and the ultraviolet. For additional details on the power supplies, see the discussion on pages 4 and 5.

High Performance, High Power Ion Laser



- Quartz rod

- Quartz rod resonator
- Temperature-compensated prism
- Kinematic resonator design
- Snap-in mirror mounts
- Intra-cavity variable aperture
- Intra-cavity etalon space
- Separate cover for intra-cavity space
- Convenient thumbwheel controls
- Simple wavelength selection

- **Rugged BeO**

- **Rugged BeO design**
- **Hard seal technology**
- **Argon and krypton versions**
- **Gas fill system with reservoir for argon**
- **Pressure pump system for krypton**
- **High Power UV models with crystalline quartz windows**

- Fully regulated

- Fully regulated
- Light stabilization in visible and UV
- Detachable power meter
- Quick-disconnect umbilical
- Light modulation

The Spectra-Physics Model 171 Ion Laser has been engineered for high output power while retaining that ideal combination of reliability, stability, convenience, and size characteristic of all Spectra-Physics ion lasers.

The versatile Model 171 Ion Laser is widely used as a pump laser for tunable CW dye lasers. All-lines output powers sufficient to pump a wide variety of dyes are available across the spectrum from UV to far red. The Model 171 has also opened up new areas for Raman, Brillouin and other scattering experiments, and applications in data storage and recording are rapidly developing. For power and performance specifications see page 14.

The Model 171 Ion Laser is available in three versions.

VISIBLE ARGON VERSIONS

The argon models, 171-06, -07, -08, and -09 provide all-lines visible power from 9 watts to 18 watts.

Spectra-Physics Ion Lasers Performance Specifications

	Model 171 -01, -06, -07, -08, -09	UV Model 171 -17, -18, -19
Noise, Light Control	0.5% ¹	1% ²
Noise, Current Control	1% ¹	2% ²
Stability Light Control in any 30 min. period after 2-hr. warm-up	± 0.5%	± 0.5%
Stability Current Control after 30-min. warm-up *after 2-hr. warm-up	± 3% *	± 3% *
Frequency Stability ⁴	60 MHz/°C	60 MHz/°C
Beam Diameter ³	1.58 mm	1.58 mm
Beam Divergence ³	.56 mrad	.56 mrad
Cavity Configuration	Long Radius Output Flat High Reflector	Long Radius Output Flat High Reflector
Cavity Length w/o prism w prism Folded Cavity	1.72 ± .003 meter 1.77 ± .003 meter N/A	1.72 ± .003 meter 1.77 ± .003 meter N/A
Polarization	Vertical	Vertical
Mode-Spacing w/o prism w prism Folded Cavity	85.7 - 88.8 MHz 83.3 - 86.2 MHz N/A	85.7 - 88.8 MHz 83.3 - 86.2 MHz N/A
Size — Head	14.6 x 15 cm x 1.88 m 5.75 x 5.9 x 74 in	14.6 x 15 cm x 1.88 m 5.75 x 5.9 x 74 in
Size — Power Supply	46.7 x 47.6 x 91.7 cm 18.38 x 18.75 x 36.09 in	46.7 x 47.6 x 91.7 cm 18.38 x 18.75 x 36.09 in
Shipping Weight	211 kg (465 lbs)	211 kg (465 lbs)
Input Power	3 phase w grnd	3 phase w grnd
Volts	460 volts ± 8%	460 volts ± 8%
Amps	60 amps	60 amps
Watts	38 kW	38 kW
Water Flow Rate	13.25 liters/min (3.5 gpm)	13.25 liters/min (3.5 gpm)
Water Pressure Min. Max.	4.6 kg/cm ² (65 psi) 5.3 kg/cm ² (75 psi)	4.6 kg/cm ² (65 psi) 5.3 kg/cm ² (75 psi)



Specifications subject to change without notice.

1 Performance at 514.5 nm for Argon 647.1 nm for Krypton, RMS, 10 Hz - 2 Mhz. Contact factory for performance data at other wavelengths.

2Performance all-lines UV, RMS, 10 Hz - 2 MHz. Contact factory for performance data at other wavelengths.

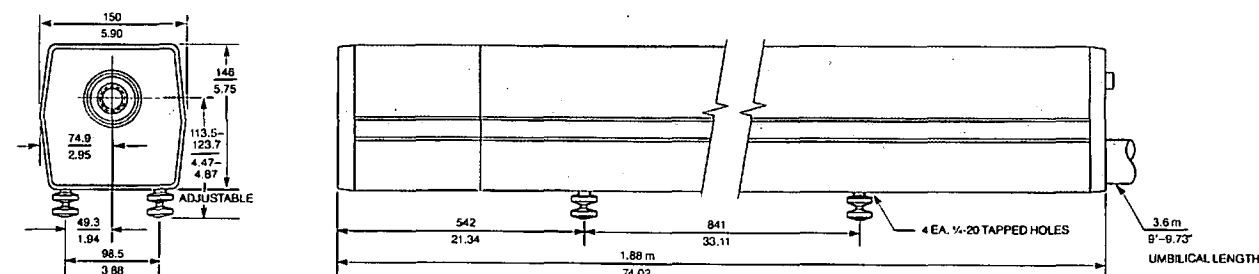
3At 1/e² points. Data for 514.5 nm (for UV Model 171 at 351 nm beam diameter is 1.30 mm and beam divergence is 0.46 mrad.) Data at other wavelengths (assuming no change in optical configuration)

is given by $\frac{DIA(1)}{DIA(2)} = \left(\frac{\lambda_1}{\lambda_2} \right)^2$

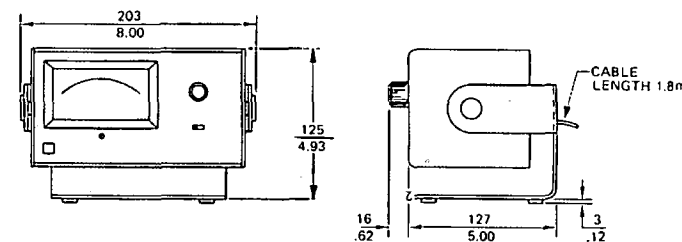
4 Frequency of laser running in single longitudinal mode is defined by the etalon frequency stability rather than the laser cavity. See pages 12 and 13 for details.

Outline Drawings Dimensions $\frac{\text{mm}}{\text{in}}$

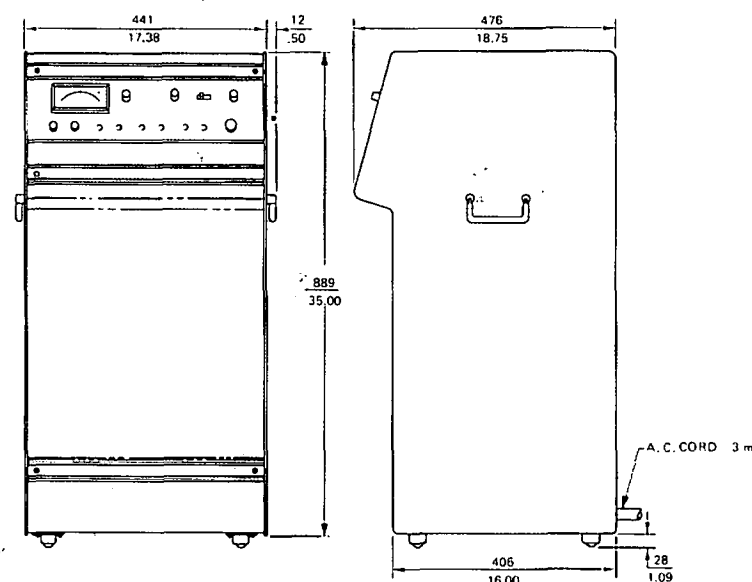
LASER HEAD, MODEL 171



POWER METER, MODEL 171



POWER SUPPLY, MODELS 270 AND 270-1



WARRANTY

Spectra-Physics products are protected by a one-year warranty. All mechanical, electronic, and optical parts and assemblies, including plasma tubes, are unconditionally warranted to be free from defects in workmanship and material for the first year following delivery. This warranty is in lieu of all other warranties, express or implied, and does not cover incidental or consequential loss.

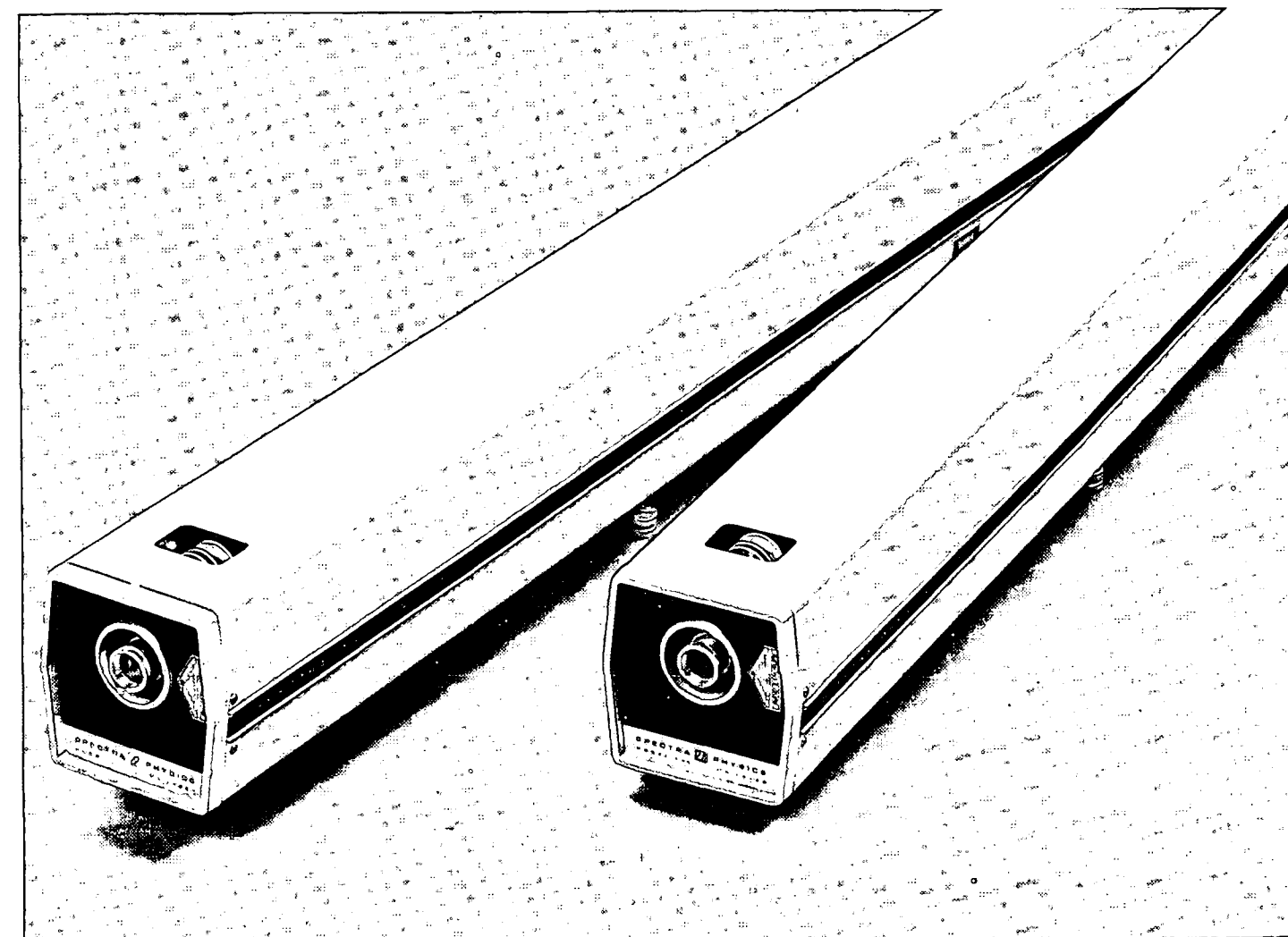
LASER SAFETY

Spectra-Physics has worked closely with federal agencies to promote the safe use of lasers, and has designed these products to comply with the Center for Devices and Radiological Health (CDRH) standards now in effect in the United States.

CDRH warning logotypes, similar to that shown, appear on each laser to indicate the CDRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype.



Spectra-Physics High-Power Ion Lasers



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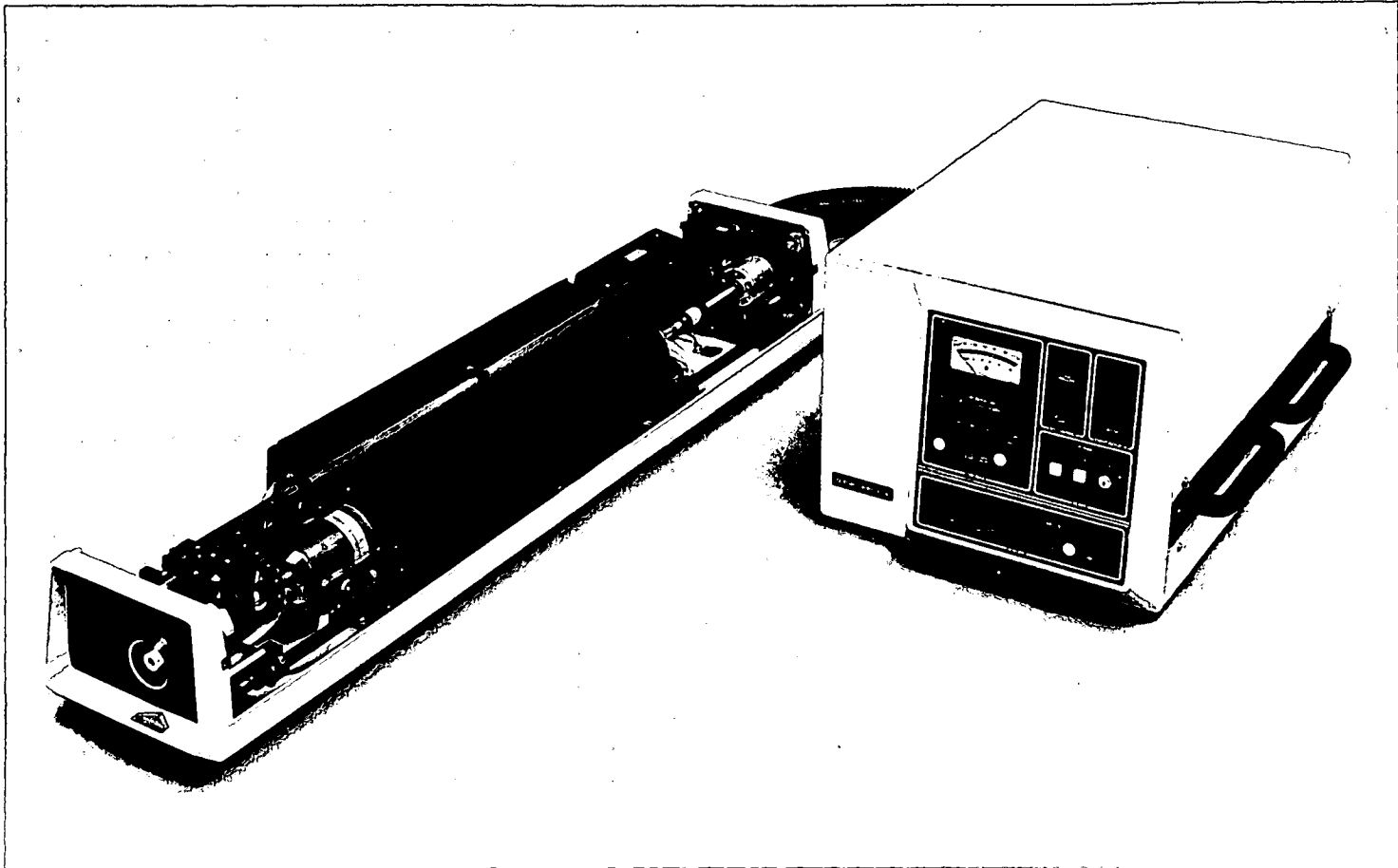
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**CUSTOMER
SERVICES
TOLL FREE**

800/227-8054

Spectra-Physics has long been recognized as the leader in high-power ion lasers. Since 1970, when the first Spectra-Physics ion laser was introduced, a commitment to continued product development and product improvement has resulted in one of the broadest lines of high quality ion lasers and accessories available in the world today. The lasers provide CW output from the ultra-violet to the far red region of the optical spectrum, with powers up to 18 watts. Higher-power pulsed operation can be achieved by adding one or several Spectra-Physics accessories to create an ion laser system. The scientific market demands strong continuing technical support, and Spectra-Physics recognizes this demand by providing one of the largest and most professional worldwide sales and service organizations of any laser manufacturer today.



Model Number	Description
2020-03	Argon Ion Laser, 3 Watt all-lines blue-green (458-514 nm)
2020-05	Argon Ion Laser, 5 Watt all-lines blue-green (458-514 nm)
2020-11	Krypton Ion Laser, 0.75 Watt all-lines red (647-676 nm)
2025-03	Argon Ion Laser, 3 Watt all-lines blue-green (458-514 nm) 0.2 Watt all-lines ultraviolet (351-364 nm)
2025-05	Argon Ion Laser, 5 Watt all-lines blue-green (458-514 nm) 0.4 Watt all-lines ultraviolet (351-364 nm)
2025-11	Krypton Ion Laser, 0.75 Watt all-lines red (647-676 nm) 0.15 Watt all-lines ultraviolet (337-356 nm)

	Dimensions L x W x H (cm)	Dimensions L x W x H (in)	Weight (kg)	Weight (lbs)
Laser Head	128.5 x 24.1 x 20.1	50.6 x 9.5 x 7.9	68	150
Power Supply	81.6 x 54.3 x 37.2	32.1 x 21.4 x 14.6	95	210

Standard Model 2020 Includes:

- Model 2020 Laser Head
 - Model 022 Plasma Tube
 - Model 2560 Power Supply
 - Standard Magnet
 - Dummy Passbank
 - High Resolution End-Plate
 - System Controller
- SCR Controller
 - Laser Head Controller
 - Built-in Photodetector
 - Light Control Function
 - Automatic Gas Fill Function
 - Broadband High Reflector (visible)
 - Output Coupler (visible)

Standard Model 2025 Includes:

- Model 2020 Laser Head
- Model 022 Plasma Tube
- Model 2560 Power Supply
- High Performance Magnet
- Magnet Regulator
- Auxiliary Front Panel
- Dummy Passbank
- High Resolution End-Plate
- System Controller
- SCR Controller
- Laser Head Controller
- Built-in Photodetector
- Light Control Function
- Automatic Gas Fill Function
- Broadband High Reflector (visible)
- Output Coupler (visible)
- Broadband High Reflector (UV)
- Output Coupler (UV)

OUTPUT POWER SPECIFICATIONS

Argon Ion Laser TEM₀₀ (Watt)

Wavelength (nm)	Model Number	
	2020-03 / 2025-03	2020-05 / 2025-05
Multi-line		
351.1-363.8	0.050 / 0.200	0.100 / 0.400
457.9-514.5	3.000 / 3.000	5.000 / 5.000
Single Line ¹		
514.5	1.200	2.000
501.7	0.200	0.400
496.5	0.400	0.700
488.0	1.000	1.500
476.5	0.350	0.750
472.7	0.130	0.300
465.8	0.070	0.200
457.9	0.200	0.350
454.5	0.050	0.120

Note:
1. Single-line powers for argon lasers are specified at 514.5 nm and 488 nm and for krypton lasers at 647.1 nm only. Other powers indicated are nominal. Firm specifications are available with special testing.

Krypton Ion Laser TEM₀₀ (Watt)

Wavelength (nm)	Model Number	
	2020-11 / 2025-11	
Multi-line		
337.4-356.4	-	/ 0.150
406.7-415.4	-	/ 0.100
647.1-676.4	.750	/ 0.750
Single Line ¹		
799.3		0.030
752.5		0.100
676.4		0.150
647.1		0.600
568.2		0.200
530.9		0.200
520.8		0.090
482.5		0.045
476.2		0.060
413.1	-	/ 0.060

PERFORMANCE SPECIFICATIONS

Noise and Stability Characteristics		Beam Characteristics	Water and Electrical Requirements
Noise ^{1,2} Current Mode	- 0.5% rms	Beam Diameter ⁴ - 1.5 mm @ 514.5 nm @ 1/e ² points	Power Supply Line - 3 phase with ground
Noise ^{1,2} Power Mode	- 0.2% rms	Beam Divergence @ 1/e ² points - 0.5 mrad @ 514.5 nm	Voltage - 208 V (±10%)
Stability ³ Current Mode	- ±3%	Cavity Length - 1.10 m	Current - 48 A, Model 2020 61 A, Model 2025
Stability ³ Power Mode	- ±0.5%	Mode Spacing - 136.1 MHz	Power - 17.3 kVA, Model 2020 Consumption 22.0 kVA, Model 2025
		Polarization - Vertical	Water Flow Rate - 9.5 l/min (minimum) (2.5 gal/min)
			Water Pressure - 1.1 - 5.3 kg/cm ² (15 - 75 psi)

Specifications subject to change without notice.

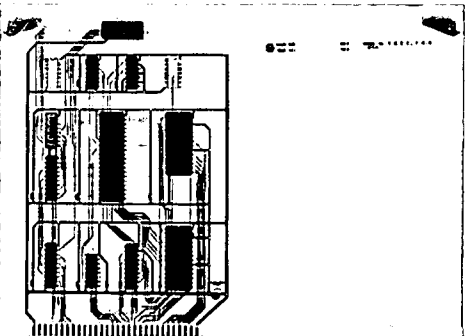
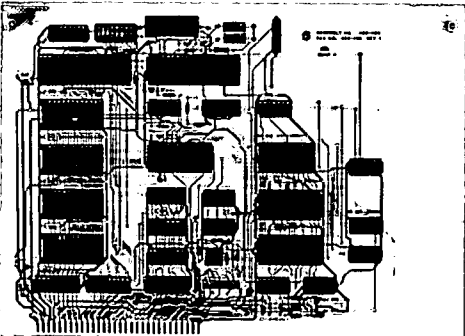
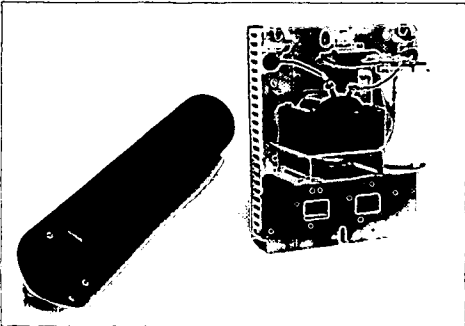
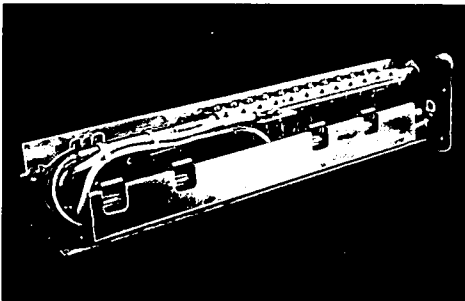
- Notes:
1. Performance at 514.5 nm for argon or 647.1 nm for krypton, 10 Hz-2 MHz, at specified output power.
2. Using Model 2210 Linear Passbank; without Model 2210, typical noise in current or power mode is 3%.
3. In any 30-min period after a 2-hr warm-up.
4. Data for 514.5 nm; at other wavelengths, assuming no change in optical configuration, the diameter is given by:

$$\frac{DIA_1}{DIA_2} = \left(\frac{\lambda_1}{\lambda_2} \right)^{\frac{1}{2}}$$

OPTICS SELECTION CHART

Laser Model	Wavelength (nm)	Output Coupler	Broad Band/Prism HR
2020-03/2025-03	351.1 & 363.8	G3873-007	G3802-016
2020-05/2025-05	457.9 to 514.5	G3873-006*	G3802-009*
	528.7	G3861-003	G3802-015
	488.0 & 514.5 ⁴	G3814-016	G3802-009
	454.5	G3861-002	G3802-013
	454.5 to 514.5 ^{1,2,3}	G3810-007	G3810-005
	454.5 to 514.5 ^{2,3,6}	G3808-017	G3808-018
	1090 ^{2,7}	G3812-006	G3812-005
2020-11/2025-11	337.4 to 356.4	G3873-008	G3802-016
	406.7 to 415.4	G3873-009	G3802-025
	476.2 to 520.8	G3873-010	G3802-015
	530.9 to 568.2	G3873-011	G3802-015
	647.1 to 676.2	G3873-012*	G3873-013*

- Notes:
* Supplied with Standard Laser.
1. TEM₀₁ multimode.
2. Performance not guaranteed.
3. Mode size and divergence changes.
4. Recommended for two-color LDV applications. Suppresses 488.9 nm line. Improves conversion efficiency when etalon is detuned to balance simultaneous 488.0 nm and 514.5 nm single-frequency operation.
5. 752.5 nm dominates. No 793 or 799 nm output.
6. Higher order multimode.
7. Not optimized.



Linear Passbank 2210
Reduces residual ripple on plasma tube DC voltage supply to improve noise performance.

Auxiliary Front Panel 2220
Required when Model 2020 is operated under (optional) external controls or when High Performance Magnet/Magnet Regulator is installed.

Magnet Regulator 2230
Allows independent magnet current control up to 15A. Requires Auxiliary Front Panel.

High Performance Magnet 2240
Provides magnetic field strength up to 1700 Gauss, for enhanced UV/violet performance. Requires Magnet Regulator and Auxiliary Front Panel.

Smart Board 2260
Allows control of laser functions through external inputs by RS232 serial data link, IEEE 488 parallel data link (IEEE Interface Card required) or remote control. Provides 2k EEPROM for memory storage of operational settings.

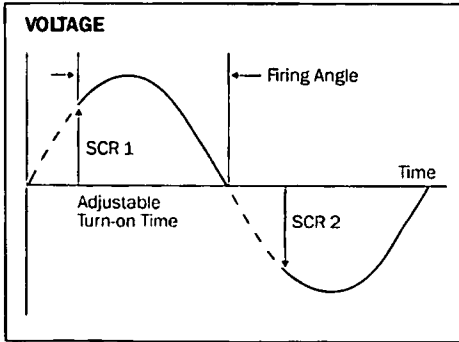
IEEE Interface Card 2280
Interface board to allow external control using IEEE 488 parallel data link protocols. Requires Smart Board.



Other features of the 2020's unique microprocessor control capabilities include:

- the option for complete computer or remote digital control;
- pre-light-off check listing to ensure that all components are in proper working condition before power is applied to system;
- complete memory of current or most recent operating status;
- digital control of photodiode preamp gain for $\pm 5\%$ accuracy power readout at all individual wavelengths;
- full digital readout of operating wavelength.

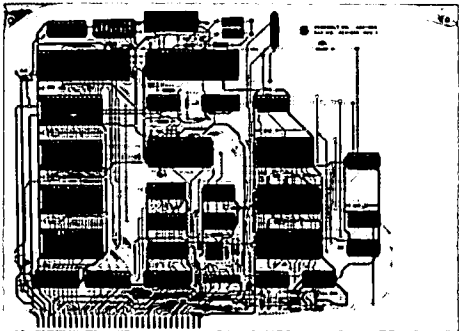
These features make the 2560 Power Supply a highly reliable, efficient and intelligent part of the system.



PHASED SCR'S FOR COMPACT AND EFFICIENT POWER HANDLING
The Model 2560 uses digitally controlled SCR's for generating a reliable and stable DC current. The use of SCR's allows power handling at a constant and high level of efficiency.
With a switching technique, a temporarily increased line voltage is counteracted by adjusting the turn-on time of the rectifiers rather than by dissipating the excess power as would be the

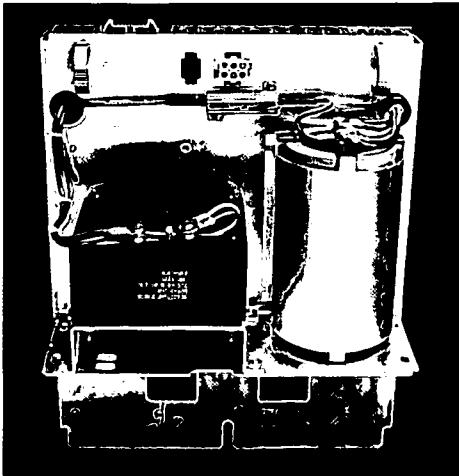
case for a linear passbank. At higher current levels, where the number of transistors in a linear passbank would rapidly increase, the use of switching SCR's is extremely advantageous since it requires far less critical components subject to failure.
The microprocessors in the Model 2560 constantly monitor all line fluctuations and calculate the optimum turn-on time, or firing angle, for up to 12 SCR's to obtain a stable output with maximum efficiency.

ADDITIONAL OPTIONS
Smart Board for Increased Operating Capabilities
A powerful extension for the Model 2650 capabilities is created by the addition of the Smart Board. This board allows control of plasma tube current, magnet current and output power through an external input. Interfacing is possible through either the industry standard RS232 serial data link, the industry standard IEEE 488 parallel data link (additional interface board required) or a remote control unit. It also allows the operator to ask more detailed questions about the system status. Additionally, this board provides EEPROM non-volatile back-up memory to store laser operation settings which later can be used as default values after start-up.



Magnet Regulator for Independently Optimized Magnetic Fields
This plug-in option allows the magnetic field to be independently controlled from the plasma tube current. In addition, with an optional High Performance Magnet, the Magnet Regulator provides an increased magnetic field of up to

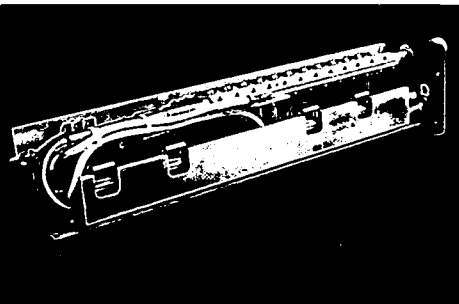
1700 Gauss. With these options, optimum magnetic fields can be selected for the individual laser lines.
See also page 15 for more details on the magnetic field strength dependence of the laser lines.



IEEE Interface for External Input
A special interface card makes the Model 2560 completely controllable through an IEEE 488 data bus.



Linear Passbank for Minimum Noise
The linear passbank option minimizes residual line ripple on the DC voltage supply to the plasma tube. This option is essential if the application requires low noise performance. With this option, 0.5% RMS noise over a 10 Hz to 2 MHz bandwidth is achieved in the current control mode, while in the power control mode this number is even further reduced to 0.2% RMS.



Power Supply

- Fully instrumented front panel
- Microprocessor based
- High electrical efficiency
- Computer and remote controllable
- Self-diagnostic

Features

- Up to four microprocessors in Power Supply and Laser Head
- Digitally controlled phased SCR's
- Optional IEEE and RS232 data link
- Optional plug-in units for performance improvements

General Considerations

Since the output power of an ion laser is a strong function of the current through the discharge, a power supply needs to generate an extremely stable DC current independent of line voltage fluctuations. Direct adjustment of the current provides a quick control over the laser output power. Rectification of the AC line input and complete regulation of any DC instabilities therefore are the main functions of the power supply.

In addition, for convenient operation, it is important to have easy access to other operating parameters such as gas fill pressure and magnetic field.

The Model 2560 Power Supply features a microprocessor based design that utilizes digitally control phased-SCR's (silicon controlled rectifiers) in a sophisticated switching technique to efficiently generate highly stable DC currents. Microprocessors continuously control and monitor all critical system parameters and guarantee safe operation at all times.

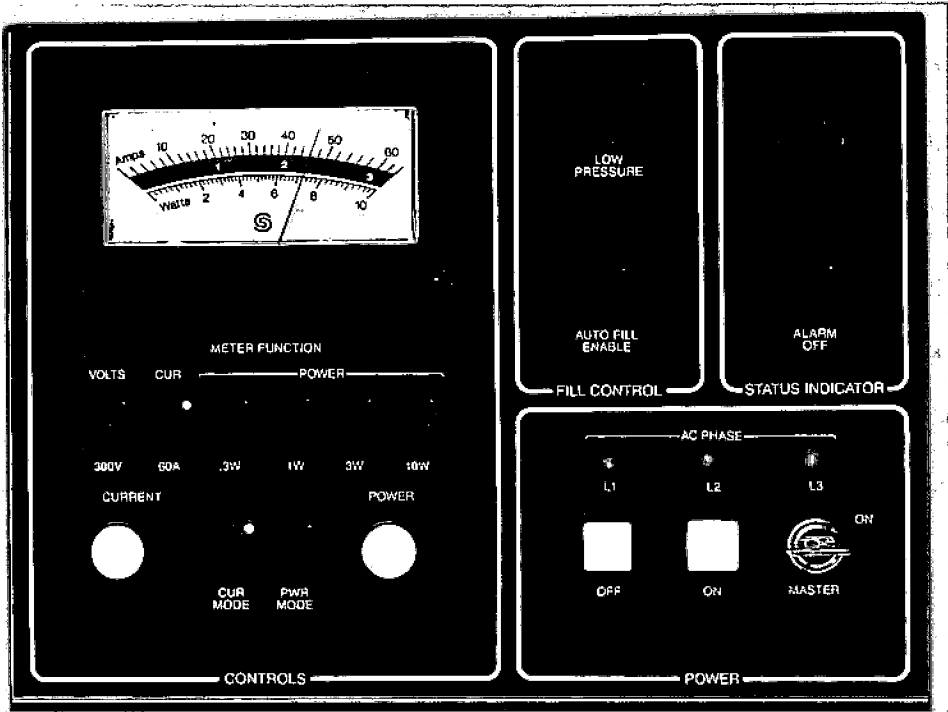
A modular design approach with numerous retrofitable options allows complete interfacing through external controls and further improvement of the system performance.

FULL FRONT PANEL INSTRUMENTATION FOR MAXIMUM USER FLEXIBILITY

The Model 2560 Power Supply features a fully instrumented front panel design to provide optimum operational convenience.

Key control functions switches and indicators include:

- a master key switch to prevent unauthorized power turn-on;
- power "on"/power "off" switches for turn on and shut off of DC power to the laser head;
- AC phase lamps to indicate that all three phases of the power lines are properly connected;

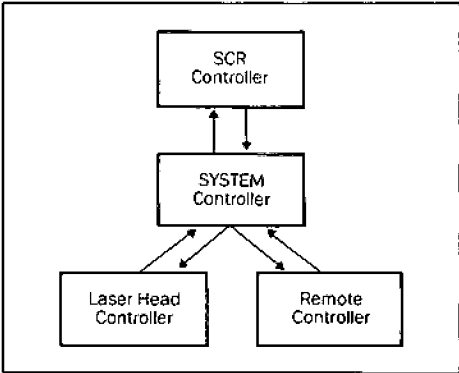


- momentary contact function selection switches with LED indicators, to allow quick selection of operational mode (current or power), range of the power meter and readout of key operational parameters;
- a multifunction meter to display values of key operating parameters (tube voltage, tube current, optical output power and magnet current);
- current and power adjustment knobs (two 10-turn digitally controlled potentiometers) to allow precise control of laser current or closed loop output power,
- status fault indicator and electronic alarm system to provide an audible fault indicator and two-digit numerical read-out of error codes,
- low pressure indicator and autofill system enable switch to indicate tube fill requirements and allow customer selected enabling of the automatic fill system.

MICROPROCESSOR BASED FOR COMPLETE DIGITAL CONTROL CAPABILITY

Individual microprocessors in the Head and Model 2560 Power Supply continuously monitor and maintain all the key system operating parameters including:

- plasma tube current,
- plasma tube voltage,
- output power,
- magnetic field,
- water flow,
- water temperature,
- safety interlock status,
- utility status.



This level of microprocessor control allows the user to operate the system even with marginal utilities. At the first hint of trouble or inadequate operating conditions, the main microprocessor unit can shut the system down to protect against any possibility of catastrophic failure. Optional electrically alterable PROM's in the power supply provide non-volatile memory storage to record the fault or faults that caused shutdown as well as the last conditions under which the system was operating. A query of the status fault indicator displays the two-digit fault code on the front panel (e.g., inadequate water flow rate at given current, etc.) and, after correction of the problem allows return to original operating status.

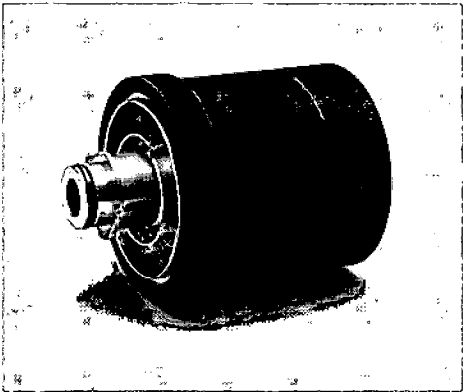
Options

Model Number



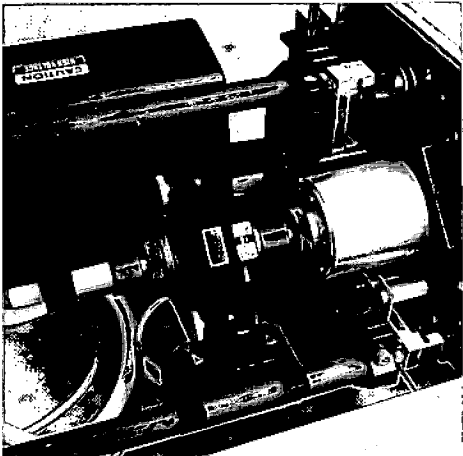
High Resolution Digital End Plate
Multi-lever high resolution mirror mount, with 3-digit LED display of wavelength, photodiode gain selection, and LED "on center" indicator.

2290



Prism Assembly
Allows single-line operation for a number of selected wavelength ranges. Specify gas type and wavelength range.

P/N 0428-6080

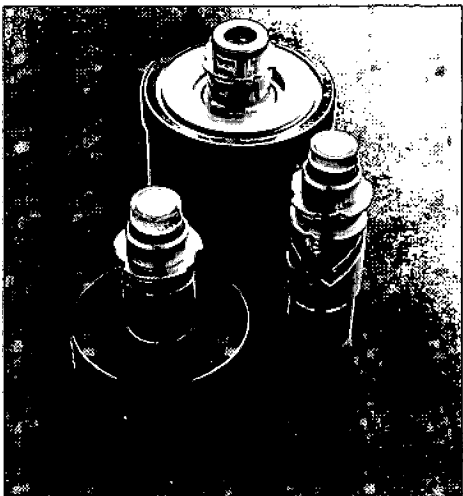


Temperature-Stabilized Etalon
Allows single-frequency operation, specifically at low gain lines: 457.9 nm (argon), 413.1 nm (krypton) and 647.1 nm (krypton). Includes Model 482 Oven Temperature Controller.

583

Air Spaced Etalon
Allows single-frequency operation at high intensity argon lines 488.0 and 514.5 nm.

589

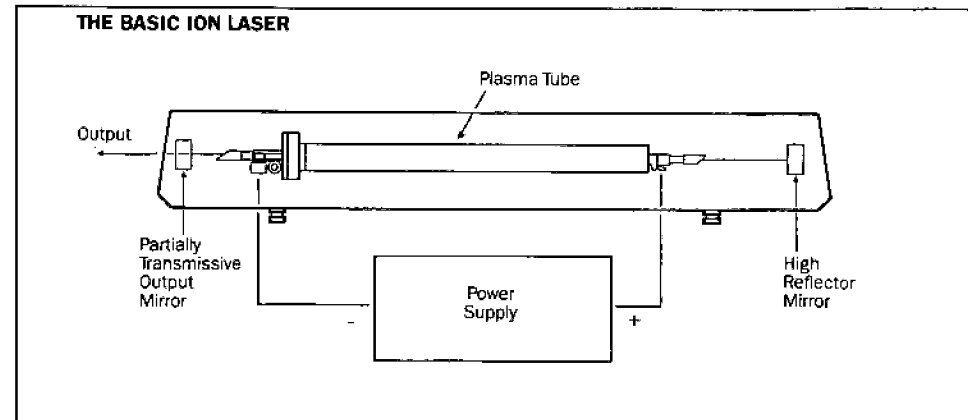


Optics
Large selection of optics for operation of all Models 2020 and 2025 of numerous wavelengths.

GENERAL DESCRIPTION

The basic ion laser consists of three primary components: a resonator structure, a plasma tube and a power supply. The resonator structure holds the two reflective mirrors in precise alignment, thus forming a resonant optical cavity. One of these mirrors is totally reflective in the wavelength of operation and is referred to as the high reflector. The other mirror, the output coupler, is partially transmissive to allow a fraction of the light energy stored in the cavity to escape as output power. The plasma tube provides optical gain within the resonator, causing it to act as an oscillator. The power supply provides a DC voltage and an adjustable current across the plasma tube to sustain a controlled arc discharge through the fill-gas of the plasma tube. High-power ion lasers typically utilize argon or krypton gas as the gain medium.

In the discharge, the ionized atoms of the fill gas are excited through multiple collisions with the accelerated electrons. Stimulated emission from the various excited states to the ground state of the ionized argon or krypton atom produces the required laser action. Depending on physical conditions of the discharge, a fraction of the noble gas atoms may be double ionized. Stimulated emission from these states is possible as well, giving rise to UV laser action.

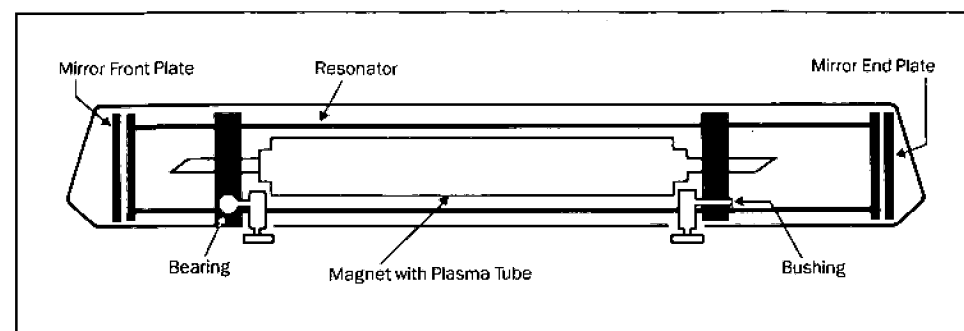


Argon

Argon laser transitions exhibit the highest gain and generally have the highest output powers. Lasing wavelengths are strongest in the blue-green region of the spectrum, with additional moderate emissions in the ultraviolet and in the infrared. The two primary wavelengths are 488.0 nm (blue) and 514.5 nm (green). The powers of these, plus additional important lines between 457.9 nm and 514.5 nm, are summed to determine the broadband power specification of the laser. Argon lasers are nominally classified by their broadband power levels. By substituting a set of UV optics, broadband UV operation can be obtained between 334.0 nm and 363.8 nm.

Krypton

Krypton laser transitions do not have as much gain as argon transitions, and are generally less powerful. Krypton lasers exhibit emission across a broader visible spectrum than argon lasers, and are often attractive for this reason. The primary wavelength from a krypton laser is the strong red line at 647.1 nm, although there are other significant lines in blue, green, yellow, red and near infrared regions. Krypton lasers are nominally referred to by their broadband red output power (647.1 nm plus 676.4 nm).



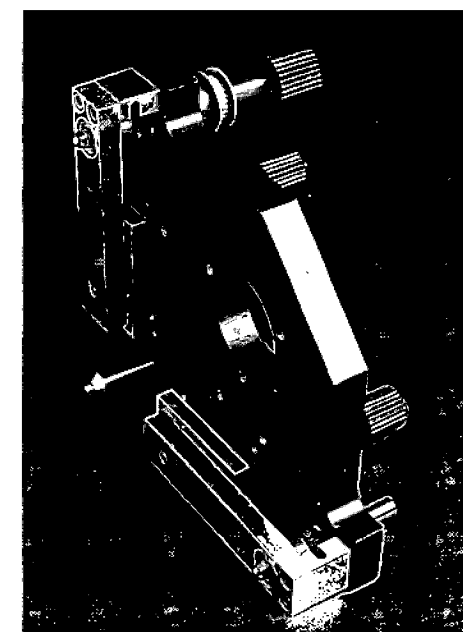
compensation exceedingly straightforward, thus eliminating the need for complex re-entrant type designs.

To complete the overall resonator structure, massive end-plates in combination with high stiffness springs are used to assure tight coupling of the mirror mounts to the resonator bars, thus maximizing rigidity and minimizing susceptibility to mechanical resonances.

This combination of elements results in an optical cavity structure that provides outstanding performance with superb beam-pointing characteristics, excellent length-frequency stability and low amplitude jitter.

KINEMATIC MOUNTING FOR MAXIMUM MECHANICAL ISOLATION

The entire resonator structure in the Model 2020 is kinematically mounted so that thermal and mechanical stresses cannot be coupled from the laser housing into the resonator to disturb the mirror or plasma tube alignment. Two isolation-bushings and a spherical bearing isolate the entire optical cavity from mechanical stress applied to the outer case, end-plates, or feet of the laser. This construction also relieves any thermally generated mechanical stresses which might originate in the resonator structure. The stability of this design is confirmed by the superb turn-on and warm-up performance of the Model 2020. Typically, at fixed current, the laser turns on at more than 80% of full power and produces 95-100% of full power within ten minutes. Power drift, without light control, is a direct measure of the stability of the resonator structure. In the Model 2020, this power drift is typically less than 3% over a ten hour period.

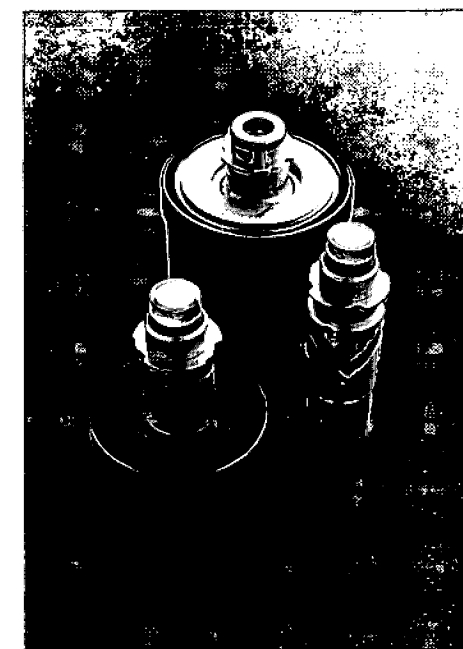


HIGH RESOLUTION MIRROR MOUNTS FOR PRECISE OPTICAL ADJUSTMENT

In the Model 2020 special attention has been paid to the design of the mirror mounts. Direct drive coarse adjustments give quick search for horizontal or vertical mirror position. A unique multi-lever-linkage mechanism provides backlash-free fine adjustment and allows high resolution control of angular alignment through an approximately 30:1 reduction in mirror displacement.

PRECISION OPTICS HOLDERS FOR QUICK ALIGNMENT AND COMPLETE INTERCHANGEABILITY

The optics holders have been designed to provide quick and easy change of the mirrors in the holders and of the holders in the lasers. A bayonet type connection seals the optical cavity to ensure a dust free intracavity space. Decoupled mirror seats provide a high degree of reproducibility upon insertion of the mirror holders, minimizing the search for optimum alignment after each mirror change.

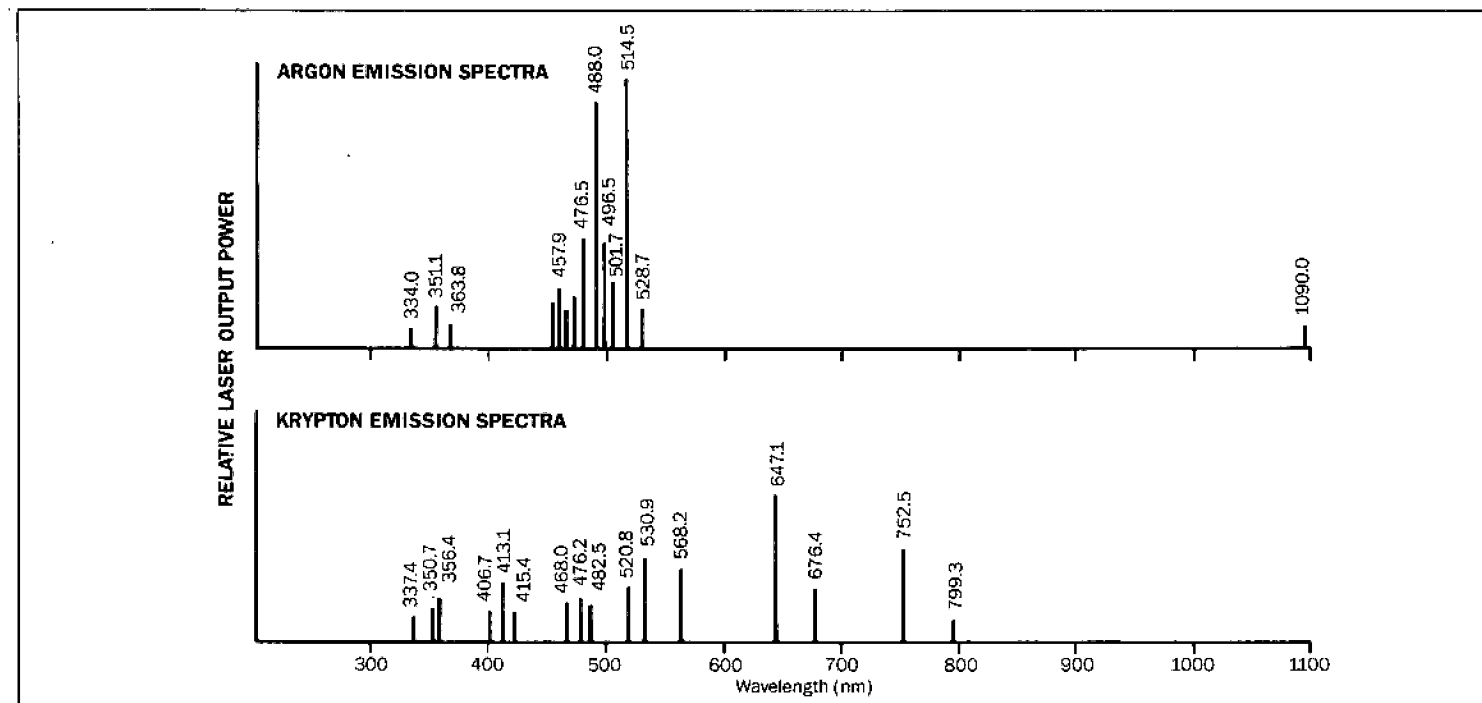
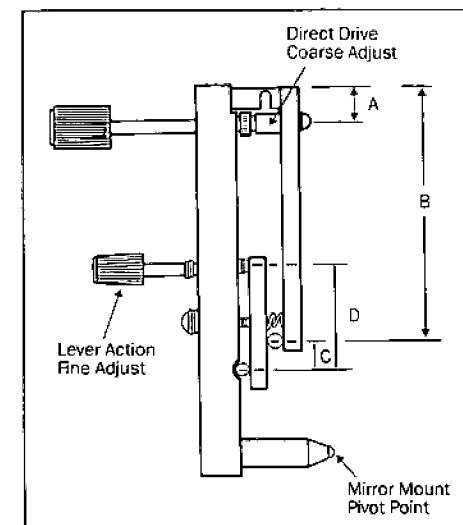


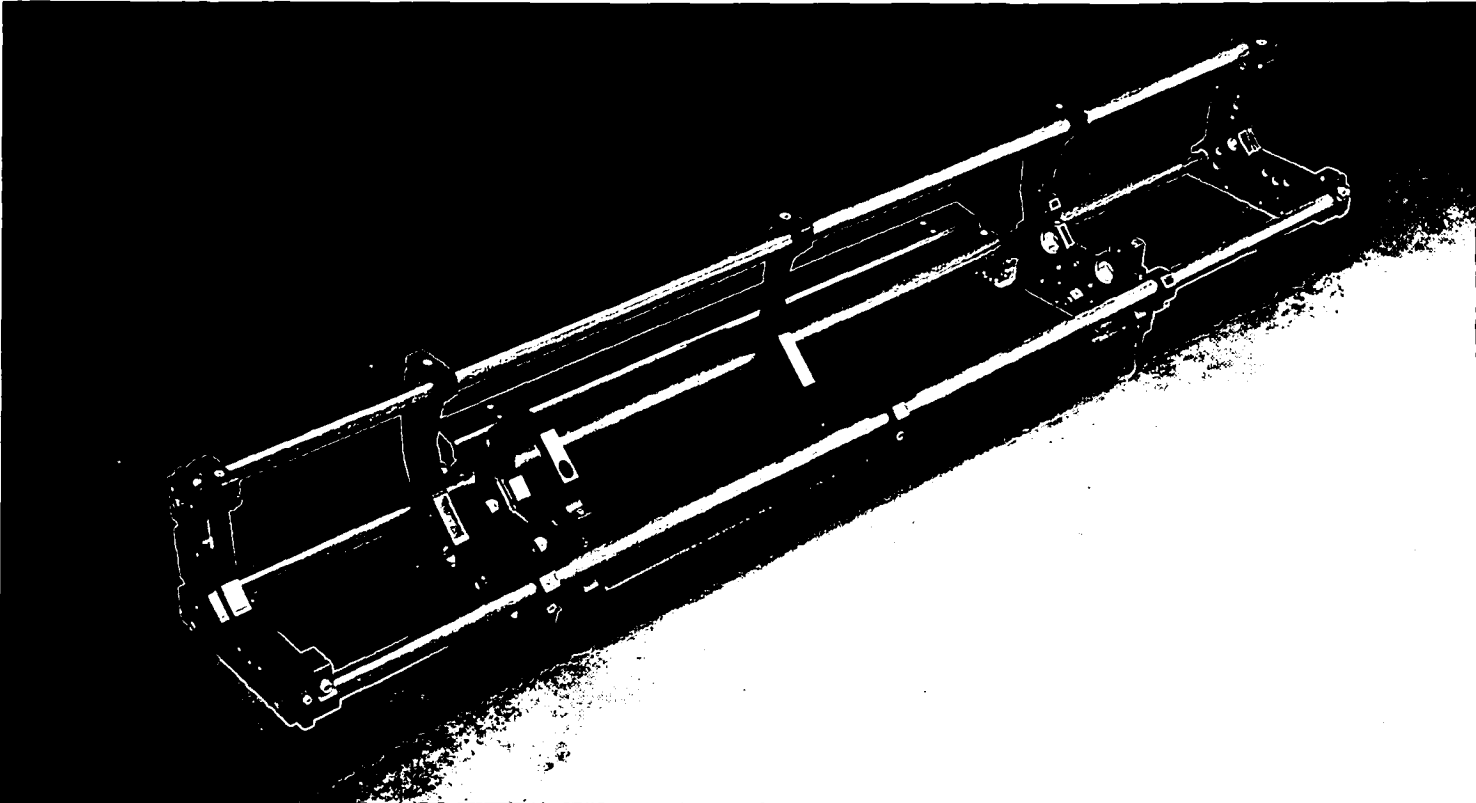
INTRACAVITY SPACE FOR SINGLE-FREQUENCY OPERATION

An intracavity space is provided for simple installation and quick alignment of an etalon. The etalon provides extremely stable single-frequency output power for applications requiring long coherence lengths or very narrow linewidths.

TEMPERATURE COMPENSATED PRISM ASSEMBLY FOR MINIMUM ANGULAR DRIFT

A completely temperature compensated prism assembly guarantees stable single-line operation over a large temperature range. This combines with the superb angular stability of the resonator to provide minimum angular drift of the laser beam. Beam-pointing stability of the laser is typically better than five microradians per °C.





- High frequency stability
- Minimal temperature sensitivity
- Superb beam pointing stability
- High precision, backlash free mirror adjustment
- Quick and repeatable optics change

Features

- Composite graphite resonator
- Non orthogonal geometry
- Totally temperature compensated design
- Kinematic isolation of optical cavity
- Multi-lever-linkage mirror mounts

General Considerations

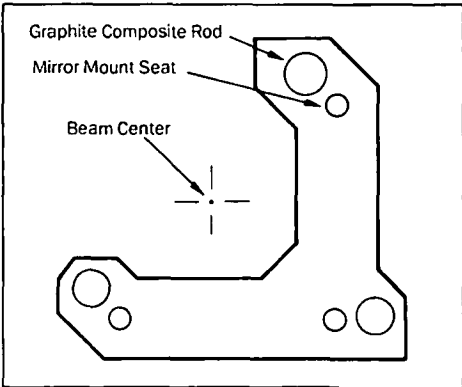
The primary function of the resonator in the laser is to provide an optical cavity that is as stable as can be. First of all it must be resistant against flexure, vibrations and other mechanical distortions which can degrade the laser beam-pointing stability or even reduce its output power. Secondly it must be insensitive to temperature variation for maximum length stability. Length stability is of major concern for single-frequency operation where a change in cavity length directly corresponds to a change in operating frequency.

UNIQUE NON-ORTHOGONAL GRAPHITE COMPOSITE RESONATOR FOR SUPERB BEAM POINTING AND LENGTH STABILITY

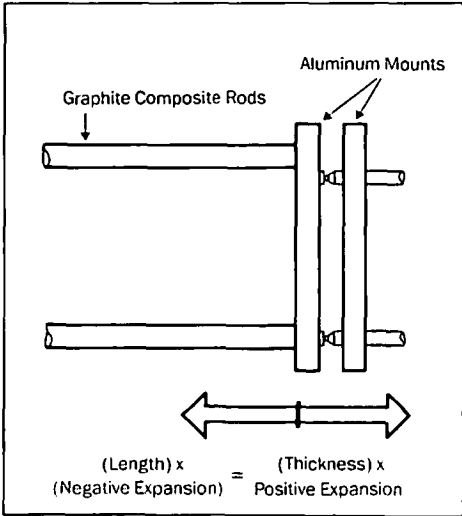
The Model 2020 optical cavity is designed for maximum rigidity and outstanding length stability.

Resonator construction begins with hollow tubes of steel alloy which feature a high modulus of elasticity, for overall strength. These tubes are arranged in a non-orthogonal geometry, which, based on theoretical calculations, produces a structure that is far less susceptible to vibrations or flexure than traditional "L" shaped configurations.

Length stability over a wide temperature range is obtained by using low expansion graphite composite rods inside the resonator tubes. The use of graphite composite as the length con-



trolling element in the resonator design has several distinct advantages. First the thermal expansion coefficient of composite graphite is four to five times



smaller than that of quartz and is the lowest of any material currently used for construction of laser resonators. Secondly, the thermal expansion coefficient of graphite composite is negative, making overall temperature

OUTPUT POWER AND CURRENT DENSITY

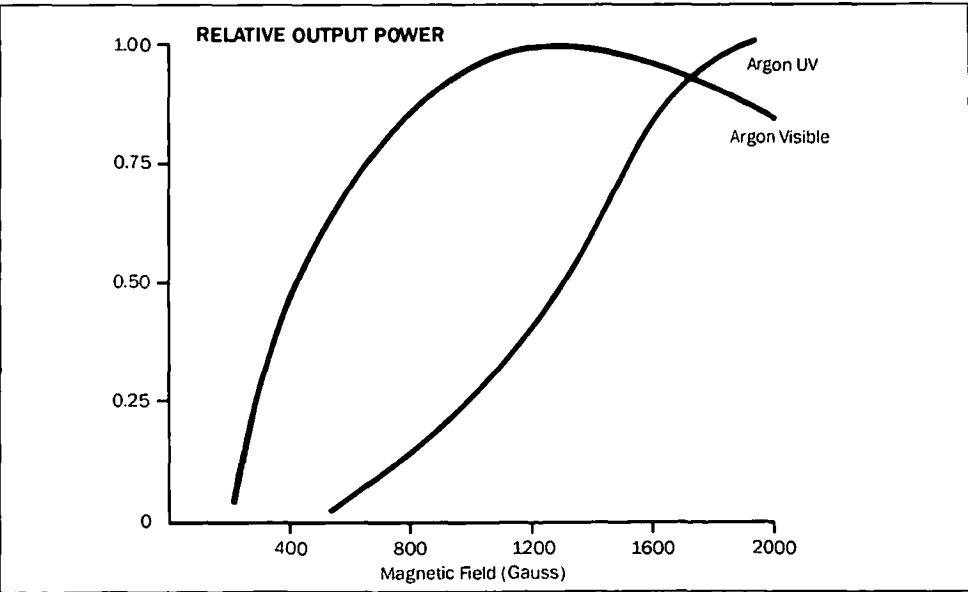
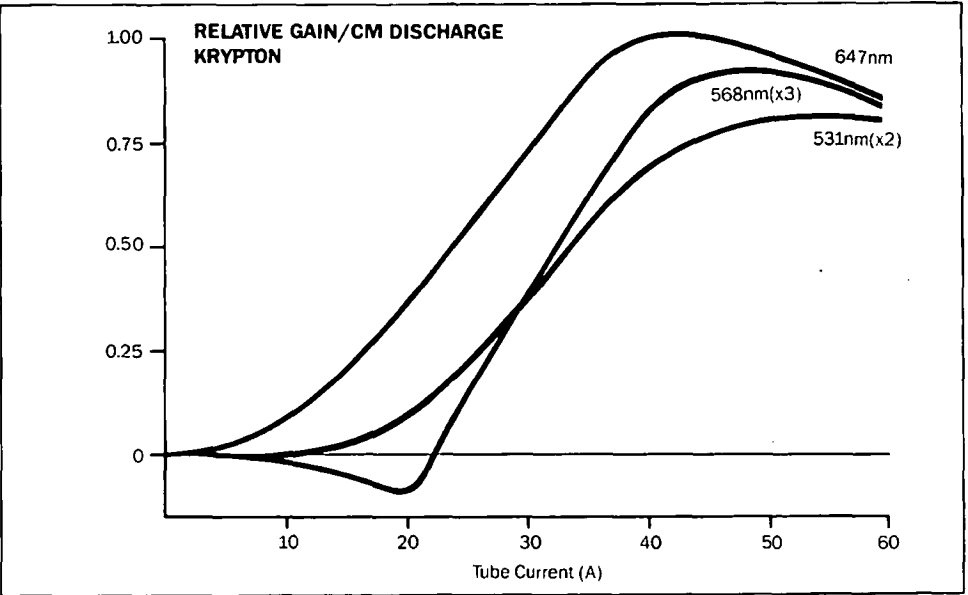
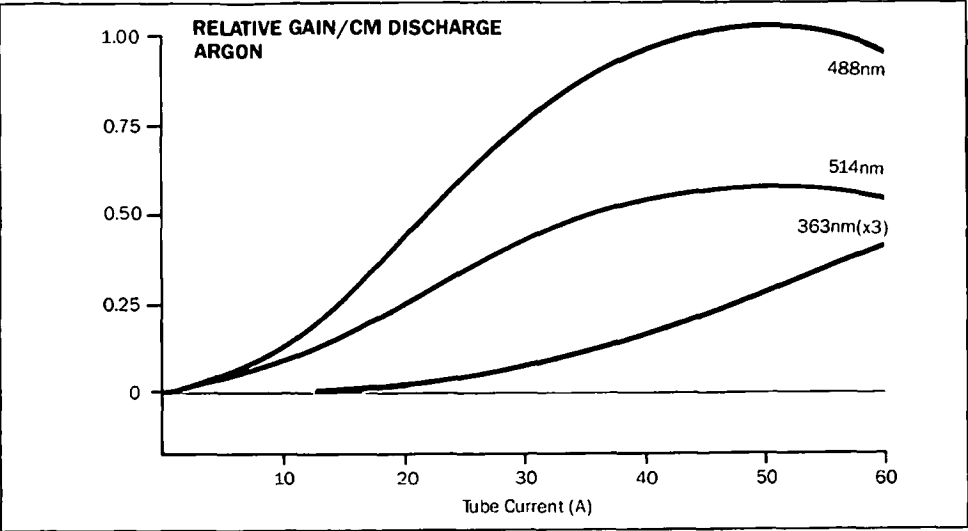
The output power of a given laser line is determined by variables such as: optical gain through the medium, the transmission of the output coupler and intracavity scatter and reflection losses. For maximum output power, the intracavity losses are minimized through the use of clean and properly designed optical components. An optimum transmission for the output coupler is determined by actual values for the total intracavity losses and optical gain. The only independent variable for obtaining maximum output power is the gain. This parameter which is different for each laser line depends on the current density, and its value is determined by the detailed physics of the transition. For some argon and krypton lines, the gain as a function of current density is given in the next columns.

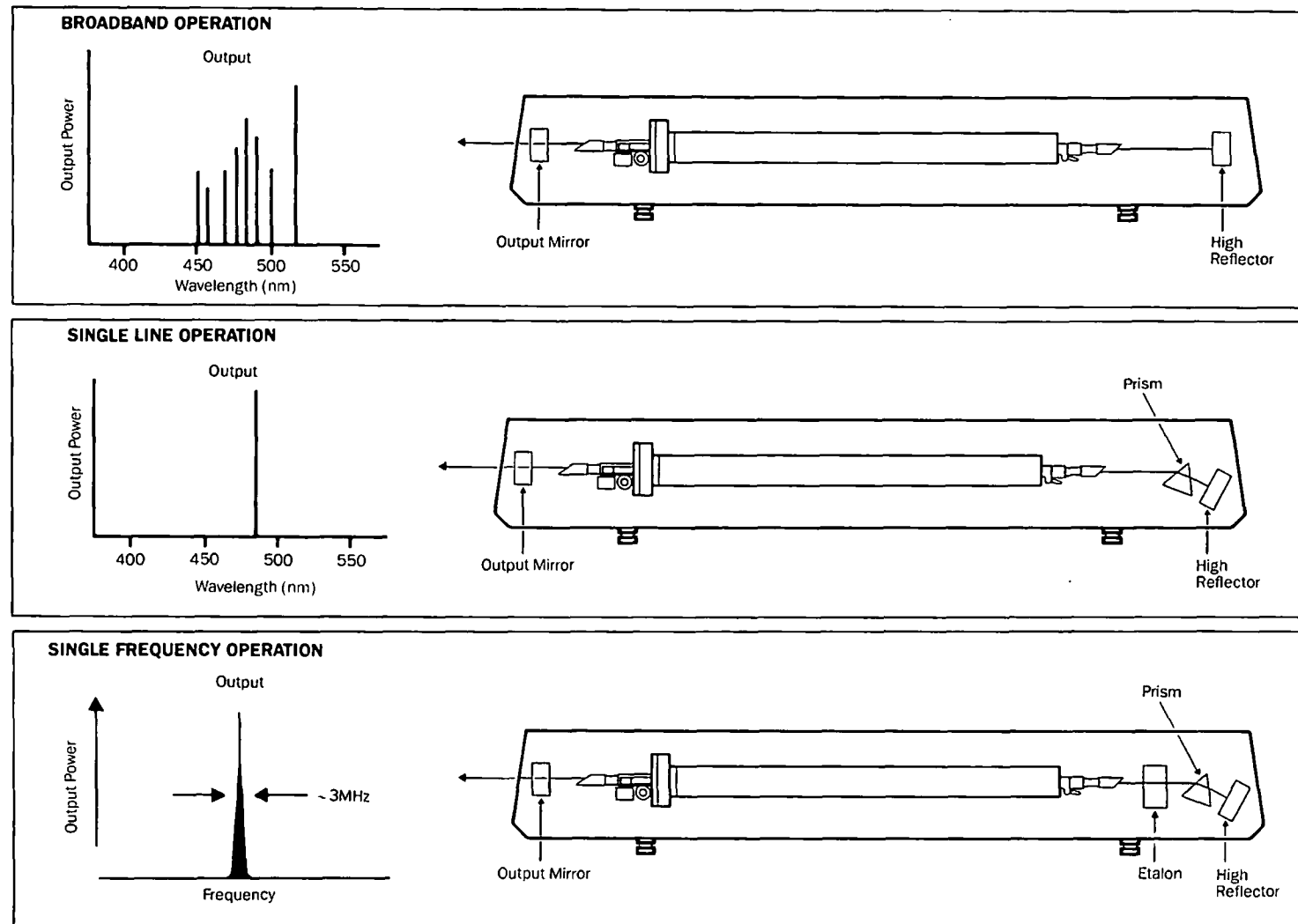
Although the functional dependence of the gain for the visible argon and krypton lines is different, in both cases maximum gain is observed at values below approximately 800 A/cm². However, for the violet lines of the krypton laser and ultraviolet lines of the argon laser (corresponding to transitions of the double ionized atoms), the threshold current density is about 600 A/cm². No saturation of the gain is observed even for the highest current densities that can be realized. In order to obtain maximum violet and ultraviolet performance it is therefore essential to operate at the highest current densities.

OUTPUT POWER AND MAGNETIC FIELD

A longitudinal magnetic field significantly influences the output power of the various lasing lines. One effect of the magnetic field is to confine the discharge, thereby increasing the plasma density and the power for those lines operating below the saturated gain value. An adverse effect of the magnetic field is to create a line-dependent Zeeman splitting of the energy levels of the transition. This produces a small amount of ellipticity in the polarization of the emission. As a result, increased losses on the polarization sensitive Brewster angle windows will cause the power to go down.

Depending on the absolute values of both effects, each line will have a different optimum magnetic field. For the ultraviolet lines the output power still increases with maximum obtainable magnetic fields.





BROADBAND OPERATION

For broadband, or "all-lines" operation, a high reflector plus an output coupler are used. These mirrors have optimized reflection and transmission for a number of lines not too widely separated in wavelength (usually about 70 nm maximum). Different sets of all-lines optics are used to cover different groups of lasing lines. With a given set, the laser operates at a number of wavelengths simultaneously.

SINGLE-LINE OPERATION

Single-line operation is achieved by use of an intracavity prism assembly. This assembly consists of a Brewster angle prism and a high reflector. The dispersive effect of the prism is utilized to have only one laser line at a time perfectly aligned perpendicular to the high reflector, allowing only this line to lase. Different lines may be accessed by tilting the prism assembly with respect to the longitudinal axis of the laser.

SINGLE-FREQUENCY OPERATION

If a laser is operating single line, a closer look at the output on a higher resolution wavelength or frequency scale would reveal that many discrete frequencies are present under the profile of the line. At a particular wavelength, discharges in argon or krypton gas provide gain over a frequency interval of 5 GHz to 8 GHz, depending on the wavelength and gain of the particular laser line. This band, or line profile, is centered on the frequency of the particular atomic transition and its width is caused primarily by Doppler broadening.

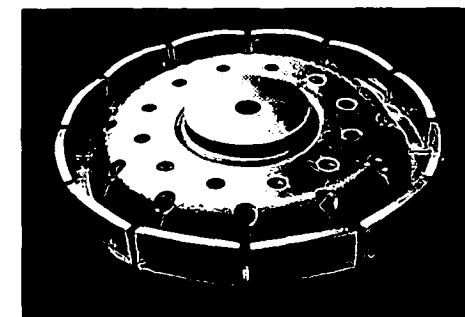
Since for lasing it is required that the oscillating electromagnetic field inside the cavity forms a standing wave between the mirrors, only a discrete number of frequencies, ν_n satisfy the relation:

$$\nu_n = \frac{nc}{2L}$$

where n is an integer, c is the speed of light, and L is the optical spacing between the two cavity mirrors. Light at the discrete frequencies that fall under the gain envelope will be amplified and lasing at these frequencies will occur. These discrete lasing frequencies are referred to as longitudinal modes. For a one-meter-long ion laser, about 40 longitudinal modes are oscillating simultaneously for a given laser transition.

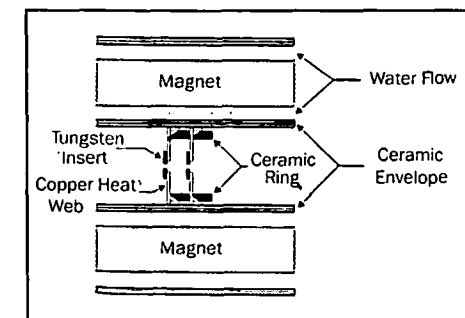
In order to have the laser operating at one longitudinal mode only, a frequency selective intracavity optical element, or etalon, is introduced. The etalon is essentially a bandpass filter which introduces just enough additional loss on all intracavity longitudinal modes except the selected one. This mode will be the only one lasing then at any time. The laser is said to operate single-frequency in this case.

thermal contact area. Conductive cooling by water flow on the outside of the envelope efficiently transports the heat away from the plasma tube. Through this cooling scheme, the outside temperature of the plasma tube never exceeds 80°C. This construction allows high current operation for maximum performance in the deep blue and UV, yet efficient cooling to minimize temperature effects in the resonator. In addition it protects against thermal fracture and provides rapid performance stabilization.



MOLY-MANGANESE BRAZE TECHNIQUE FOR 100% HERMETIC SEALS

To ensure durable operation, the brazes in the plasma tube must provide good mechanical and thermal contact. Metal-to-ceramic seals in the Model 022 plasma tube are made using a two-step braze process. First the ceramic is metalized with a nickel coated molybdenum-manganese alloy. In the second step, the metal is actually brazed to the ceramic with a copper-silver eutectic. Sandwich brazes utilizing ceramic back-up rings provide an extra margin of reliability by ensuring strain relief against differential thermal expansion of the metal and ceramic. The resulting seals are completely hermetic and less susceptible to the formation of microcracks which can cause vacuum leaks after temperature cycling during normal heat-up and cool-down.

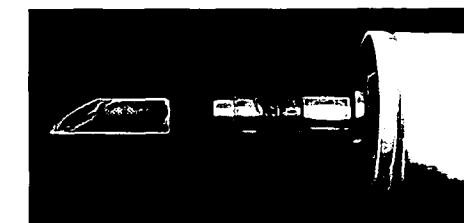


STABLE DISCHARGE FOR LOW NOISE PERFORMANCE

The stability of the discharge directly influences the noise performance of the laser. In the Model 022 tightly spaced disks with precisely controlled separations ensure a highly stable discharge and low noise performance. An accurately designed internal gas return path further adds to the stability of the discharge.

ANODE ISOLATION TO ELIMINATE ELECTROLYSIS

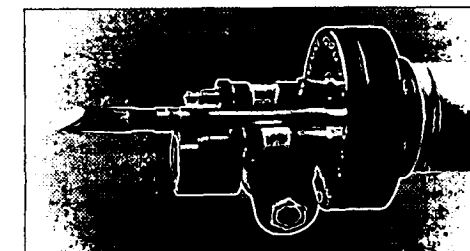
The anode in the Model 022 is totally enclosed by the metal-ceramic envelope. Complete isolation from the water flow prevents electrolysis and ensures long plasma tube lifetime and high reliability.



CRYSTALLINE QUARTZ BREWSTER WINDOWS FOR OPTIMUM PERFORMANCE IN ALL SPECTRAL REGIONS

Since all Model 022 plasma tubes can potentially be operated with enhanced ultraviolet output, the Brewster angle windows are made of crystalline quartz. Based on optical considerations, this material has the best properties in both the visible and UV region of the spectrum. However, since crystalline quartz is birefringent and has different thermal expansions along the two axes, special care must be taken with the hard sealing of the windows and the alignment of the two windows with respect to each other during the manufacturing of the tube.

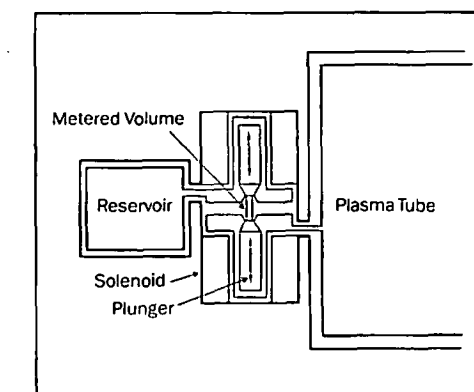
The window assembly on the Model 022 features crystalline quartz windows hard sealed to crystalline quartz end-bells with properly matched crystal axis orientation. These end-bells in turn are sealed to the metal end-flanges of the plasma tube using a hard seal and multiple metal transitions with a low temperature braze. This design allows precise angular alignment of the birefringent windows to ensure maximum output performance.



COMPACT FILL SYSTEM FOR OPTIMIZED FILL PRESSURE

The ultracompact gas fill system for the Model 022 consists of an all metal, high pressure gas reservoir and a dual valve gas-delivery mechanism. The complete, compact system is solidly connected to the cathode end-flange of the plasma tube.

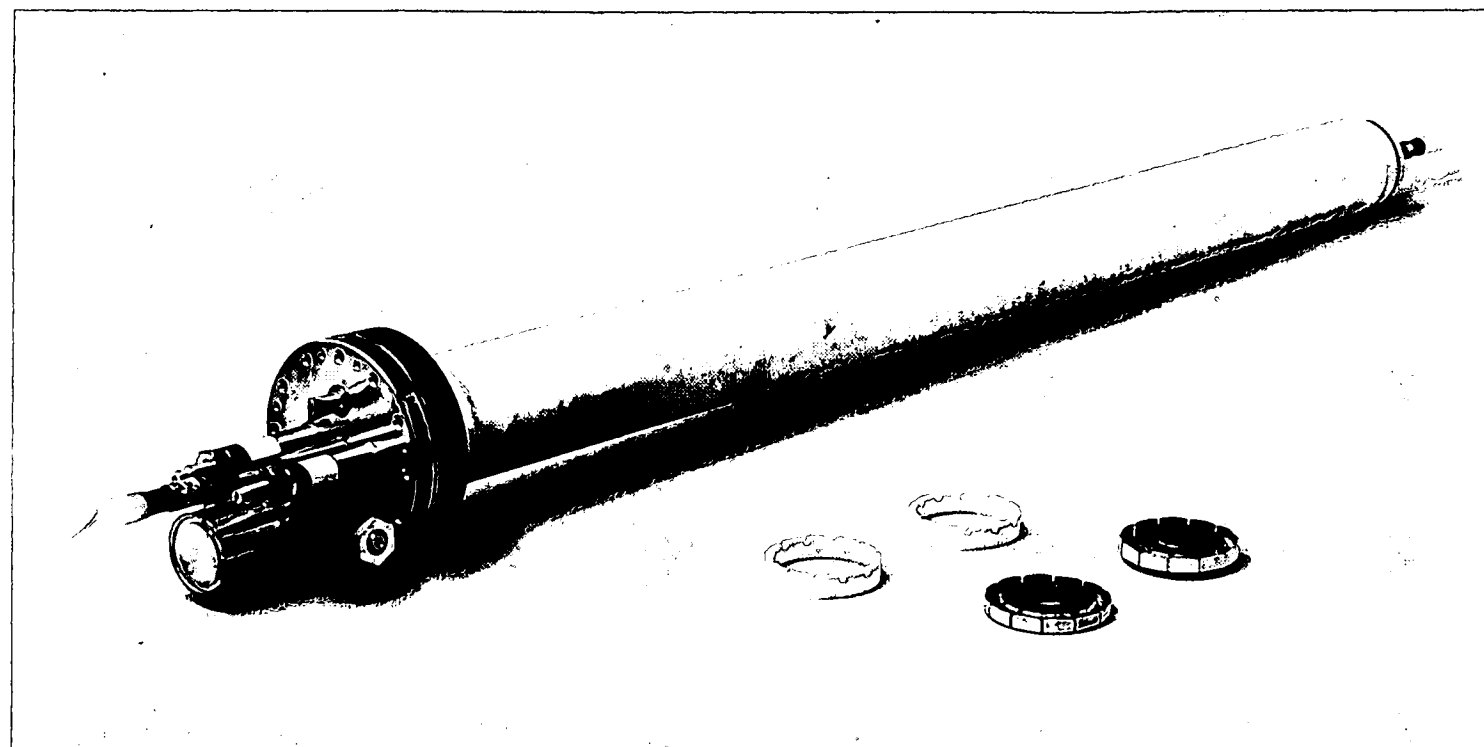
The dual valve mechanism delivers precisely metered gas volumes for exactly controlled, stepwise optimization of the plasma tube pressure. The entire assembly is baked out together with the plasma tube at elevated temperatures to make it completely contaminant free and to ensure maximum cleanliness.



TOTAL VACUUM INTEGRITY FOR MAXIMUM LONG-TERM RELIABILITY

For reliable long-term operation it is crucial that the plasma tube can maintain its low (<1 torr) pressure of high purity noble gas. Any gas or other impurity leaking into the tube would severely reduce the laser performance and finally prevent lasing altogether.

In the Model 022, total vacuum integrity is ensured through the use of low porosity alumina, sandwich brazing techniques, a compact gas fill system and brazed on end-bells.



- Unsurpassed UV performance
- Low noise characteristics
- Drop-out free operation
- Rugged metal-ceramic construction

Features

- Copper-tungsten disks
- Conductively cooled ceramic envelope
- Sandwich brazing technique
- Dual valve metered fill system
- Crystalline quartz end-bells

General Considerations

The plasma tube is the most essential of all laser components because the discharge in the plasma tube provides the optical gain for the laser. The level of performance that ultimately can be achieved is therefore primarily set by the physical parameters characterizing the discharge.

One of these parameters, the current density, is of major importance since it determines the maximum output power that can be obtained at the individual laser lines. In particular, the output power of the deep blue and ultraviolet lines depends critically on the highest current density that can be obtained (see also curves on page 15). The reason for this is that the emission of these wavelengths corresponds to transitions of the double ionized atoms. For maximum performance at these shorter wavelengths,

the plasma tube must be able to handle current densities as high as possible.

However, at increased current densities there is an increased potential of sputtering of the materials directly enclosing the discharge. Also, efficient dissipation of the excess heat becomes more important in order to maintain a sufficiently low overall temperature of the plasma tube. In addition to these considerations it is essential that the plasma tube maintains its vacuum integrity at all times.

The design of a plasma tube with maximum performance in the ultraviolet and deep blue therefore requires a careful selection of materials, an efficient cooling scheme and a rugged construction.

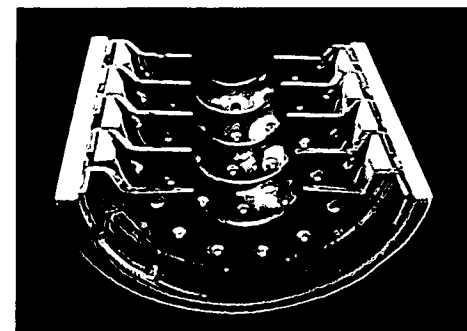
The state-of-the-art Model 022 plasma tube is conservatively designed to satisfy all these requirements.

METAL-CERAMIC CONSTRUCTION FOR HIGH PERFORMANCE/LOW TEMPERATURE OPERATION

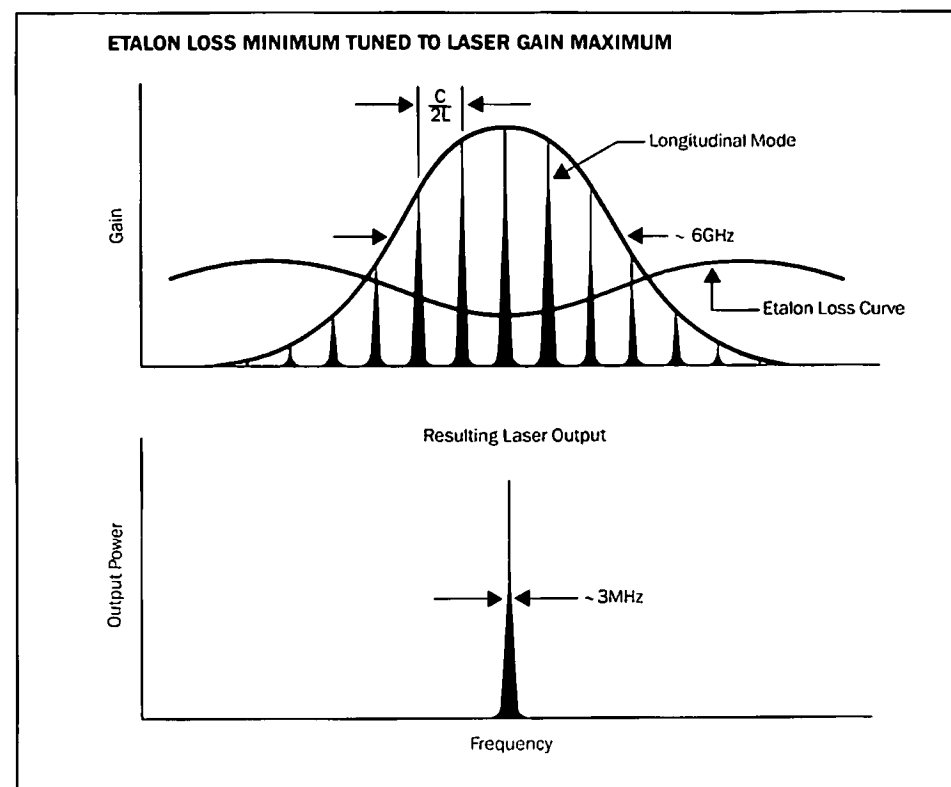
The Model 022 features segmented bore metal-ceramic construction with copper-tungsten disks for high performance at maximum current densities and effective heat dissipation for low temperature operation.

Tungsten, as material directly enclosing the discharge, allows current densities of up to 1500 A/cm² to be obtained without adverse sputtering effects.

Tungsten is one of the very few materials that is extremely sputter resistant and at the same time compatible with high vacuum processes because of its extremely high melting point. It is therefore the material of choice for plasma tube bore elements.



In order to efficiently dissipate the excess heat of the discharge, the tungsten disks are densely packed and brazed to copper heat webs. Copper is preferred in this case because of its extremely high thermal conductivity. The copper heat webs, in turn, are folded against the inside of the ceramic envelope and brazed to provide a large



COHERENCE LENGTH

For several applications the distance or path length over which the wavefront from the laser light maintains a fixed phase relation is of prime importance. This distance or "coherence length" l_c is inversely proportional to the linewidth of the laser:

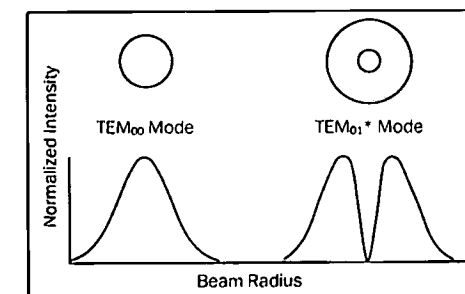
$$l_{\text{coherence}} = \frac{c}{\Delta\nu}$$

Another way of interpreting the coherence length is to define it as the maximum difference in optical path length between two arms of an interferometric system at which interference fringes can be detected.

It is immediately evident that when changing the laser from single-line to single-frequency operation, the coherence length increases enormously. Using some typical values of 6 GHz and 3 MHz for these two configurations respectively, the coherence length increases from 50 mm to 20 meters.

FREQUENCY STABILITY

The frequency stability of an ion laser is directly related to the length stability of the resonator cavity. The length stability is affected by two factors: thermal expansion of the resonator structure, and mechanical vibrations, the latter of which causes microphonic movement of the cavity mirrors.



Thermal frequency stability is defined as the instantaneous rate of change in an emission frequency with respect to temperature or $d\nu/dT$. The value is expressed in MHz/°C. A properly designed laser resonator is therefore made of a low expansion material and includes a temperature compensation scheme to further minimize residual thermal effects.

Frequency modulation due to mechanical vibrations, referred to on occasion as "jitter", is expressed as the peak-to-peak frequency vibration in MHz. The actual value of jitter for a particular ion laser is determined by cooling water flow rate, external vibrations, and acoustic noise.

Frequency stability is most important in applications requiring single-frequency operation.

SPATIAL MODES

The term "spatial" or "transverse" mode relates to the distribution of power

across the laser beam. Examples of different spatial modes are shown in the next column.

The particular spatial mode produced by a laser is determined by the mirror radii, the limiting aperture within the optical cavity, and the wavelength of operation. For the majority of applications, the most desirable spatial mode is the TEM₀₀ mode which is characterized by a Gaussian power distribution across the beam. This mode provides the smallest beam diameter and divergence angle, and remains Gaussian as the beam propagates through free space or through properly designed optical elements. As a result, the TEM₀₀ mode can be focused to the smallest possible spot size.

BEAM POLARIZATION

The plasma tubes of most ion lasers utilize Brewster angle windows to minimize reflection losses within the laser cavity. Use of Brewster angle windows also results in the output beam being strongly polarized. Typical extinction ratios under these conditions are normally greater than 100:1. The polarization takes place in the plane formed by the normal to the Brewster angle window and direction of beam propagation.

BEAM-POINTING STABILITY

Beam-pointing stability is a measure of the laser's ability to maintain precise angular alignment of the output beam during temperature fluctuations. A change in direction of the output beam is primarily due to two factors. The largest of these is the temperature sensitivity of the prism wavelength selector. Temperature changes alter the index of refraction of the prism, resulting in beam-pointing deviations. To minimize this effect, the prism design must include temperature compensation.

More subtle beam-pointing irregularities occur due to thermal gradients within the resonator structure which misalign the cavity. Thermal gradients can be greatly reduced by designing the structure so that all of its component parts are thermally coupled to each other.

BEAM DIAMETER AND DIVERGENCE

Beam diameters are measured at the 1/e² points of the Gaussian beam. That is also the size of an aperture which will pass 87% of a Gaussian beam's power. Beam divergence is given in terms of full angle, usually in milliradians.

Both beam diameter and beam divergence are a function of wavelength, mirror curvature and mirror spacing.

FREQUENCY STABILITY

The frequency stability of a single-frequency ion laser is determined by two factors: the frequency stability of the etalon and the frequency stability of the ion laser resonator, as defined by the two reflecting mirrors. If, due to an instability in either the etalon or resonator, the selected longitudinal mode drifts away from the etalon loss minimum, an adjacent longitudinal mode will experience less loss and finally the laser frequency will hop to the adjacent mode.

Instabilities of the resonator structure will result in mode hops near the etalon loss minimum, whereas instabilities in the etalon can cause hops to consecutive modes and result in larger frequency excursions.

Two types of etalons can be used to obtain single frequency operation: air spaced etalons and solid etalons.

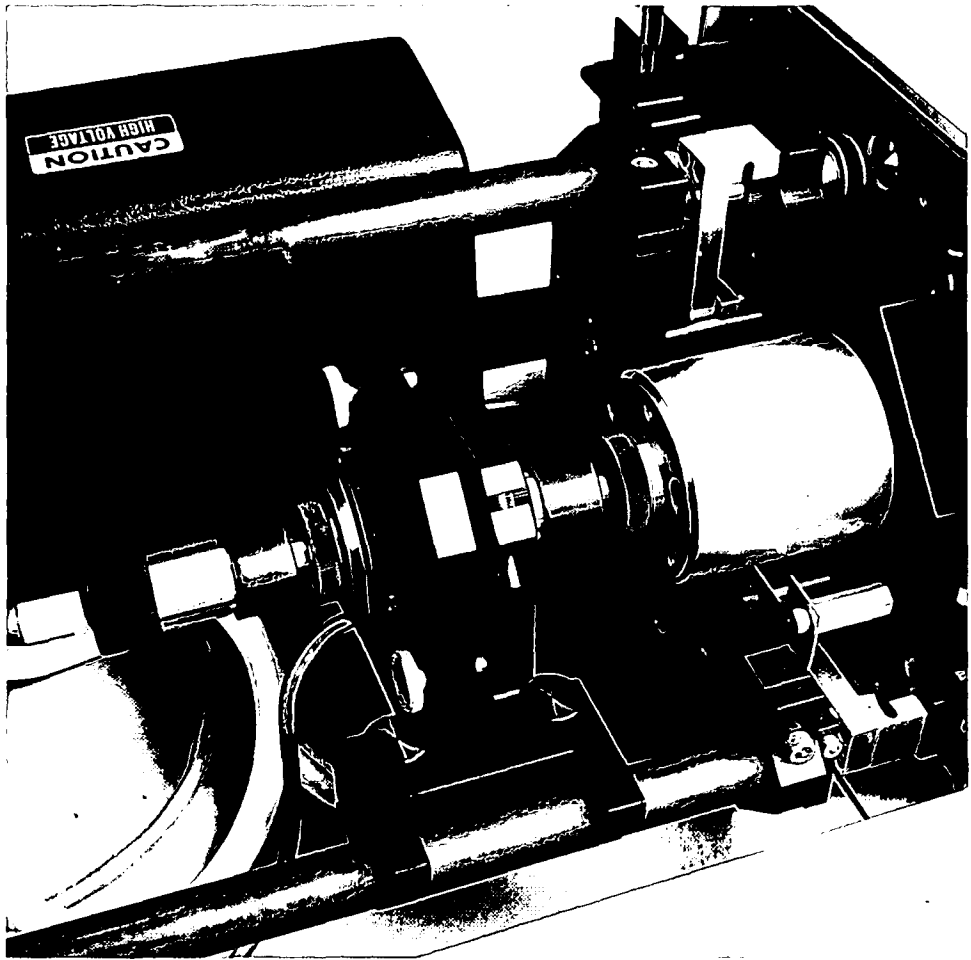
AIR-SPACED ETALONS

Air spaced etalons are preferred for stable single-frequency operation at the two high intensity argon lines: 488.0 and 514.5 nm.

These etalons usually consist of two thin dielectric-coated windows separated by a hollow low-expansion cylinder. Etalons intended for use at high gain lines typically require relatively high-reflectivity coatings which absorb a minute amount of the intracavity power. If a solid etalon element was used, this absorbed power would heat the solid spacer, changing the index of refraction and in turn detune the etalon.

By using a hollow spacer between the two etalon windows, these detuning effects are eliminated. The etalon frequency stability is determined solely by the expansion coefficient of the spacer.

For instance, utilizing an ultra-low-expansion titanium silicate spacer with a thermal expansion coefficient of 0.3×10^{-7} per °C, a frequency stability of better than 18 MHz per °C change in etalon temperature can be obtained. Maximum efficiency is achieved by adjusting the tilt angle of the etalon with respect to the intracavity beam.



Frequency tuning over one or two free spectral ranges can be accomplished by mechanical compression of the etalon spacer.

Generally, air spaced etalons can be quickly installed and removed and therefore are easy to operate.

SOLID TEMPERATURE-STABILIZED ETALON

Solid temperature-stabilized etalons offer extremely stable single-frequency operation at the lower gain lines; the 457.9 nm line of argon, and the 413.1 nm and 647.1 nm lines of krypton.

These etalons generally consist of a solid fused silica etalon element, inside

a temperature stabilized and tunable oven.

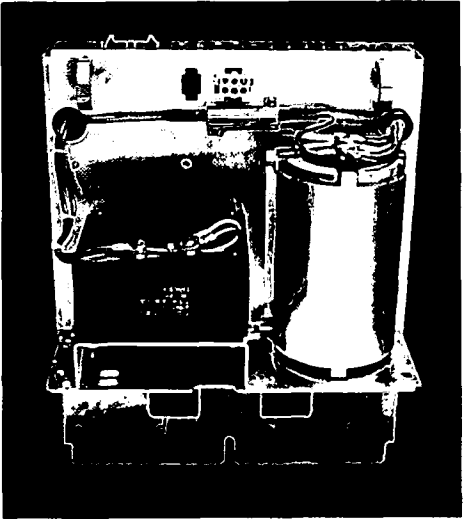
The insertion loss is low which makes this etalon element ideal for the lower gain lines. Since a solid etalon element has only two optical surfaces, reflection losses, which are a primary consideration when gain is low, are minimized and single-frequency conversion efficiency is maximized.

Temperature control of the etalon element to within .01°C during normal operation allows a frequency stability of better than ± 20 MHz to be obtained.

Temperature control also provides a convenient means of tuning the etalon over a number of free spectral ranges.

MODULARITY

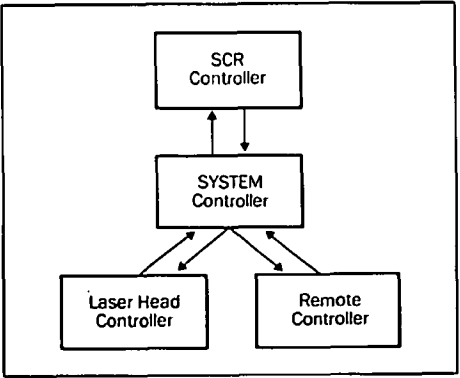
Spectra-Physics' Model 2020 ion laser is designed with the future in mind. A completely modular design approach provides unusual flexibility to continuously match the laser performance to changing or developing requirements. A large selection of options allows the laser to be upgraded from a simple version, producing reliable and cost effective laser light, all the way up to a fully microprocessor-controlled and computer interfaceable system with unequalled performance. Best of all, the most advanced Model 2020 system can be built up step-by-step. The fundamental idea is improvement by addition and not by replacement. In this way the Model 2020 will not only be the best choice for today's application but it will also prove to be a solid investment in solving tomorrow's problems.



TECHNOLOGY

The Model 2020 incorporates recent developments in a number of technological areas.

A metal-ceramic plasma tube features combination copper-tungsten disks to provide efficient heat transfer and high resistance to sputtering. Moly-manganese brazing techniques ensure rugged, microcrack-free construction for reliable day-to-day operation. Silicon controlled rectifiers (SCR's) in the power supply replace massive and expensive transistor passbanks and provide highly efficient current handling capabilities. Up to four micro-processors constantly monitor all vital laser functions and assist in yielding maximum laser performance. A composite graphite optical resonator and multi-lever-linkage mirror mounts assure the most stable and reproducible operation. Individually these features would offer significant improvement in state-of-the-art performance; together they make the Model 2020 stand out from the rest.



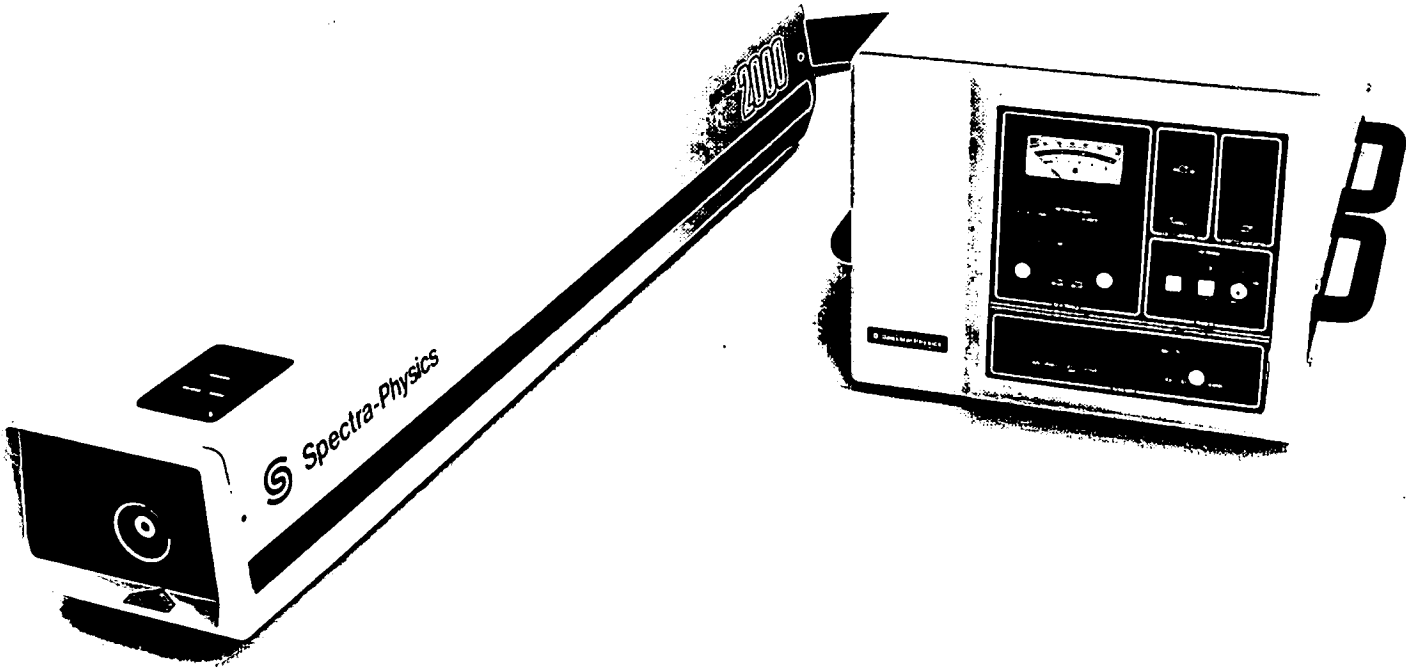
PERFORMANCE

From the viewpoint of technical performance, the Model 2020 has a number of additional unique features to offer.

The conservative metal-ceramic plasma tube design provides the capability of handling very high currents for levels of UV output power that previously could only be obtained with large frame ion lasers.

The option of variable magnetic field-control provides the opportunity for complete optimization of individual laser lines. Finally, drop-out free operation, a low noise option and superb intensity stability all help to set the new standards for ion laser performance.





Spectra-Physics, the world's largest laser manufacturer, produces the widest range of lasers and laser systems including HeNe, Ion, CO₂, Excimer, Nd:YAG and Diode lasers. A broad spectrum of applications ranges from advanced scientific research to industrial production. The company has earned its excellent reputation in the scientific community through a strong commitment to technical innovation and a dedication to high quality. A professional worldwide sales and service organization guarantees continuing technical support of all Spectra-Physics products.

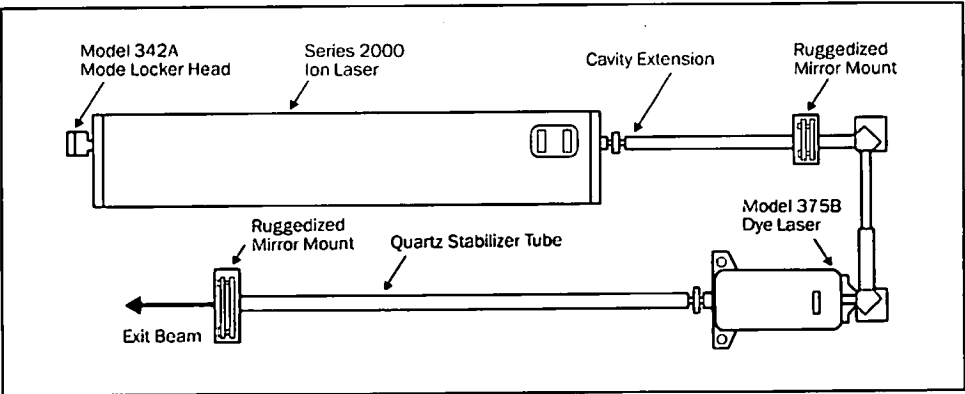
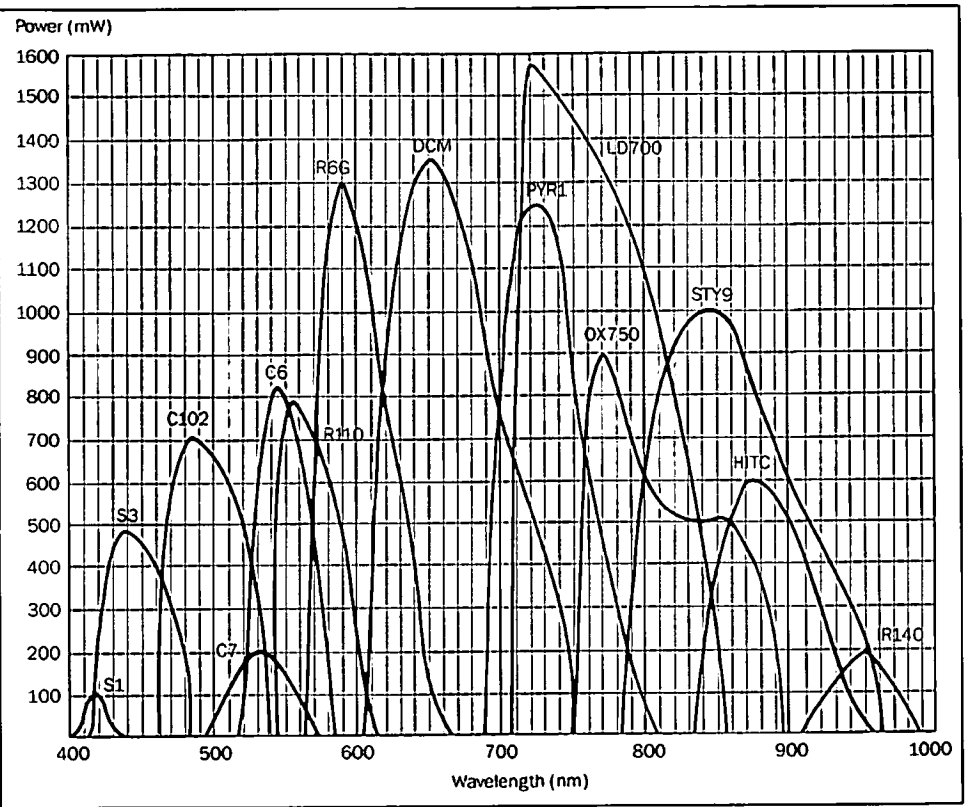
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CONTINUOUS WAVE OPERATION

Many applications require a laser source that is tunable rather than fixed in wavelength. A CW dye laser optically pumped by an argon or krypton ion laser provides the perfect solution in this case. Generally, a CW dye laser has a three mirror configuration with a standing electromagnetic wave (linear dye laser) or a four mirror configuration with a travelling electromagnetic wave (ring dye laser). Inside the cavity, a free flowing dye jet is optically pumped by a tightly focused ion laser beam. This pumping creates a population inversion between the ground and excited states of the dye molecules. Stimulated emission and subsequent laser action can then be obtained over the major part of the broad fluorescence band of the dye. Insertion of elements with adjustable dispersion in the dye laser cavity provide the wavelength selection and tunability that make the dye laser so unique. By changing the dyes, complete wavelength coverage can be obtained.

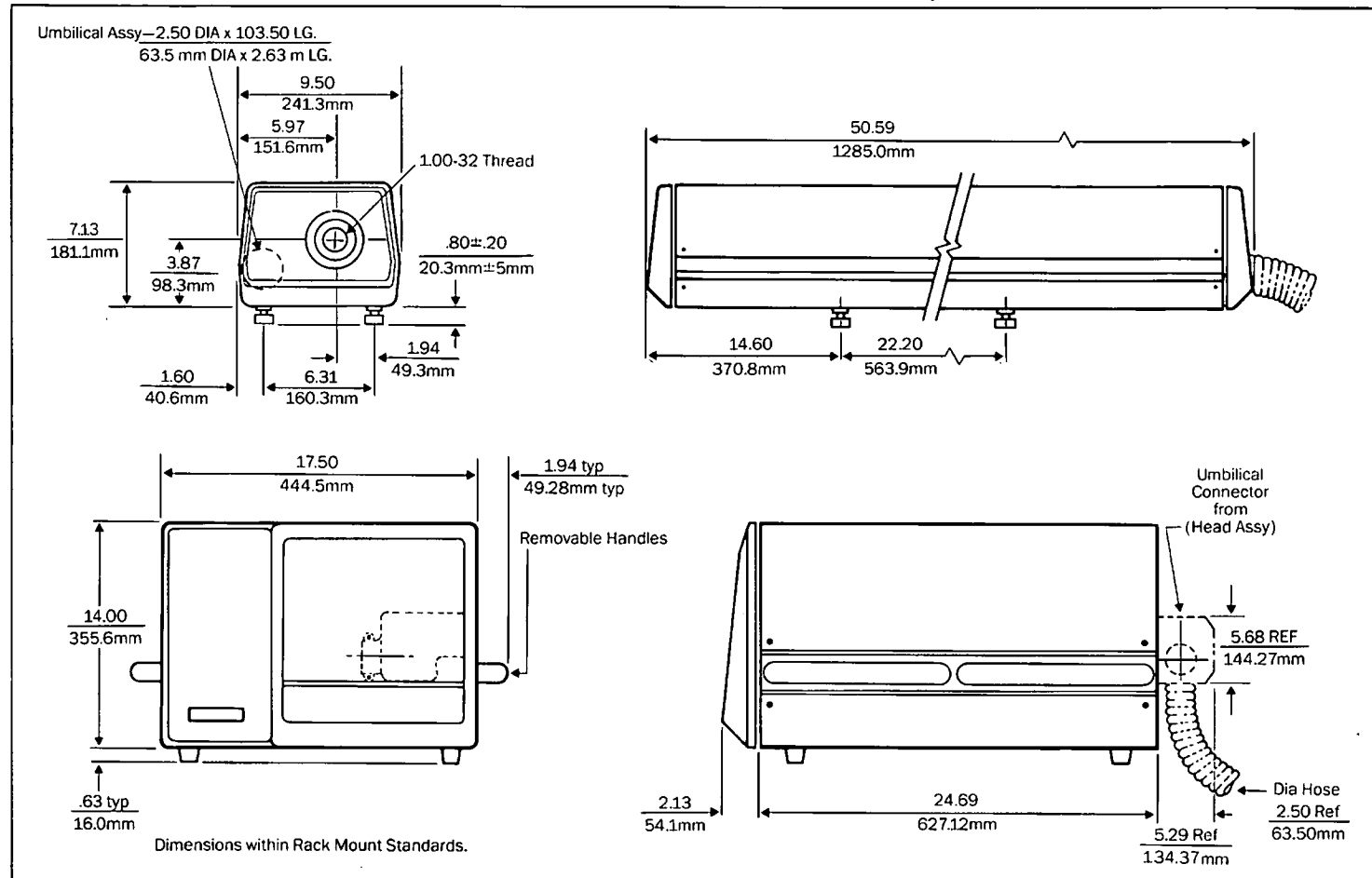
PULSED OPERATION

Ion lasers can be the basic building block for a large number of pulsed laser systems. Up to 12 unique system configurations can be made through various combinations of an ion laser, a mode-locker, a cavity dumper and a dye laser. With these different configurations a wide selection of pulsewidths, repetition rates and peak powers can be obtained over a large wavelength range. Both the mode-locker and cavity dumper are acousto-optic modulators that produce light pulses based on an interaction of the intracavity light with the time dependent acoustic wave inside the modulator. Insertion of a mode-locker in an ion laser results in pulses of less than 150 psec with a fixed repetition rate determined by the cavity length of the ion laser (typically 82 MHz). When a mode-locked ion laser is used to pump a dye laser with a matched cavity length, pulses of about 1 psec at this same repetition rate may be obtained over the



wavelength range determined by the dye laser. With a cavity dumper, incorporating a Bragg deflection crystal, the energy stored inside a closed ion or dye laser cavity may be switched out of the laser in a single high-intensity pulse. Pulses as short as 15 nsec can be obtained at a variable repetition rate with the

maximum rate determined by the intracavity build-up time. Proper synchronization of a cavity dumper to a mode-locker allows selection of single mode locked pulses from an ion or dye laser, to obtain high intensity pulses with variable repetition rates in the picosecond region.



WARRANTY

All Models 2020 and 2025 are protected by a 90 day warranty. Warranty extension for incremental 12 month periods can be purchased before expiration dates of any prior warranty.

All mechanical, electronic and optical parts and assemblies, including plasma tubes, are unconditionally warranted to be free from defects in workmanship and material for the warranty period.

This warranty is in lieu of all other warranties, expressed or implied, and does not cover incidental or consequential loss.

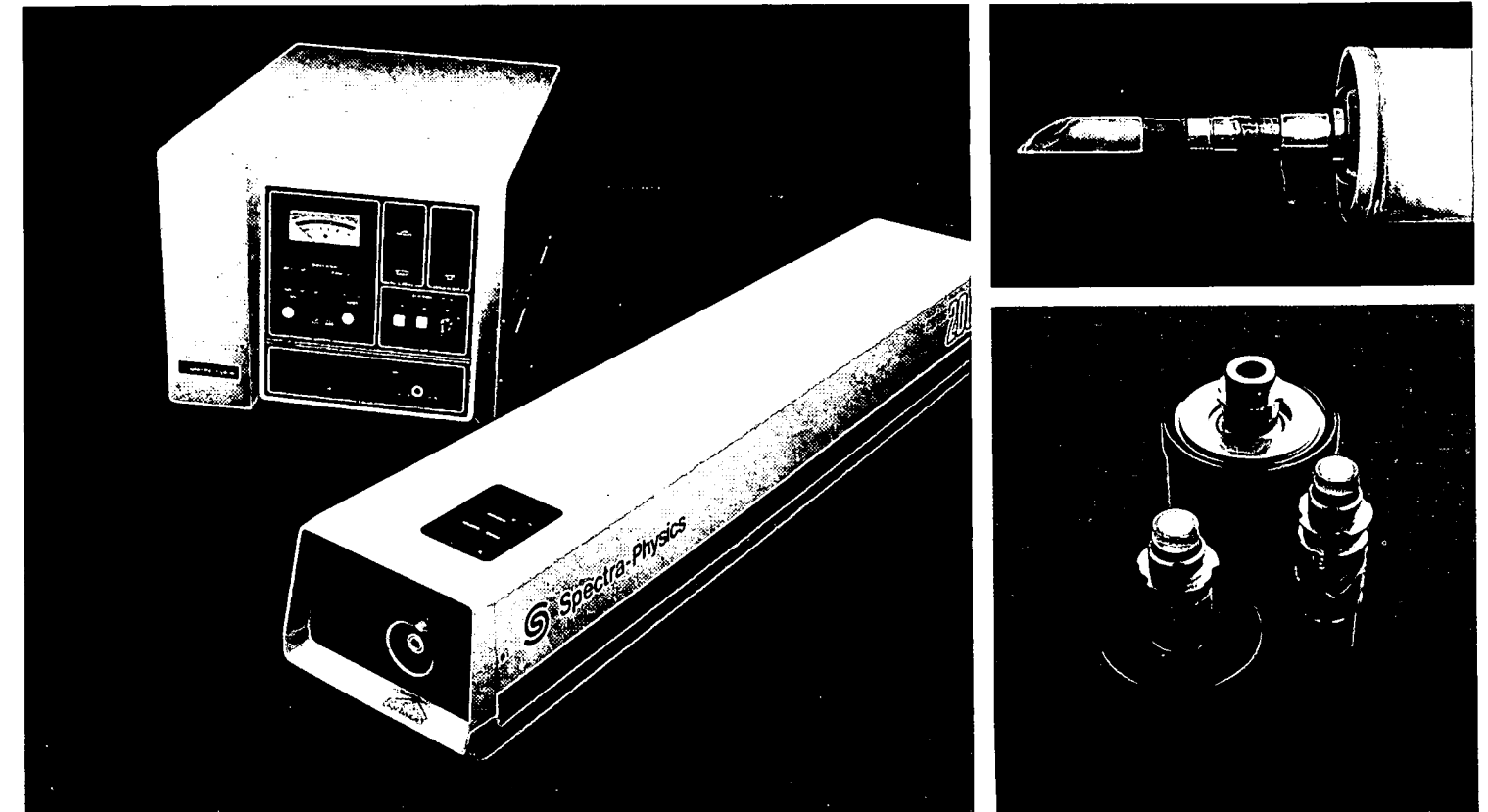
LASER SAFETY

Spectra-Physics has worked closely with federal agencies to promote the safe use of lasers, and has designed these products to comply with the Bureau of Radiological Health (BRH) standards now in effect in the United States.

BRH warning logotypes, similar to that shown below, appear on each laser to indicate the BRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype.



Model 2020 Ion Laser Systems



The Model 2020 Ion Laser

- Unsurpassed performance in the deep blue and ultraviolet
- Advanced technology power supply design
- Microprocessor control
- Advanced state-of-the-art plasma tube design
- Total system modularity

Spectra-Physics

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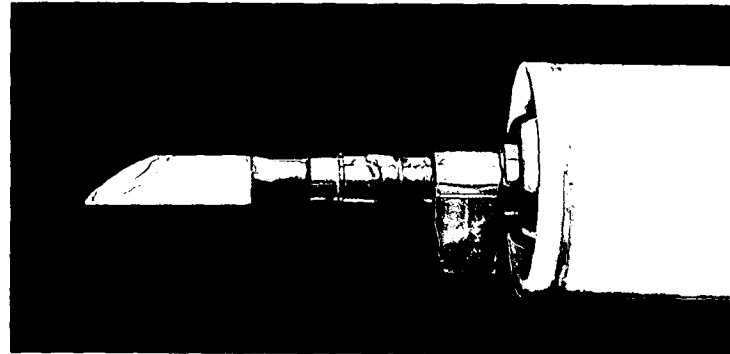
Spectra-Physics K.K.
15-8, Nanpeidaicho
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TLX: 348-488

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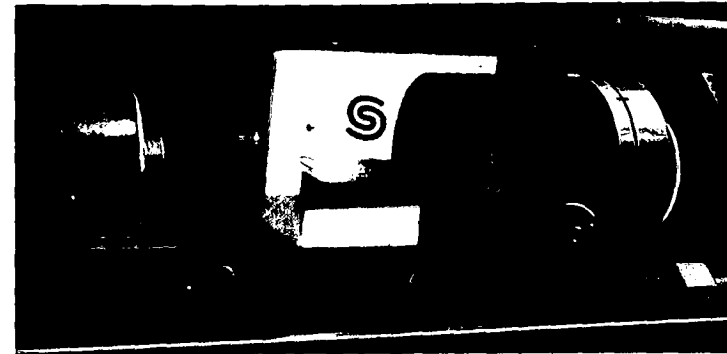
800/227-8054

Crystalline Quartz Window/End-Bell Assemblies



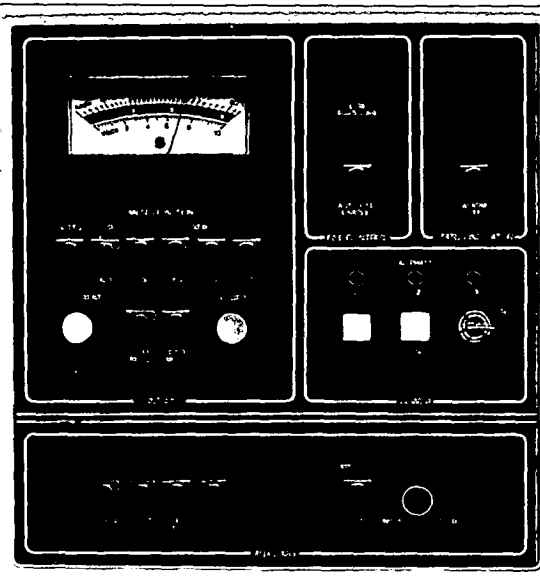
Hard sealed, crystalline quartz Brewster angle window and end-bell assemblies are attached directly to the plasma tube body via a special, low-temperature braze process. This process ensures clean, leak-tight seals and precise rotational and angular alignment.

Ultra-compact Fill System



The unique, highly compact gas fill reservoir of the Model 022 allows precise metering of gas fill volumes and exact optimization of tube pressures. Bake-out at over 400°C ensures maximum cleanliness and absolute minimization of contaminants. Automatic or manual fill may be user-selected.

POWER SUPPLY



- Full front panel instrumentation
- Microprocessor based control system
- Silicon controlled rectifier current regulators
- Fully modular plug-in performance options

Fully Instrumented Front Panel

Full front panel instrumentation provides maximum user flexibility and precise system control.

A multi-function front panel meter provides direct readout of output power, tube current, tube voltage and magnet current. Two digitally controlled 10-turn potentiometers allow precise adjustment of laser current and power settings.

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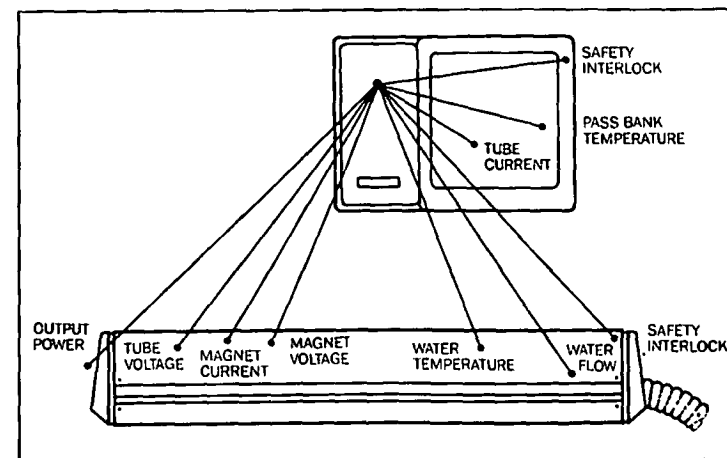
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A query of the status fault indicator displays the fault code on the front panel, and after correction of the problem allows return to original operating status.

Additional system features include the option of full remote digital control and pre "light-off" check-listing of crucial system components to ensure proper operation before power is applied.



Phased-SCR Power Handling Technology

Phased-SCR current regulation provides high current capability with greater reliability. In the phased-SCR technique line voltages are simply switched off when not needed for regulation, eliminating the need for large numbers of power transistors for dissipation of excess energy. As a result, fewer numbers of critical components are subject to failure for better performance and higher reliability.

Performance Options

■ Linear Passbank

The 2020's optional, small linear passbank follows the phased-SCR regulator and reduces residual line ripple to within 0.5%. Noise regulation in the light mode is to within 0.2% RMS over a 10 Hz to 10 MHz bandwidth.

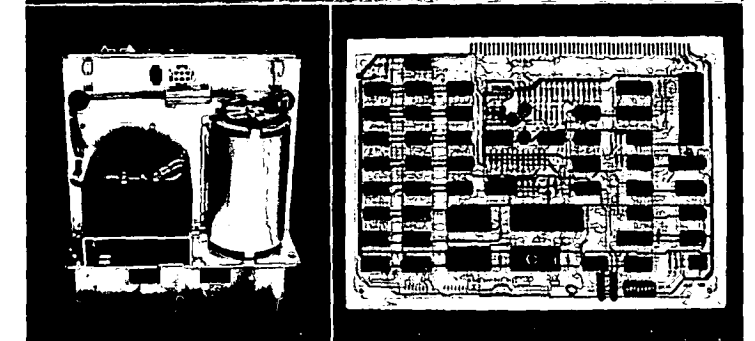
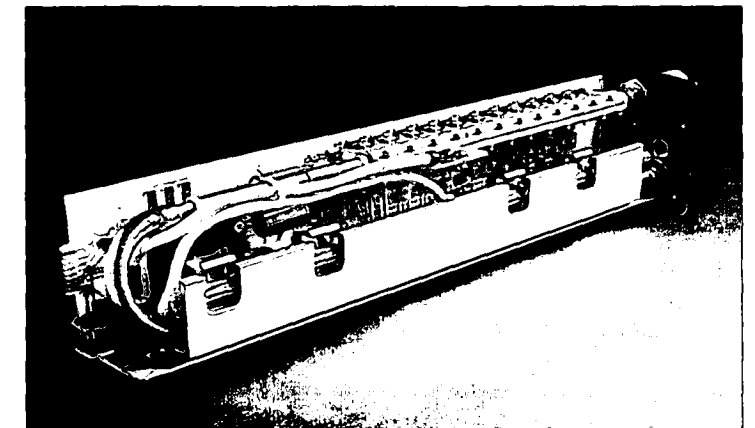
■ High Performance Magnet and Magnet Regulator

The high performance magnet and magnet regulator system allows independent control of magnetic field up to 1700 Gauss for optimization of each individual laser line.

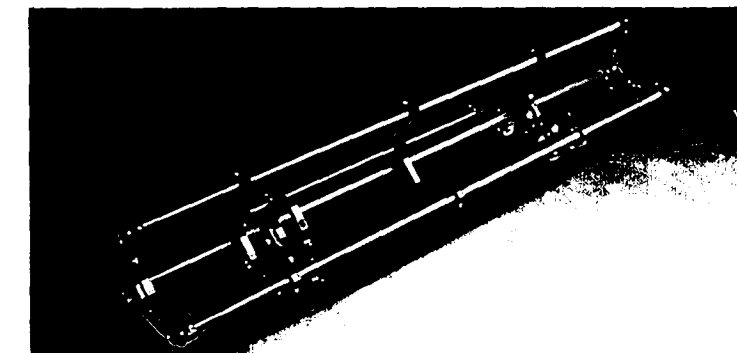
■ Digital Remote Control Options

Optional RS232 or IEEE 488 digital interface boards allow full remote operation of all front panel control functions, plus full readout of all key system operating parameters.

Fully modular in design, these plug-in performance options are available at time of original purchase or later as your requirements for these various features evolve.



HEAD DESIGN



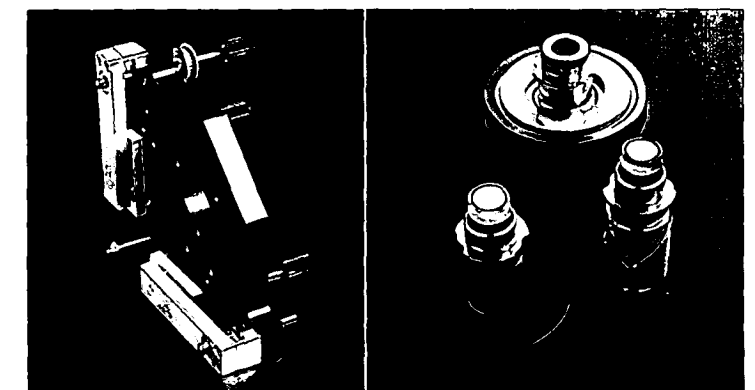
- Kinematically mounted graphite composite resonator
- High precision, multi-levered, mirror mount design
- Additional features

Graphite Composite Resonator

The 2020 head design features a fully temperature-compensated, kinematically mounted graphite composite resonator with a unique, non-orthogonal rod distribution for high strength, superb beam pointing stability, excellent length stability and greatly reduced susceptibility to vibration.

Multi-Lever Mirror Mount Design

Precise control of mirror alignment is provided by a unique multi-lever mirror mount design that utilizes a compound lever action to provide both coarse and fine adjustment that is backlash-free and allows fine positioning of mirror angles to within tens of microradians.



Additional Features

Additional features of the 2020 head design include:

- A digitally controlled photodiode preamp assembly for $\pm 5\%$ accuracy power readout at all individual wavelengths;
- A high voltage start circuit designed to comply with international safety standards and eliminate the need for running high voltages through the laser umbilical;
- Rear panel options that range from providing simple mechanical control, to full digital readout of wavelength.

Summary

At Spectra-Physics, the pursuit of excellence really is worth the effort. The 2020 Ion Laser System proves this by providing unique and satisfying features, outstanding levels of performance and the utmost in user friendly, highly reliable, day-to-day operation.

The pursuit of excellence is worth the effort



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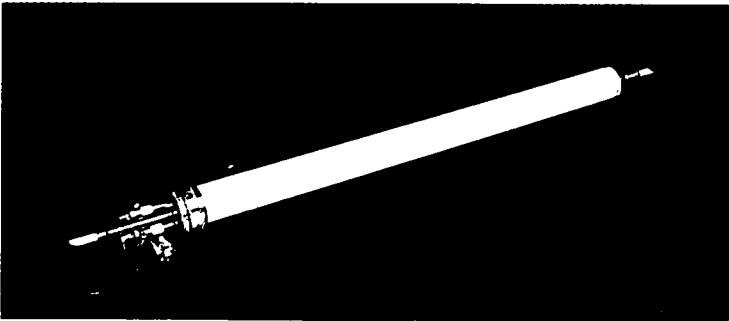
Spectra-Physics Model 2020 Ion Laser Systems

Spectra-Physics Model 2020 Ion Lasers are based on a totally advanced design concept that provides outstanding levels of performance and superb reliability. Included among the many user-oriented features are:

- An advanced plasma tube design that offers rugged, metal-ceramic construction and high current handling capabilities for optimum performance in the visible, deep blue and UV;
- A microprocessor-based control system that monitors and maintains the status of key operating parameters to protect against catastrophic failures and reduce any likelihood of inadvertent operator error;
- A conservative approach to power handling that utilizes digitally controlled phased-SCR current regulation for high current outputs with maximum reliability;
- A fully modular design concept that allows complete flexibility in choosing system performance levels and provides the unique option of beginning with a basic laser system and upgrading to the most advanced configuration through simple addition of plug-in modules;
- Full remote digital control capabilities, via parallel bus and serial control interface options, for maximum convenience and flexibility in system operation.

The Model 2020 is the most advanced ion laser system available today. Whatever your needs, the 2020 will meet them with unparalleled performance, reliability and ease of system operation.

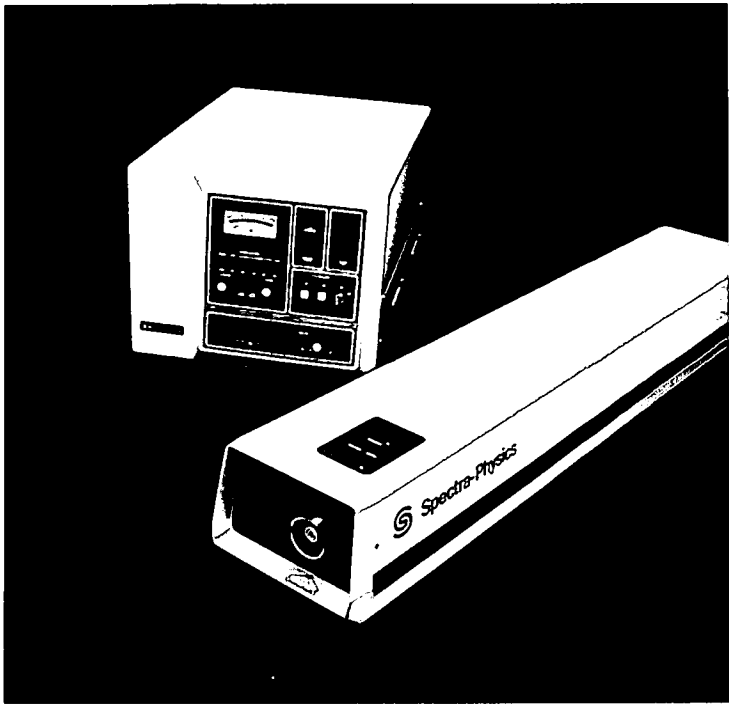
STATE-OF-THE-ART PLASMA TUBE DESIGN



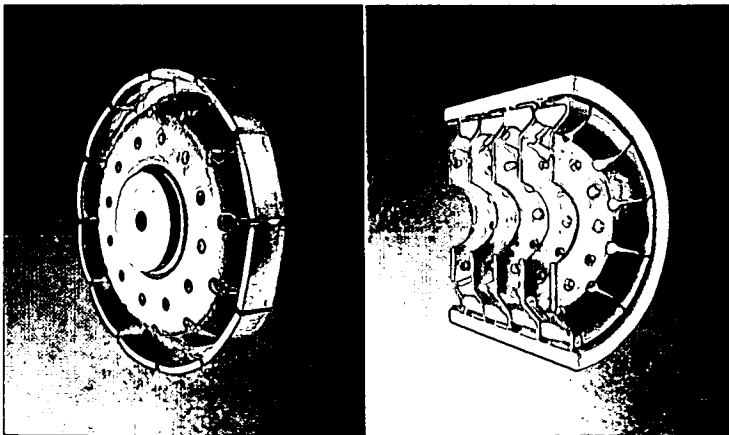
- Rugged, metal-ceramic construction
- Highest current handling capability in a small frame laser
- Unparalleled performance in the deep blue and UV
- Compact, high-pressure fill system
- Ultra-high reliability

Metal-Ceramic Construction

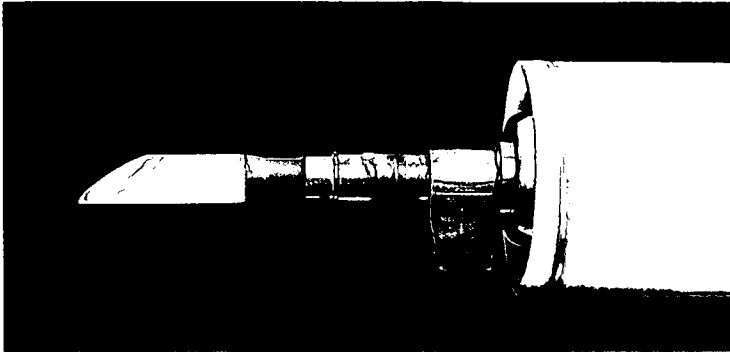
The Model 022 plasma tube features a segmented bore discharge design and rugged metal-ceramic construction for outstanding reliability and unparalleled performance. Multi-element, copper-tungsten disks are brazed into high purity precision bore alumina tubing to provide both excellent thermal transfer properties and high resistance to sputtering. High density disk packing provides significant margin in heat dissipation for efficient, reliable operation at high currents. In addition, the anode structure is electrically isolated from the cooling water via the ceramic envelope to prevent anode electrolysis and ensure long life and high reliability.



Moly Manganese Braze Technology—No Micro-Cracks
Moly manganese metalization and braze technology, using a copper-silver eutectic, ensures reliable crack-free joining of bore disks to the alumina tube wall and 100% hermetic seals. End seal design, incorporating ceramic back-up rings and copper stress-isolation pads, assures an extra margin of reliability providing strain relief against differential expansion during the brazing process and later during normal cycles of heat-up and cool-down. Thanks to this rugged construction and careful attention to thermal transfer properties, the 022 can routinely handle high current loads for optimum performance at all power levels and maximum outputs for the current sensitive lines in the deep blue and UV.

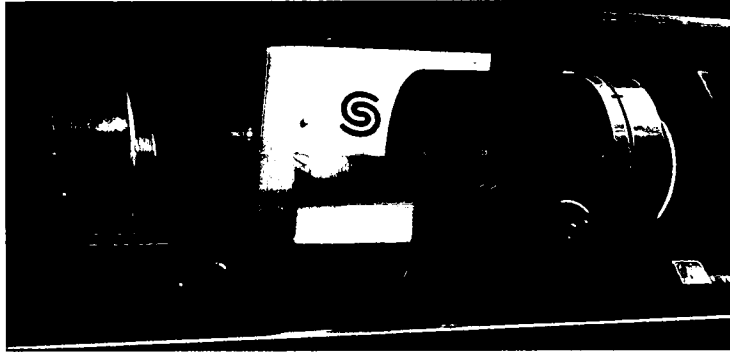


Crystalline Quartz Window/End-Bell Assemblies



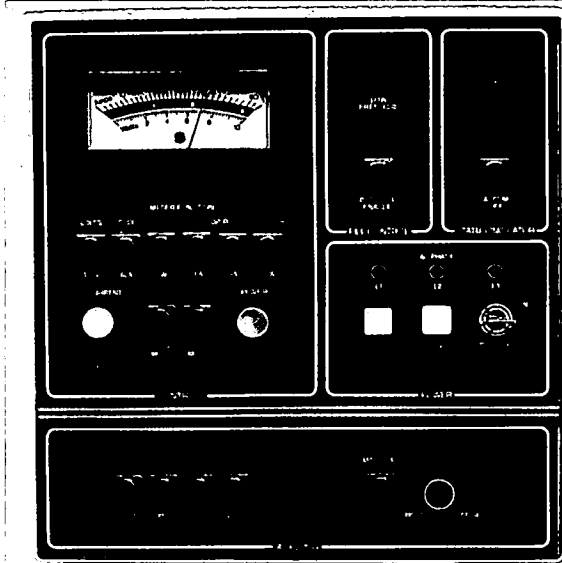
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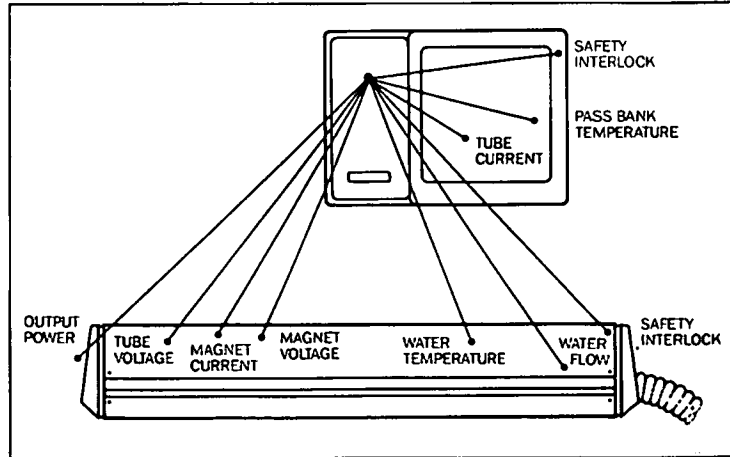
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Field Sales Engineer
Laser Products Division
Western Region



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Criminal Division
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Detective Jeff Thompson
Sgt. Haggas
Capt. Sadowski

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201 349-2010 24 hours

Department of Public Safety
Division of State Police
Forensic Science Laboratory
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Meriden, CT 06450

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Captain Bokikio

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Corp. Bob Rike

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John Vaughn

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Houston, TX 77002

Sgt. Juan Jorge

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Attn: Bill Frizell

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Attn: Ray Herd

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Jim Doran

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Illinois Dept. of Law Enforcement
Bureau of Scientific Services
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Springfield, IL 62706

Ed German

217 782-4975

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Santa Ana, CA 92702

2020-5
316-015

Frank Fitzpatrick, Chief Criminalist

714 834-3400

Texas Department of Public Safety
5805 N. Lamar Blvd.
Austin, TX 78752

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COMPENDIUM OF REPORTS ON
LASER TECHNOLOGY

- 1 - Inherent Fingerprint Luminescence -- Detection by Laser, January, 1977.
- 2 - Laser-Assisted Thin-Layer Chromatography and Luminescence of Fingerprints: An Approach to Fingerprint Age Determination, January, 1978.
- 3 - Modification of Fingerprint Powder with Coumarin 6 Laser Dye, July, 1978.
- 4 - Laser Detection of Latent Fingerprints -- Treatment with Fluorescers, January, 1979.
- 5 - Laser Detection of Latent Fingerprints -- Treatment with Phosphorescers, July, 1979.
- 6 - Case Analysis of Fingerprint Detection by Laser, July, 1979.
- 7 - Laser Detection of Latent Fingerprints: Preparation of Fluorescent Dusting Powders and the Feasibility of a Portable System, January, 1980.
- 8 - Laser Detection of Latent Fingerprints: Ninhydrin, January, 1982.
- 9 - Laser Detection of Latent Fingerprints: Ninhydrin Followed by Zinc Chloride, July, 1982.
- 10 - The Effects of the Argon Ion Laser on Subsequent Blood Examinations, July, 1982.
- 11 - Laser Detection of Latent Fingerprints: Treatment with Glue Containing Cyanoacrylate Ester.
- 12 - Laser Detection of Latent Fingerprints on Skin.
- 13 - You are Missing Ninhydrin Developed Prints?, September, 1981.
- 14 - Laser Detection of Latent Fingerprints: A Case Study, February, 1982.
- 15 - Fingerprinting with Lasers, July, 1979.
- 16 - Latent Print Detection by Laser - FBI
- 17 - Closed Loop Cooling System for Cooling Argon-Ion Laser - FBI

----Continued----

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- 18 - Definitions, Fluorescence Terms.
 - 19 - The Physics of Fingerprints, 1973.
 - 20 - Physical Methods of Fingerprint Development, 1975.
 - 21 - Aspects of physiochemical methods for the detection of latent fingerprints, 1978.
 - 22 - The physics of fingerprints and their detection, 1978.
 - 23 - The Chemical Components of Sweat, 1972.
 - 24 - The Oils of Latent Fingerprints, 1975.
 - 25 - Skin Lipids: Their Biochemical Uniqueness, 1974.

IMPROVE YOUR SUCCESS RATE AGAINST CRIME

What is Laser Fingerprint Detection?

Laser Fingerprint Detection (LFD) is a new method for the examination and photography of latent fingerprints using a high power laser. The main advantage of LFD over conventional methods (dusting powders, iodine fuming, silver nitrate, ninhydrin, etc.) is its capability for developing latent prints that are not otherwise developable. Those "missed prints" often prove to be critical in determining the outcome of a case. Trace compounds normally present in palmar sweat are sufficient to produce remarkable results where other more involved methods fail.

LFD suffers from none of the time limitations of dusting powder methods — latent prints many months old have been successfully developed. A variety of substrates are amenable to LFD: wood, paper, glass, plastic, cloth, etc. — even human skin in some instances. Furthermore, conventional print development can always be done after LFD (the converse is not true), making it a truly versatile tool.

How does LFD work?

In its primary application, LFD requires no chemical or physical pretreatment of the latent fingerprint. Fingerprint residues normally contain a variety of complex proteins such as pyridoxin, riboflavin, and other vitamins. These compounds will absorb light of the blue-green or ultraviolet wavelengths and re-emit light (fluoresce) at another wavelength, typically in the yellow-orange range. Figure 1 illustrates the absorption and fluorescence characteristics typical of fingerprint residues.

Because the reflected blue-green laser light is very limited in wavelength range (color spread), it can be virtually eliminated from view with a filter, allowing only the weak yellow-orange fluorescence of the fingerprint itself to be visible. The fingerprint ridge detail appears in yellow-orange light which can be permanently recorded by photographing through the filter.

New System Now Available

Spectra-Physics, the world leader in lasers, offers a complete line of argon ion lasers and a new fiber optic coupler designed especially for LFD, the Model 316-01*. This fiber optic coupler mounts directly to the front of any Spectra-Physics argon ion laser and offers the following features:

- Twenty foot fiber.
- Flexible metal casing around the fiber for protection during rugged handling.
- Automatic, footswitch-activated shutter and attenuator, to expose the exhibit only when desired.
- Adjustable output beam divergence (to accommodate different sized exhibits).
- Remote laser power control to enable the user to adjust power while situated near the sample.
- Fiber strain relief.

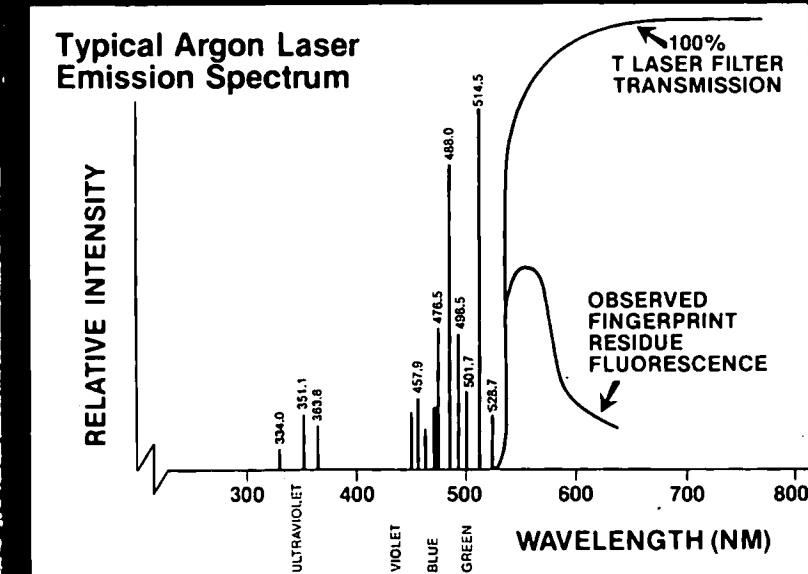
*See Model 316 product data sheet for complete specifications.

What equipment is necessary for LFD?

The first requirement is an argon ion laser capable of at least 3 watts of power. (Higher power lasers extend the sensitivity of the method.) Depending upon its rating, the laser will need 208V or 460V, three-phase electrical power. Cooling water at a rate of 2.2 to 3.5 gallons per minute and at 35 to 65psig is also required.

Since exhibits to be examined with the laser will generally be of a variety of sizes and orientations, having a means of directing and controlling the laser light is important. This control is provided by a fiber optic. The fiber should be less than one micron in diameter, for maximum flexibility, and have precision supports and adjustments to get and maintain the critical laser/fiber alignment. The laser light emerging from the end of the fiber is divergent (spreading) enough to illuminate any size exhibit, and can be pointed in any direction.

Finally, LFD should be done in a room or area that can be completely darkened to eliminate stray light from the fingerprint fluorescence.



Model 316 LFD System Components

Special Fingerprint Detection Kit, Model 316-01S, includes:

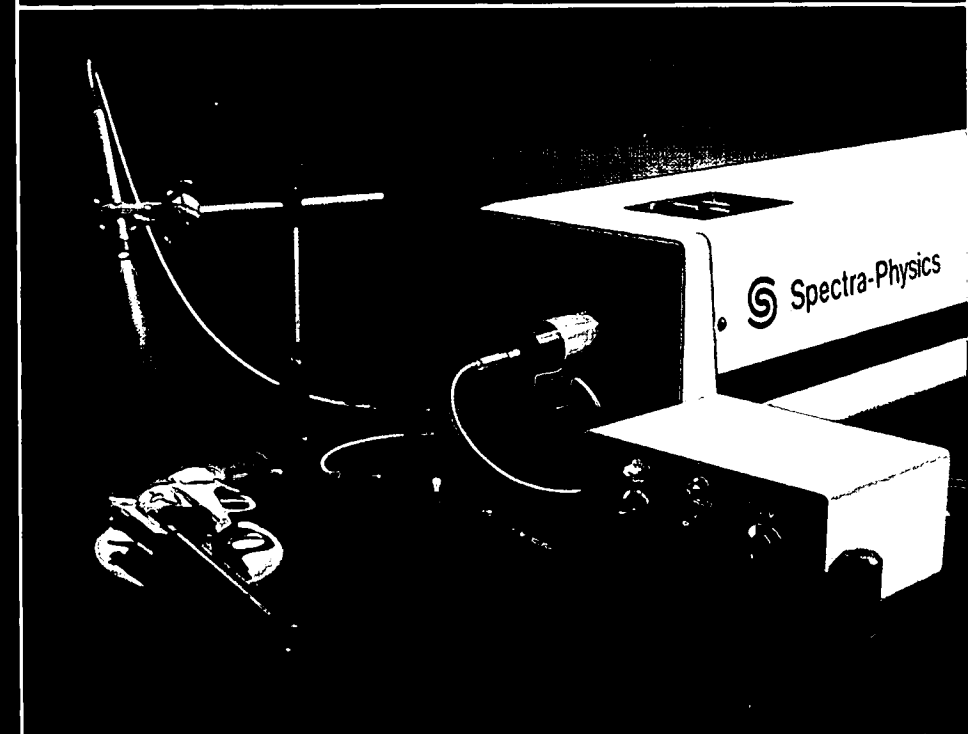
- Model 316-01 Fiber Optic Coupler
- Model 317 Adaptor Ring (for laser attachment)
- Book: Fingerprint Detection with Lasers by E. Roland Menzel
- Sheet of argon laser filter material and safety goggles

Spectra-Physics, Inc. • 1250 West Middlefield Road • Mountain View, CA 94042

LASER FINGERPRINT DETECTION:



A NEW TOOL AGAINST CRIME



BID TO THE
CITY OF SACRAMENTO, CALIFORNIA
PURCHASING DIVISION

BIDS MUST BE RECEIVED BY THE
CITY CLERK, ROOM 203, CITY HALL
PRIOR TO 10:30 A.M., TUESDAY
APRIL 1, 1986

FOR: LASER DETECTION SYSTEM

BID NO: 946

Name of Bidder INDUSTRIAL LASER SERVICE & SUPPLY Telephone (408) 436-1919

Type of Business: ☐ Corporation, ☐ Co-partnership, ☐ Individual doing business under his own name,
☒ Individual doing business using a firm name.

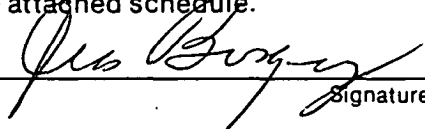
Business Address: 1620 Zanker Road, San Jose, CA 95112
Street City State Zip Code

To the City of Sacramento:

The undersigned, as bidder, certifies that the only persons or parties interested in this bid as principals are those named herein as bidder; that this bid is made without collusion with any other person, firm, or corporation; that in submitting this bid he has examined the "General Conditions and Instructions to Bidders", and the specifications; that he proposes and agrees if this bid is accepted, he will execute and fully perform the contract for which bids are called; that he will perform all the work and / or furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements as therein set forth; and that he will take in full payment therefor, the prices set forth in the attached schedule.

Jess Bosquez, President

Typed or Printed Name and Title


Signature

☐ Not Applicable

Address (if different than above business address)

PLEASE READ CAREFULLY BEFORE SIGNING

To be signed by authorized corporate officer or partner or individual submitting the bid. If bidder is: (Example)

1. An individual using a firm name, sign: "John Doe an individual doing business as Blank Company."
2. An individual doing business under his own name, sign: your own name only.
3. A co-partnership, sign: "John Doe and Richard Roe, co-partners doing business as Blank Co., By John Doe, co-partner."
4. A corporation, sign: "Blank Company, by John Doe, secretary," (or other title).

FOR CITY USE ONLY

Bid was opened on above date and at prescribed place.

Bid bond required ☒ No ☐ Yes Amount _____

Received: ☐ Cashiers or Certified Check ☐ Surety Bond

drawn on a California bank

Lorraine Magana

City Clerk/Purchasing Agent

Approved as to form and legality

City Attorney

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APR 1 1986

By the
Office of the City Clerk

GENERAL CONDITIONS AND INSTRUCTIONS TO BIDDER

- NO BID IS IN LEGAL FORM UNLESS THE FOLLOWING INSTRUCTIONS ARE FULLY COMPLIED WITH

1. Bid must be submitted on this printed bid form and sealed in the envelope supplied.
2. All bids shall be clearly and distinctly written without erasure or interlineation, and properly signed by an authorized party, who shall indicate the capacity in which the signature is executed.
3. Alternate bids are invalid unless invited and covered by the specifications.
4. If required, a bid bond in the amount stated on the front of this form must accompany this bid. Payment must be made by cash, cashier's or certified check, or by surety bond.
5. All bids must be delivered to the designated receipt not later than the time specified on the front of this form.
6. No bidder shall be interested in more than one bid as provided by City Code Section 57.302.
7. The right to reject any and all bids is reserved by the City.
8. The City reserves the right to waive any informalities or minor irregularities in connection with bids received.
9. All provisions of Chapter 57 of the City Code are applicable to any bid submitted or contract awarded pursuant thereto.
10. **Faithful Performance Bond.** The successful bidder will [] will not ~~XXX~~ be required to submit a faithful performance bond, in a form approved by the city attorney, in the amount of _____.
11. **Cash Discounts.** Cash discounts offered for payment in less than ten (10) days will not be considered as a basis of award. Cash discounts offered for payment in ten (10) or more days will be subtracted from the total bid price for the purposes of bid evaluation. Any cash discount offered by the successful bidder will be accepted by the City of Sacramento, whether or not it was considered as a basis of award.
12. Bids will be opened, in public, in the City Council Chambers, City Hall, 915 - Eye Street, Sacramento, California, at ~~10:30~~ ^{10:30} a.m., APRIL 1, 1986. (Bids must be submitted prior to ~~10:00~~ ^{10:30} a.m.)
13. Within thirty (30) days after the bid opening a contract will be awarded by the City to the lowest responsible bidder, subject to the right of the city to reject all bids, as it may deem proper. The time for awarding a contract may be extended an additional thirty (30) days, at the sole discretion of the City, if required to evaluate bids or for such other purpose as the City may determine, unless the Bidder objects to such extension in writing with his bid. The "lowest responsible bidder" is defined as follows:

In addition to price in determining the lowest responsible bidder under the provisions of this chapter, consideration shall be given to: (i) the quality and performance of the supplies to be provided by the bidder; (ii) the ability, capacity and skill of the bidder to perform the contract or effectuate the transaction; (iii) the ability of the bidder to perform the contract or effectuate the transaction within the time specified, without delay; (iv) the character, integrity, reputation, judgement, experience and efficiency of the bidder; (v) the quality of bidder's performance on previous purchases by, or contracts with, the City; and (vi) the ability of the bidder to provide future maintenance, repair parts and services for the supplies provided. (Section 57.102)

In addition to the above considerations, the City will also consider which bids will result in receipt by the City of sales or use tax under the Provisions of Part 1.5 of Division 2 of the California Revenue and Taxation Code and Article III of Chapter 41 of the Sacramento City Code and shall deduct the amount of such sales or use tax which will be received from any such bid. (Ordinance No. 4064)

THE CITY CANNOT ACCEPT A BID FAILING TO COMPLY WITH ANY OF THE ABOVE REQUIREMENTS

CITY OF SACRAMENTO
SACRAMENTO, CALIFORNIA

For furnishing to the City of Sacramento a Laser with Fiber Optic Detection System in accordance with the following provisions and specifications.

PRICING SCHEDULE

<u>Item No.</u>	<u>Quantity</u>	<u>Description</u>	<u>Manufacturer Model No.</u>	<u>Unit Price</u>
1	1 each	Laser, 5-watt visible Argon-ion, all lines blue-green (458 nm-514nm) with power supply	N/A (Please see item #5)	
2	1 each	Fiber Optic Detection System for Item 1 with laser goggles and sheet of filter material	LG/316-01/317	\$ 6,875.00
3	1 each	Prism assembly for single line operation at 488.0nm and 514nm	2200-200-2A	\$ 375.00
4	1 each	5 Year extended warranty (to be purchased along with the laser)	EW-5	\$ 6,000.00
5		Additional equipment <u>x</u> Yes <u> </u> No 553A (Bidders to enclose attachment) Attachment A1		20,800.00
6	1 lot	Installation including on site training as specified on page 7 9 of this bid.	FT-2	\$ 1,500.00
Sub-Total				\$ 35,550.00
6% Sales Tax				2,133.00
GRAND TOTAL				\$ 37,683.00

(* NOTE: Please see Attachment A2)

General Instructions

The intent of this request for bid is to purchase a complete laser detection system capable of detecting latent fingerprints to the satisfaction of the Sacramento Police Department. This is a pre-acceptance condition. Should the above specifications be incomplete, bidders are to enclose an Attachment A with their bid listing any additional equipment necessary to complete the system.

The prices for this additional equipment shall be included in the grand total of the pricing schedule.

Cash Discount

Payment Discount: 1 % for payment within 11 calendar days.

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By the
Office of the City Clerk Page 7 of 10 pages

Delivery Guarantee

Vendor shall guarantee delivery within 90 days after receipt of order (ARO).

Brand Name or Equal

(As used in this clause, the term "brand name" includes identification of products by make and model.)

(a) If items called for by this Invitation for Bids have been identified in the Schedule by a "brand name or equal" description, such identification is intended to be descriptive, but not restrictive, and is to indicate the quality and characteristics of products that will be satisfactory. Bids offering "equal" products - including products of the brand name manufacturer other than the one described by brand name will be considered for award if such products are clearly identified in the bids and are determined by the City to meet fully the salient characteristics requirements referenced in the Invitation for Bids.

(b) Unless the bidder clearly indicates in his bid that he is offering an "equal" product, his bid shall be considered as offering a brand name product referenced in the Invitation for Bids.

(c)(1) If the bidder proposes to furnish an "equal" product, the brand name, if any, of the product to be furnished shall be inserted in the space provided in the Invitation for Bids, or such product shall be otherwise clearly identified in the bid. The evaluation of bids and the determination as to equality of the product offered shall be the responsibility of the City and will be based on information furnished by the bidder or identified in his bid, as well as other information reasonably available to the purchasing activity. CAUTION TO BIDDERS. The purchasing activity is not responsible for locating or securing any information which is not identified in the bid and reasonably available to the purchasing activity. Accordingly, to insure that sufficient information is available, the bidder must furnish as a part of his bid all descriptive material (such as cuts, illustrations, drawings, or other information) necessary for the purchasing activity to (i) determine whether the product offered meets the salient characteristics requirements of the Invitation for Bids and (ii) establish exactly what the bidder proposes to furnish and what the City would be binding itself to purchase by making an award. The information furnished may include specific references to information previously furnished or to information otherwise available to the purchasing activity.

(2) If the bidder proposes to modify a product so as to make it conform to the requirements of the Invitation for Bids, he shall (i) include in his bid a clear description of such proposed modifications and (ii) clearly mark any descriptive material to show the proposed modifications.

(3) Modifications proposed after bid opening to make a product conform to a brand name product referenced in the Invitation for Bids will not be considered.

Award

The City reserves the right to reject any and all proposals or alternate proposals as the best interest of the City may require. Consideration will be given in comparing proposals and in awarding a contract, not only to the amount of the proposal, but also the kind and quality of the equipment offered, its suitability for use in the service intended, as well as the lowest ultimate cost to the City. Time required for delivery may influence the award.

Bid Inquiries

Questions regarding this bid should be referred to:

Support Services Division
5730 24th Street, Bldg. 4
Sacramento, CA 95822
Attention: Merrily Whiteside
(916) 449-5551

These inquiries are to be submitted at least 10 days prior to the bid opening date. Any interpretations by the City will be made in the form of a written amendment. The receipt of such an amendment must be acknowledged in accordance with the directions on the amendment. Oral explanations or instructions given before the award of the contract will not be binding.

Contract Intent

Specifications on the following pages are written with the intent to meet and comply with all requirements but the final certification to comply shall rest with the vendor and not the City of Sacramento. Should requirements as specified not comply, the manufacturer is required to refigure and revise the specifications to meet all laws, rules and regulations where it applies, and the City of Sacramento is to be notified thereof.

Default By Supplier

In case of default by supplier, the City reserves the right to procure the articles or services from other sources and to hold the supplier responsible for any excess costs occasioned to the City thereby.

Delivery Ticket/Packing Slip

All shipments under this agreement shall be accompanied by a delivery ticket packing slip, or sales slip which shall include the following minimum information:

- (1) Name of supplier
- (2) Contract/purchase order number
- (3) Date of purchase
- (4) Itemized list of supplies or services furnished
- (5) Date of delivery or shipment

Evaluation (Demonstration)

City reserves the option for an "on the job demonstration and evaluation" by City personnel before acceptance of contract in the event performance of unit proposed is not familiar to the City. Demonstrator shall be available within 15 days of bid opening. Only units meeting these specifications shall be demonstrated. Time required for the evaluation shall be as determined by the City.

F.O.B.

Prices to be bid F.O.B. destination - as follows:

City of Sacramento
Police Department
631 H Street
Sacramento, CA 95814

General Provisions

The attached General Provisions, 1 and 6 only, are hereby made a part of this request for bids and any resultant contract(s).

Manufacturer's Name

Manufacturer's name, brand and/or product number must be inserted in the proper space on the bid form.

Order of Precedence

In the event of an inconsistency between the provisions of this solicitation, the inconsistency shall be resolved by giving precedence in the following order:

- (a) the Schedule (excluding the Specifications)
- (b) terms and conditions of the solicitation, if any
- (c) General Provisions
- (d) other provisions of the contract, when attached or incorporated by reference, and
- (e) the Specifications

Payment and Invoicing

Invoices, in triplicate, shall be mailed or delivered to City of Sacramento, Accounts Payable, 915 I Street, Room 114, Sacramento, CA 95814.

Payment Terms

Payment terms shall be 50% upon delivery and acceptance of the operational equipment by the Police Department with the balance to be paid upon completion and acceptance of the training by the Police Department. All cash discounts if taken shall be computed from the date of delivery or completion and acceptance of material, or from date of receipt of invoice, which ever is latest. Invoices must be submitted as specified at the time of shipping authorization.

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Training

Once the system is operational, the vendor shall provide a minimum of two days (16 hours) of instruction in laser examination of evidence items. Trainer must possess the practical experience and knowledge necessary to provide comprehensive instruction in the utilization of the laser to illuminate latent prints including the use of rhodamine 6G, zinc chloride, and cyanoacrylate to compliment laser illumination. Training shall encompass laser safety, laser theory, examination and application methodologies, chemical formulations, basic operation, optic adjustments, and user level maintenance. A review of the Operator's manual shall also be conducted. Training shall take place in the Identification Unit, as scheduled by the Sacramento Police Department. Training must be completed within 90 days after acceptance of operational equipment by the Sacramento Police Department.

Safety Requirements

All merchandise must comply with current Federal laser product performance standards of the Bureau of Radiological Health, U. S. Department of Health, Education and Welfare.

Purchase Agreement Documents

A copy of the Notice Inviting Bids, the Bid and a copy of these General Conditions and the Specifications and Bid will remain on file in the Office of the City Purchasing Agent and it is understood will form the purchase agreement when accepted by the City Manager. All materials or services supplied by the Contractor shall conform to the applicable requirements of the City Charter, City Ordinances, and all applicable State and Federal Laws, as well as conforming to the specifications contained herein.

Warranty/Guarantee

Contractor delivering merchandise against this specification shall guarantee that they meet the minimum requirements set forth herein. If it is found that the merchandise delivered does not meet the minimum requirements of this specification, the contractor will be required to correct the same at contractor's expense.

BIDDER'S NAME: INDUSTRIAL LASER SERVICE & SUPPLY

DO NOT DETACH THIS SHEET - SUBMIT ENTIRE BID PACKAGE AS YOUR PROPOSAL

DATE BID OPENED <u>4-1-86</u>	MARK ONE BOX FOR EACH ITEM ONLY	BID SECURITY ☒ NONE REQUIRED ☐ PROPERLY SIGNED	BID DEPOSIT TYPE ☐ BID BOND ☐ CALIF. BANK CASHIER'S CHECK ☐ CERTIFIED CHECK ☐ CASH ☐ CALIF. BANK MONEY ORDER	AFTER AWARD OF BID ☐ SECURITY RETURNED ☐ SECURITY ACCEPTED	EMPLOYEE INITIALS _____ DATE _____
EMPLOYEE INITIALS <u>mb</u>					

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By the
Office of the City Clerk
Page 7 of 10 Pages

NOTE: Bidder not acknowledge addendum

ILS&S

INDUSTRIAL LASER SERVICE & SUPPLY

1620 ZANKER ROAD SAN JOSE, CALIFORNIA 95112 (408) 436-1919

TELEX: 171618

INT'L: 184817

ATTACHMENT A2

As mentioned in the cover letter enclosed with this bid, a detection system configured around a 10 Watt laser if offered as an alternative. Specifications of this system, model number LPD-2000-10 are enclosed with this attachment. The LPD-2000-10 has much better performance, starting with the power level (10 Watts as opposed to 5 Watts). References from police departments using this system are available on request.

We are pleased to submit a bid for the laser detection system, based on the LPD-2000-10, as follows:

Item Number	Qty.	Description	Manufacturer Model Number	Unit Price
1	1 Each	Laser detection system, incorporating a fiber optic detection system; prism assembly for single line operation at 488.0nm and 514.5nm; laser safety goggles and sheet of filter material.	LPD-2000-10SP	\$26,540.00
2	1 Each	Installation and training	FT-2	\$ 2,500.00
3	1 Each	Five (5) year extended warranty	EW-5	\$ 6,000.00
Subtotal				\$35,040.00
6% Sales Tax				2,102.40
Grand Total				\$37,142.40

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APR 1 1986

By the
Office of the City Clerk

ILS&S

INDUSTRIAL LASER SERVICE & SUPPLY

1620 ZANKER ROAD SAN JOSE, CALIFORNIA 95112 (408) 436-1919

TELEX: 171618

INT'L: 184817

ATTACHMENT A1

The following items(s) would be necessary, in addition to the items quoted in the pricing schedule, in order to complete the system (as per "General Instructions" on page 3 of this bid). It is important to note that a higher laser power level is a very desirable aspect of a laser detection system. Accordingly, a 6 Watt laser is proposed, in place of a 5 Watt laser.

Item No.	Qty.	Description	Manufacturer	Unit Price
5	1	6 Watt Argon Laser (Specifications enclosed)	Model Number 553A	\$20,800.00

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APR 1 1986

By the
Office of the City Clerk

ILS&S

INDUSTRIAL LASER SERVICE & SUPPLY

1620 ZANKER ROAD SAN JOSE, CALIFORNIA 95112 (408) 436-1919

TELEX: 171618

INT'L: 184817

March 28, 1986

The City Clerk
Room 203
City Hall
Sacramento, CA

Dear Madame/Sir:

Please find enclosed our bid on the laser detection system (your bid number 946). It is advantageous to have as high a laser power as possible. Accordingly, I have proposed a 6 Watt laser, as attachment A1, in place of the 5 Watt laser. Please note that this laser requires 4 GPM of cooling water.

Also, we can provide a system that would be ideally suited for the intent of your RFQ. I have included the system description and a price quote as attachment A2. Such laser systems are being used by several police departments and references are available on request. Thank you for providing us the opportunity of responding to your RFQ.

Sincerely yours,


Jess Bosquez
President

Enclosures

JB/sf

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APR 1 1986

By the
Office of the City Clerk

ILS&S

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Subtotal				\$35,040.00
6% Sales Tax				2,102.40
Grand Total				\$37,142.40

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Office of the City Clerk

How do Tungsten Bores compare with BeO and carbon bores in these most vulnerable areas?

Both BeO and carbon bores have measurable gas clean-up rates as new, unsaturated tubes. The clean-up rate you observe upon receipt of your BeO or carbon bore laser will be determined by how thoroughly your particular system was processed before being shipped to you. You might be lucky and get a tube processed by your vendor's best processor or you might be unlucky and get a tube processed by their worst processor. Who knows? One thing is almost certain; if you have a BeO or carbon tube there will be some gas clean-up occurring from the moment you turn your new laser on. That's the bad news; now the good news. We see no measurable gas clean-up in our Tungsten tubes from the moment they are first ignited! The quality of your new Tungsten tube in this respect is almost independent of human caprice.

Since we will not compromise the life of your laser, no matter how small the probability, a gas refill system is provided - just in case.

Regarding bore powdering and subsequent interior window contamination: To date all ion laser systems commercially available have had to live with this undesirable bedmate. In examining present day BeO and carbon lasers you will see cathode protective discharges and long skinny Brewster stubs. The presence of these devices in your laser is a flashing neon sign saying the problem is present. Carbon tubes, poco carbon more easily than pyrolytic carbon, powder severely above moderate plasma current densities. BeO tubes are somewhat better until higher, more efficient current densities are reached. But in the end both types generate bore powder and all the

cathode discharges and long stubs in the world will not stop all of the possible contaminants from reaching the interior Brewster window. Some more good news — you will notice on our new tungsten bore tubes there are no cathodes, no long, thin Brewster stubs. The problem isn't there. There is no noticeable sputtering of tungsten in our tube, therefore, there are no contaminants to destroy the optical quality of our Brewster windows. Remember Tungsten melts around 3400°C and vaporizes around 5500°C. Material with these properties simply cannot get to the Brewster window when the operating temperature of bore edge of the disk is less than 1600°C. As they say, our Tungsten tubes don't get older, they get better — it's a fact.

We don't worry about coolant submersed glass to metal seals since we don't have any such seals in the tungsten system.

Since our bore material is metal, we can preheat the bore to temperatures exceeding operating temperature without igniting a plasma, therefore, we can indirectly heat the bore material under ultra high vacuum (10^{-8} Torr) to insure absolutely no residual contamination in the system before the lasing media is introduced to the Ion Tube. This convenience is not available to BeO and carbon tube manufacturers who must rely partially upon igniting the plasma in order to clean the tube. Ask any Barium impregnated Tungsten matrix cathode around and they will tell you that supplying current to a dirty plasma tube is not the best way to insure long cathode life and cleanliness.

The 550 series is an entirely new design in every respect. Not only is the new Tungsten tube a significant departure from previous commercial construction, the 550 system has innovations throughout. For example the 550 Series power supply has only one basic design which services all model laser heads, 2 through 12 Watt versions.

Other Features Include:

- Full time optical servo loop operation with manual override
- Built in power meter with range switch
- Optional wavelength selector
- Fast disconnect umbilical
- Plug in card modules for easy repair
- Inverted trihedral-slot-flat mirror mounts with gear reduced drive
- Optional intracavity space and separate cover for easy access
- Optional plane of polarization
- Quartz Rod Stable Resonator

We invite side by side comparison with any commercial argon ion gas laser available on today's market.

Compare power:

For any power rating you wish to choose, Laser Ionics offers more reserve over rating than any manufacturer, bar none.

Compare Stability:

The 550 series lasers are always in optical loop mode control. Less than 1% power deviation for as long as 50 hours.

Compare Reliability:

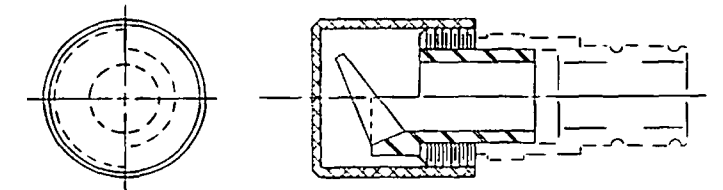
The 550 series has the fewest parts and most simple design of any gas ion laser of similar power rating. Fewer parts means fewer failures.

Compare Price:

Acquisition cost per Watt is lower than any other manufacturer's list price.

Wavelength Selecting Littrow Prism

The 550-A wavelength selecting littrow prism is an optical accessory used to suppress all lines of oscillation except the wavelength desired. As Laser Ionics uses a half littrow prism, the 550-A mounts conveniently into the rear mirror mount in place of the maximum reflector used for Broad Band operations.

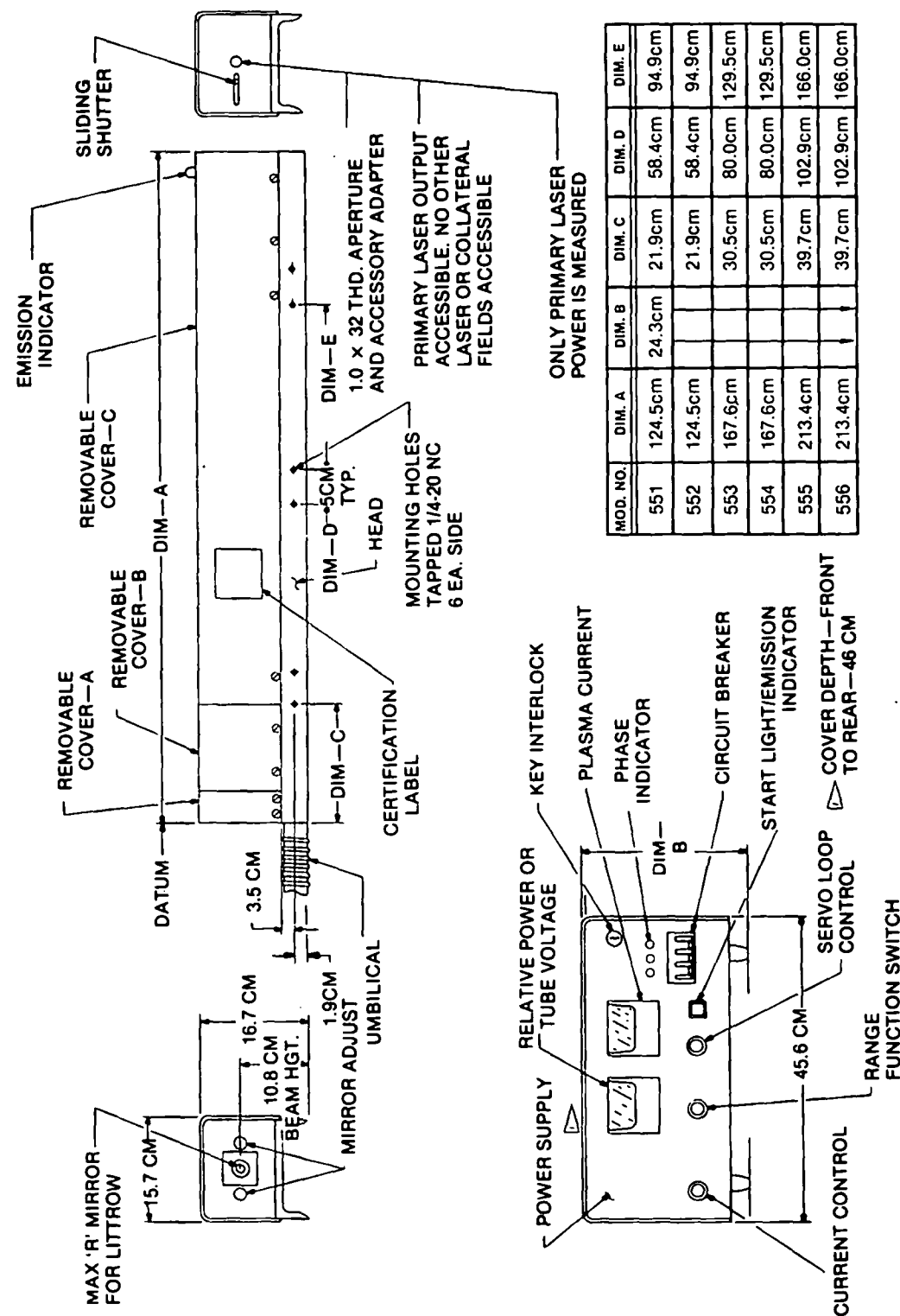


The 550-A has the terminal maximum reflector coated directly onto the fused silica body, thereby making the dispersive element and the reflective element one monolithic unit. With this single unit positioned on an invar mount, the resultant wavelength selector is both thermally and mechanically stable.

Relative Power/Tube Voltage Metering

All 550 series ion lasers offer front panel mounted relative power metering and tube voltage (gas pressure) metering.

A small portion of the emitted laser radiation is sampled by means of an external Brewster window, minimizing the useful power extracted from the laser beam. The extracted beam is further filtered from the background spectrum and diffused in order to uniformly illuminate the sensing silicon diode. Diode output is single stage amplified. This amplified output is displayed by a 3 inch analog meter with a dual range switch which allows the operator to set full scale range appropriate for single line or all line operation.



MOD. NO.	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
551	124.5cm	24.3cm	21.9cm	58.4cm	94.9cm
552	124.5cm		21.9cm	58.4cm	94.9cm
553	167.6cm		30.5cm	80.0cm	129.5cm
554	167.6cm		30.5cm	80.0cm	129.5cm
555	213.4cm		39.7cm	102.9cm	166.0cm
556	213.4cm		39.7cm	102.9cm	166.0cm

NCDRH warning logotypes, similar to that shown here, appear on each laser to indicate the NCDRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype which is approximately 50% greater than rated output power.



VISIBLE AND INVISIBLE LASER RADIATION. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION



14W - CW Argon

CLASS IV LASER PRODUCT

LASER IONICS, INC.

701 S. KIRKMAN ROAD, ORLANDO, FLORIDA 32811
305/298-1561; TELEX # 567443

Laser Ionics, Inc. has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

Printed in USA 500L13
©Copyright CLC October 1982

LASER IONICS, INC.

Series
550

The Tungsten-Bore, Ion-Gas Laser.

Why Tungsten?

Tungsten has the highest melting point and lowest vapor pressure of all metals. Tungsten retains its considerable mechanical strength at high temperatures while remaining resistant to chemical & ion bombardment erosion.

Consider the Advantages

Tungsten Laser Bore Technology ... provides you, as a potential laser user.

Economy

Construction and processing of the new Tungsten Bore Laser removes laser head manufacturing from the realm of "art" to the arena of production engineering. The result is lower manufacturing costs, therefore, significantly lower acquisition cost to you, the user.

Ruggedness

The 550 series laser tube bores are metal, extremely durable metal. In our opinion, backed by ten years of producing high power ion lasers, the 550 series Tungsten tubes are by far the most durable ion tubes your money can buy at any price.

Intrinsic Long Life

Historically ion tubes fall predominately in one of four (4) modes,

- 1) Gas clean-up reduces tube pressure below an operable pressure regime.
- 2) Bore material powdering contaminates interior of Brewster window.
- 3) Glass to metal seal failure, if seal area is coolant submersed.
- 4) Gas contamination due to an insufficiently clean tube at the time of manufacture.

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Other Features Include:

- Full time optical servo loop operation with manual override
- Built in power meter with range switch
- Optional wavelength selector
- Fast disconnect umbilical
- Plug in card modules for easy repair
- Inverted trihedral-slot-flat mirror mounts with gear reduced drive
- Optional intracavity space and separate cover for easy access
- Optional plane of polarization
- Quartz Rod Stable Resonator

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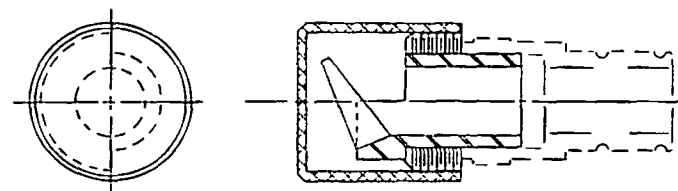
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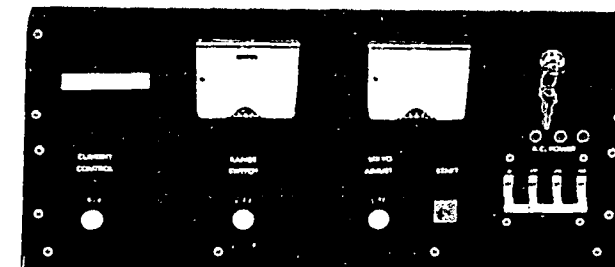
The 550-A has the terminal maximum reflector coated directly onto the fused silica body, thereby making the dispersive element and the reflective element one monolithic unit. With this single unit positioned on an invar mount, the resultant wavelength selector is both thermally and mechanically stable.

Relative Power/Tube Voltage Metering

All 550 series ion lasers offer front panel mounted relative power metering and tube voltage (gas pressure) metering.

A small portion of the emitted laser radiation is sampled by means of an external Brewster window, minimizing the useful power extracted from the laser beam. The extracted beam is further filtered from the background spectrum and diffused in order to uniformly illuminate the sensing silicon diode. Diode output is single stage amplified. This amplified output is displayed by a 3 inch analog meter with a dual range switch which allows the operator to set full scale range appropriate for single line or all line operation.

The panel meter which displays relative power has a third switch position which causes the panel meter to display tube voltage. Tube voltage is a convenient method to determine gas pressure in the ion tube. An operating tube voltage or gas pressure range has been shaded on the panel meter face.



Radiated Power Servo Control System

All Series 550 ion lasers offer a closed loop for controlling radiated power, both long term average power and short term (noise) power variations.

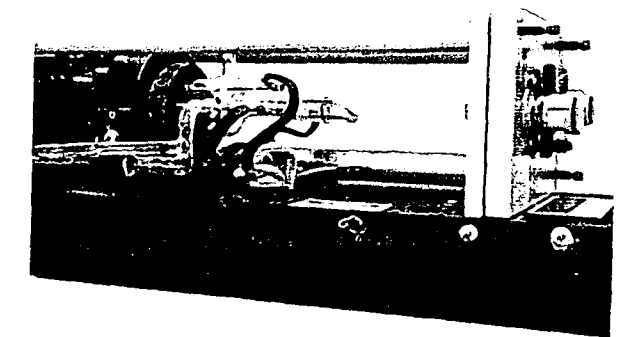
Optical noise on the laser output is principally below 400 Hz. The light sampling servo system is designed for high gain below 400 Hz, rolling off to zero gain above 400 Hz to avoid loop response to local EMI conditions.

Stable Resonator Structure

Basic design requirements upon a practical resonator structure, or "mirror holding mechanism" are three fold:

- (A) Small, precise angular movements of both mirrors must be possible for optimum alignment and wavelength selection.
- (b) In steady state, mirrors must be held to a few tenths of arc second wander over the entire thermal operating range of the structure.
- (C) In steady state etalon operation, total mirror separation, L , must remain constant to within picocentimeters once the thermal equilibrium is established.

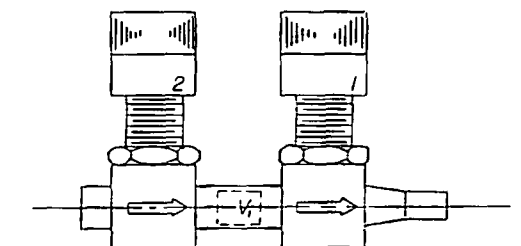
To achieve this, Laser Ionics references each mirror plane to a central plant of symmetry of the laser head by compressionally loading each mirror plane into a three point support. This three point support is made of individually heat shielded, low temperature coefficient expansion rods.



The transmitting mirror plane provides for coarse or "scan" angular sensitivity, while the maximum reflecting mirror plane has very fine angular adjustment for fine tuning and wavelength selection.

Gas Refill System

Although Laser Ionics' segmented disc tungsten bore lasers exhibit the lowest gas clean up rates (GRC) of any commercially produced ion laser, occasional refill will be required to fully realize the extended life offered by this superior design.



The two hermetically sealed valves shown are separated by a stainless steel cylinder of a known volume, V . By opening valve #2 to the reservoir in which ultra pure gas lasing media gas is stored at a known pressure, Volume V , is charged with a precise amount of gas. By closing valve #2 and opening valve #1, the tube is charged with an exact amount of gas.

WAVELENGTH (nm)	551			552			553			554			555			COMMENTS
	TEMoo POWER (mw)			TEMoo POWER (mw)			TEMoo POWER (mw)			TEMoo POWER (mw)						
676.4																
647.1																
568.2																
530.9																
520.8																
514.5	1000	80		1500	V	2250	255		3000	340	4000	V	V	5000	600	
501.7	100	10		200	A	300	40		400	55	500	A	A	600	100	
496.5	150	20		300	I	500	75		650	100	750	I	I	950	175	
488.0	700	150		1300	L	2000	450		2650	600	3300	L	L	4000	750	
482.5																
476.5				400	A	20			800	155	60			1200	275	105
476.2					B	35					100					175
472.7				100	L				200					300		
465.8				80					180					250		
457.9				250					520	25				750	50	
454.5				—					120					200		
Total Output (Watts)	2.0	0.5	0.5	4.0		0.7	6.0	1.5	1.5	8.0	2.0	2.0	10.0	12.0	3.5	3.5
Output (Watts)	2.36	.56	.56	4.13		0.77	6.52	1.83	1.75	2.52	2.38			4.66	4.44	
Resonator Length (cm)					107					150				152		
Optical Stability					±1%					±1%				±1%		
Service Power (± 5%)	220VAC/3Ø/50A			220VAC/3Ø/60A			220VAC/3Ø/60A			220VAC/3Ø/60A			220VAC/3Ø/60A			
Head Size (cm)	125x17x16			168x17x16			172x17x16			172x17x16			172x17x16			
Head Weight (Kg)	23			23			32			32			32			
Power Supply Size (cm)	46x46x24			46x46x24			46x46x24			46x46x24			46x46x24			
Power Supply Weight (Kg)	39			39			39			39			39			
Water Supply	3 GPM - 30 P.S.I.			4 GPM - 45 P.S.I.			4 GPM - 45 P.S.I.			4 GPM - 45 P.S.I.			4 GPM - 45 P.S.I.			

Beam Diameter is 2.0mm for all models* See Note #5
 Beam Divergence is 0.6 MRAD for all models
 Beam Polarization/Horizontal or vertical extinction better than 100:1
 Cavity Configuration — Flat-Long Radius for All Models (Quartz Rod Stable Resonator)
 Optical Noise is 0.7% RMS for all models.

Laser Ionics, Inc. has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

THIS LASER IS FULLY NCDRH* CERTIFIED

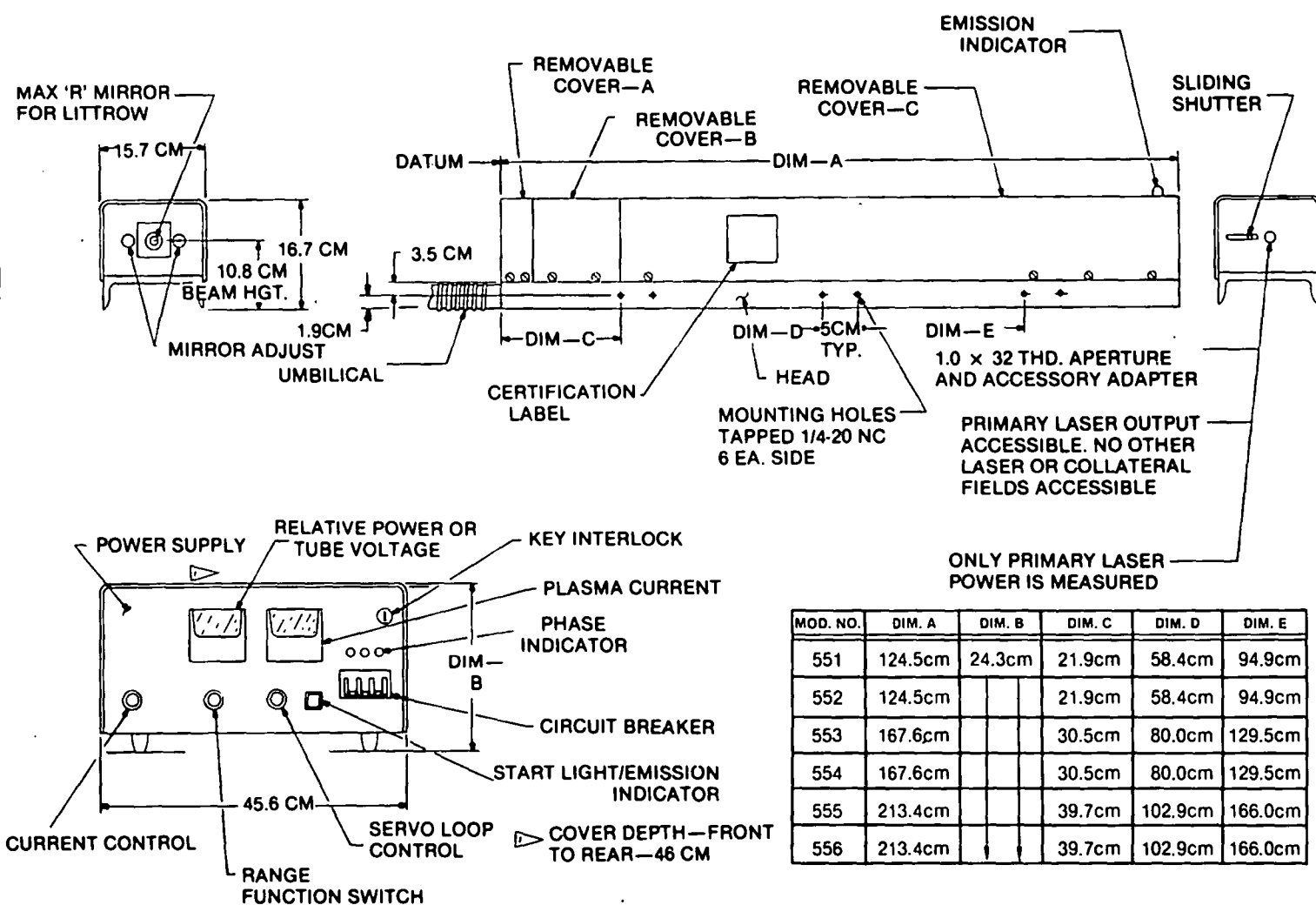
*Formerly BAH

NOTES:

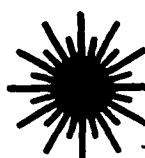
- #1 With Argon Krypton Laser best results are obtained using Argon Littrow below 520.8nm and Krypton Littrow above 530.9nm.
- #2 Individual line power data is stated using a wavelength selecting Littrow prism. Individual line data will vary as much as 25% when using broadband optics.
- #3 Total output power is guaranteed for one full year of operation.
- #4 Individual line power will be up to 25-35% of data shown when using single frequency etalon. Lower gain lines will demonstrate lower single frequency conversion.
- #5 Beam diameter measured at 514.5nm using 10 MRC output mirror.

701 S. KIRKMAN ROAD, ORLANDO, FLORIDA 32811
 305/298-1561; TELEX # 567443

LASER IONICS, INC.



VISIBLE AND INVISIBLE LASER RADIATION. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION



14W - CW Argon

CLASS IV LASER PRODUCT

NCDRH warning logotypes, similar to that shown here, appear on each laser to indicate the NCDRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype which is approximately 50% greater than rated output power.

WAVELENGTH (nm)	537			559		
	TEM ₀₀	POWER (mw)		TEM ₀₀	POWER (mw)	
				A	A	A
				A	A	A
				G	G	P
				O	O	T
				N	N	O
676.4					125	350
647.1					1250	2400
568.2					640	900
530.9					690	1200
520.8					430	420
514.5	6000	V	V	7800	1030	
501.7	700	A	A	960	175	
496.5	1100	I	I	1440	300	
488.0	4750	L	L	6000	1220	
482.5					125	180
476.5				1900	475	
476.2						300
472.7				480		
465.8				420		
457.9				1200	85	
454.5				360		
Total Output (Watts)	15			20.0	6.0	6.0
Output (Watts)					8.4	8.1
Resonator Length (cm)					221	
Optical Stability					± 2%	
Service Power (± 5%)	440VAC/3Ø/75A*			440VAC/3Ø/75A		
Head Size (cm)	21.4x17x16			23.9x17x16		
Head Weight (Kg)	59			60		
Power Supply Size (cm)	46x46x24			46x46x38		
Power Supply Weight (Kg)	39			43		
Water Supply	6 GPM-60 P.S.I.			6 GPM-60 P.S.I.		

COMMENTS

Requires Special Output Mirror

Requires Special Output Mirror

Requires Special Output Mirror

Requires Special Output Mirror

Using Broadband Optics
See Note #3
See Note #2

Beam Diameter is 2.0mm for all models* See Note #5
Beam Divergence is 0.6 MRAD for all models
Beam Polarization/Horizontal or vertical extinction better than 100:1
Cavity Configuration — Flat-Long Radius for All Models (Quartz Rod Stable Resonator)
Optical Noise is 0.7% RMS for all models.

Laser Ionics, Inc. has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

THIS LASER IS FULLY NCDRH* CERTIFIED

*Formerly BRAH

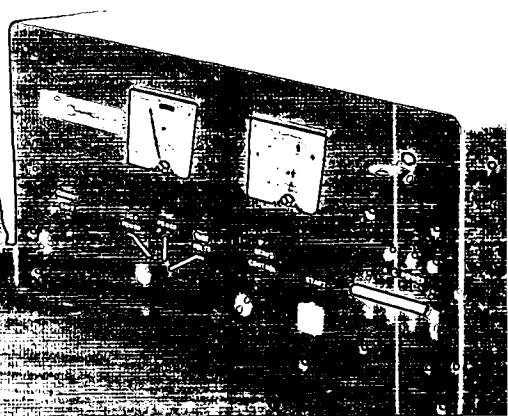
NOTES:

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- #4 Individual line power will be up to 25-35% of data shown when using single frequency etalon. Lower gain lines will demonstrate lower single frequency conversion.
- #5 Beam diameter measured at 514.5nm using 10 MARC output mirror.

Latent
Print
Detector

LPD-2000

An Inexpensive Laser System for Forensic Applications



...ent personnel with no
...g can scan exhibits with a
...r wand and quickly raise latent
...obile; the LPD can be used with
...genes.

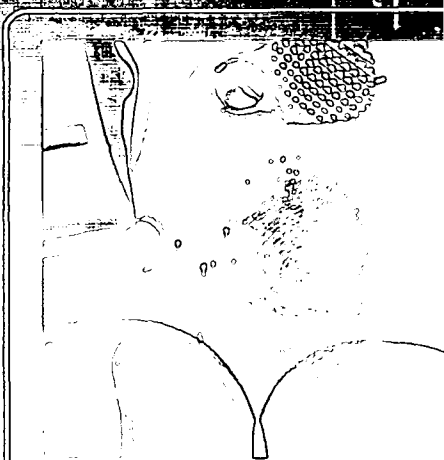
...nt Print
...stem can be
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LPD
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System Description/ Operation

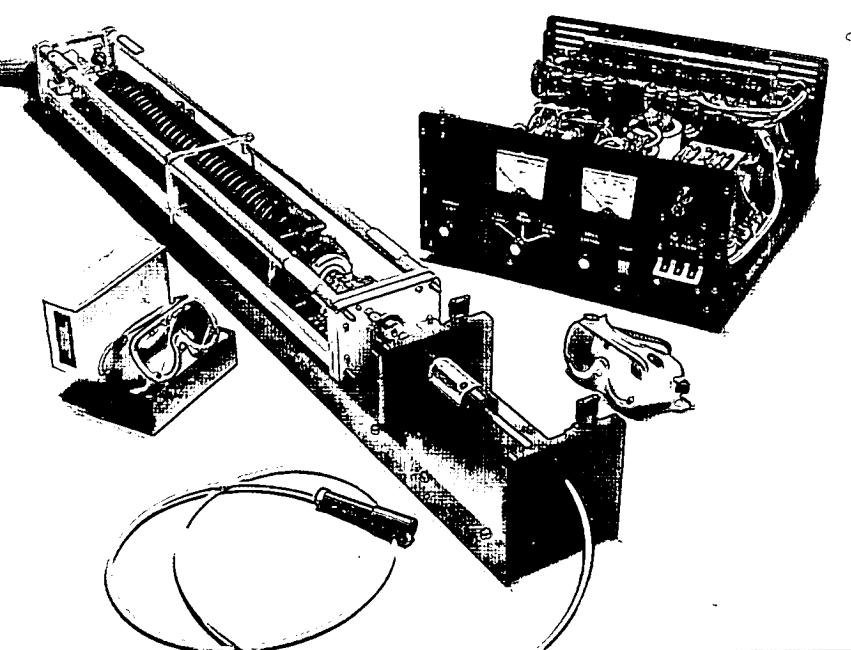
The Model LPD-2000 incorporates a Laser Ionics' Series 550 Argon Laser (Model 552A, 4-watt), a fiber-optic beam delivery device and safety goggles (two pairs). Specifications for Model LPD-2000 are provided in the accompanying table.

The principle of operation is quite simple. The argon-ion laser emits a continuous beam of high-intensity blue-green light at wavelengths ranging from 457.9 to 514.5 nm. This output is diverged by the beam delivery fiber optics device to cover a 10-in.-diameter circular area on the exhibit. The laser light directed at the exhibit causes compounds of palmer sweat—such as amino acids—to luminesce with a yellowish-orange color.



Jim Murray, Supervisor of the Crime Laboratory at the Orange County (Florida) Sheriff's Department, brings up a print on the handle of a revolver using Laser Ionics' new Model LPD-2000 Latent Print Detector.

LASER IONICS



Laser Ionics' Model 552A 4-Watt Argon-Ion Laser used in the Model LPD-2000 Latent Print Detector.

Fiber-Optic Delivery Device

The Model LPD-2000 features a 1,000-micron-diameter, single-fiber-optics cable for safe laser beam delivery directly onto crime scene exhibits. The fiber-optic cable comes complete with an x-y positioner for accurate alignment of the cable to the laser's output beam. Both the fiber-optic cable and x-y positioner easily can be removed from the laser head for cleaning of the optical surfaces.

Six feet long, the cable provides complete freedom of movement within the work area, decreases optical losses and minimizes exposure of personnel to laser light. The fused silica core contained within a silicon polymer cladding emits no measurable optical radiation other than the designated laser output. The Tetzel® outer jacket provides excellent physical strength and high resistance to damage.

®Trademark of Dupont Co.

Installation and Training

System installation and on-site training by Laser Ionics personnel is available on request.

Warranty

Laser Ionics warrants all equipment to be free from defects in material and workmanship for a period of one year from date of shipment. All repairs or replacements occurring after the first year of operation are warranted for six months from date of shipment, including laser plasma tube replacements.

NCDRH Warning Label

National Center for Devices and Radiological Health (NCDRH) warning logotypes, similar to that shown here, appear on each laser to indicate the NCDRH classification and to certify that the output power of the laser will not exceed the power level printed on the logotype which is approximately 50% greater than rated output power.

To find out how argon lasers can aid in your forensic research and investigations contact Stephanie Banks Marketing Manager (305/298-1561)

LASER IONICS

The Light Source Company

701 S. Kirkman Road, Orlando, Florida 32811, 305/298-1561

Latent Print Detector

LPD-2000

MODEL LPD-2000 SYSTEM SPECIFICATIONS

Argon Laser	Model 552A
OPTICAL OUTPUT(watts)	4
WAVELENGTH RANGE	457.9 to 514.5 nm
OUTPUT STABILITY greater than 10x1 Hz ⁽¹⁾	1%
OPTICAL NOISE (10 Hz-2 MHz) ⁽¹⁾	± 0.7 rms
POLARIZATION	greater than 100:1 E vector vertical

Fiber-Optic Assembly

OPTICAL OUTPUT	75% of Laser Output
CABLE COMPOSITION	Fused-Silica Core, Silicon Polymer Cladding Tetzel [®] Jacket
FIBER DIAMETER	1,000 microns (10 mil)
MINIMUM BEND RADIUS	12 inches
TENSILE STRENGTH	500 kpsi
POSITIONER CONFIGURATION	Single-Lens, X-Y Axis Adjustment

System

INPUT POWER	3-Phase with Ground
VOLTS (AC)	220
AMPERES ⁽²⁾	50
WATER ⁽⁴⁾	3 gpm/30 psi
LASER HEAD WEIGHT	80 lb
POWER SUPPLY WEIGHT	70 lb
SHIPPING WEIGHT ⁽³⁾	225 lb

- (1) Specified in light feedback mode of current control.
- (2) Trademark of Dupont Company.
- (3) Current specified is recommended service rating.
- (4) Specified full water flow, non-back-pressured drain.
- (5) Shipped in two containers.



Release Date: November 21, 1984

LASER DETECTOR SYSTEM HELPS FIND PRINTS

BOTH IN THE LAB AND AT THE CRIME SCENE

Orlando, Florida -- A laser detector system designed specifically to help law enforcement personnel quickly scan for finger and palm prints has been introduced by Laser Ionics, Inc., here. Conceived with the "user friendly" concept in mind, the system -- designated the Model LPD-2000 Latent Print Detector -- requires no special training to operate and can be easily transported to a crime scene.

This new tool for forensic science not only complements conventional print-raising methods, it adds a new dimension to the technology through several unique advantages it offers. The two basic print detection methods now in use -- chemical treatment and physical "dusting" of the exhibit being examined -- while extremely effective, often are not capable of adequately bringing up prints on some surfaces. For example, it is quite difficult and/or time consuming to locate latent prints on:

- Large surfaces, such as walls;
- A large assortment of items, such as hundreds of pieces of paper; and
- Articles with a textured surface, such as wallets and purses.

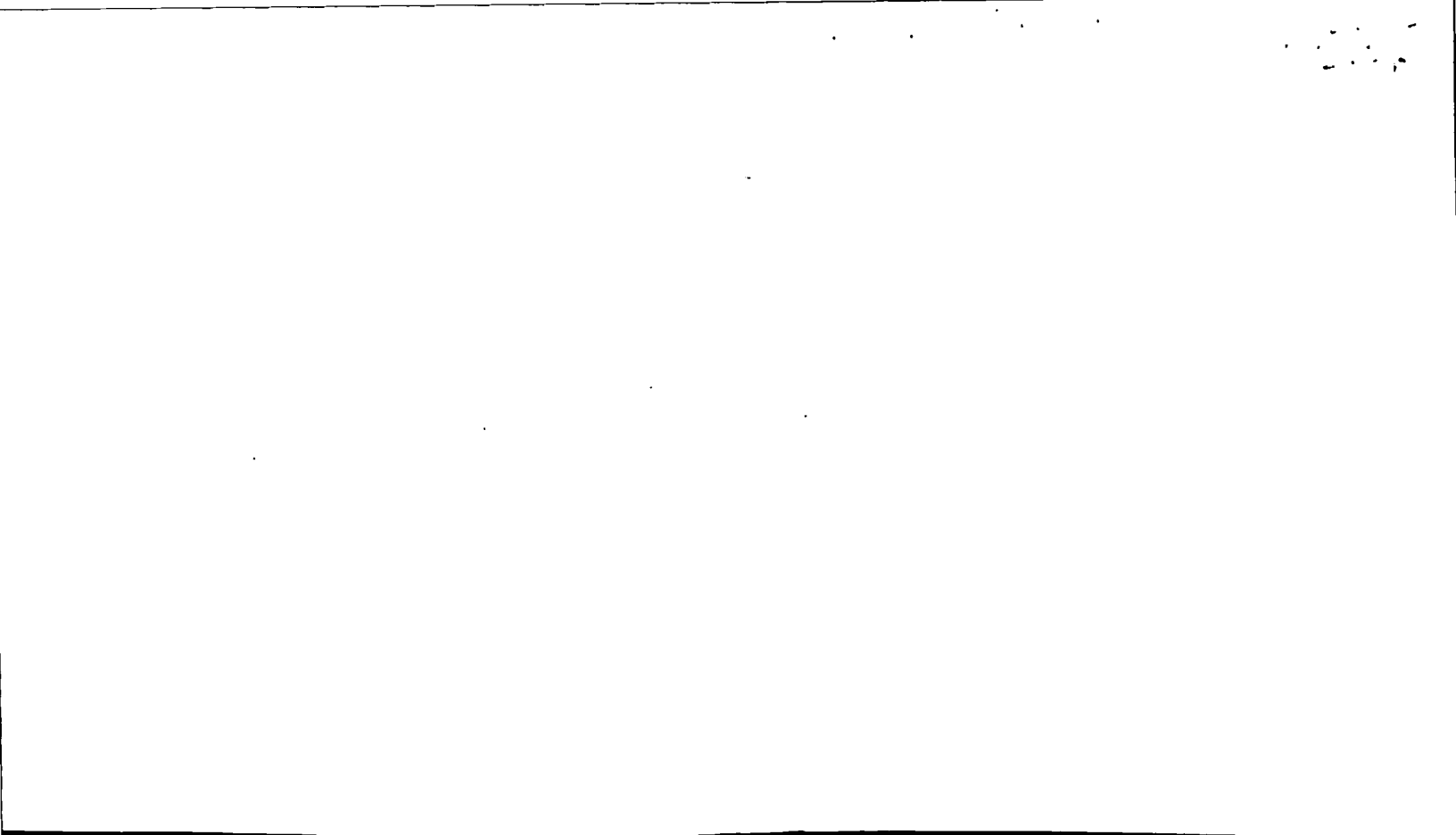
The LPD-2000 not only helps find the print, it enables forensic specialists to use the laser technique for print enhancement in conjunction with standard methods.

This new law enforcement tool consists of Laser Ionics' Model 552A Argon Laser, a fiber-optic beam delivery device and two pairs of safety goggles. The laser emits in the blue-green portion of the light spectrum (457.9 to 514.5 nanometers) at an output power of four watts. The beam delivery device incorporates an x-y positioner for accurately aligning its fiber optic cable with the laser's output beam, a twelve-foot long fiber-optics cable to safely transmit the laser light to the exhibit, and a "wand" for shining the laser beam onto the exhibit. The safety goggles not only protect the operator's eyes by filtering out the blue-green laser light, they also enhance the print's visibility.

The principle of operation is quite simple. The argon-ion laser emits a continuous beam of high-intensity green light at a wavelength of 514.5 nanometers. This beam is diverged by the beam delivery fiber optics device to cover a 10-inch-diameter circular area on the evidentiary material. The laser

light impinging on the material causes compounds of palmer sweat -- such as amino acids -- to luminesce with a yellowish-orange color. This luminescence can be recorded photographically either on black-and-white or color film for later analysis.

Price of the basic Model LPD-2000 Latent Print Detector is \$ _____. Delivery is _____ days after receipt of order.



MODEL LPD-2500
PORTABLE LATENT PRINT DETECTOR

This portable argon laser print detector can be carried by one person right to the crime scene. A fiber-optic wand and chemical reagents/dyes help law enforcement personnel quickly scan exhibits and raise latent fingerprints.

Lightweight and compact enough to be easily carried by one technician, Laser Ionics' Model LPD-2500 Portable Argon Laser Print Detector System permits law enforcement personnel to scan for prints anywhere a 115-VAC household electrical outlet or portable generator is available. When used in conjunction with a fiber-optic wand and chemical reagents and dyes contained in a field and laboratory kit provided with the system, the prints can be brought up in sharp detail.

The laser portion of the LPD-2500 consists of a 100-mW, air-cooled, argon-ion laser head connected to its power supply by a five-foot-long umbilical cord. Also supplied with the system are the fiber-optic assembly and field and laboratory kit mentioned above, a four-wheeled steel cart for transportation and storage, two pairs of argon safety goggles and two operating/maintenance manuals.

The principle of operation is quite simple. The argon laser emits a continuous beam of high-intensity blue-green light

at wavelengths from 457.9 to 514.5 nm. This output is diverged by the fiber-optic beam delivery assembly to cover an adjustable-size circular area on an exhibit. The laser light causes compounds of palmer sweat — such as amino acids — to luminesce with a yellowish-orange color. The safety goggles provided — although designed to filter out the blue-green light — permit the luminescent colors to be seen by the observer and can be used as a camera filter to take photographs.

LASER HEAD

The laser head contains a rugged plasma tube incorporating a beryllium-oxide (BeO) bore material, metal end shrouds and uniquely designed optical couplers. It also features large shrouds to provide a high volume of gas which, in turn, assures stable operation, longer life and a long duty cycle.

To provide unparalleled stability, the plasma tube is mounted in an all-metal resonator structure built around four solid Invar rods. The front and rear mirrors are gimbal-mounted to two end plates, one attached at each end of the Invar rods at all four corners. Alignment of the mirrors with the plasma tube can be easily achieved by adjusting set screws on the gimbals.

Cooling during operation is accomplished by two high-volume fans located at each end of the plasma tube. An automatic thermostat control provides proper air cooling after shut down.

POWER SUPPLY

Compact and simple to operate, the solid-state power supply operates from a common 115-VAC outlet. Its unique design eliminates the chance of electrical shock and enables

maximum laser energy output even at low line voltage inputs.

All system controls and indicators are mounted on the front panel of the power supply. Included are an ON/OFF key switch, an interface port for use with a remote control box, a Center for Devices and Radiation Health (CDRH) remote plug, fans and filament circuit breakers, and a power supply fuse.

FIBER-OPTIC ASSEMBLY

The fiber-optic assembly consists of a fiber-optic cable terminated by a scanning wand and an x-y positioner. Twelve feet long, the cable provides complete freedom of movement within the work area, decreases optical losses and minimizes exposure of personnel to the laser beam. The specially designed wand incorporates optics that diverge the laser beam directly onto a crime scene exhibit.

The fiber-optic cable incorporates a 1,000-micrometer-diameter, single-strand, fused-silica-core fiber clad with a silicon polymer. The fiber emits no measurable optical radiation other than the designated laser output. A TetzlTM* outer jacket provides excellent physical strength and high resistance to damage.

* Trademark of Dupont Company

The x-y positioner permits accurate alignment of the fiber-optic strand to the laser's output beam. Both the cable and x-y positioner can be easily removed from the laser head for cleaning of the optical surfaces.

FIELD AND LAB KIT

The field and lab kit contains a wide variety of chemical

reagents and dyes to enhance latent prints brought up by the LPD 2500.

INSTALLATION AND TRAINING

System installation and on-site training by Laser Ionics' personnel are available on request. A two-day training class will be given by an instructor experienced in field and laboratory work at Innovative Research Technology's forensic laboratory in Orlando. It will cover topics such as: how to operate and maintain the laser; safety considerations; evidence detection and recovery; use of chemical reagents and dyes to enhance results; and video viewing and photographic recording.

WARRANTY

Laser Ionics warranties all equipment to be free from defects in material and workmanship for a period of one year from the date of shipment.

SPECIFICATIONS FOR THE LPD 2500

LASER HEAD

Optical Output Power	100 mW
Wavelength Range	457.9 to 514.0 nm
Warmup Time	
Cold	< 5 min.
From Standby	Immediate
Beam Pointing Stability	
After Warmup	<30 mr
Periodic	10 mr
Long-Term Power Stability	
Two hours at constant ambient conditions	1%

Dimensions	22"L x 8"W x 6.5"H
Weight -- Operating	25 lb
-- Shipping	29 lb

POWER SUPPLY

Input Power	115 VAC. 15 A
Requirements	60 Hz, 1 0
Dimensions	14"L x 10"W x 6"H
Weight -- Operating	20 lb
-- Shipping	22.5 lb

FIBER-OPTIC ASSEMBLY

Cable Composition	Fused-silica core Silicon polymer cladding Tetzel™ jacket
Fiber Diameter	1,000 micrometers
Minimum Bend Radius	12 inches
Tensile Strength	500 kpsi
Positioner	single-lens, x-y axis
Configuration	adjustment

Laser Ionics, Inc., has a policy of continuous product research and development and, therefore, reserves the right to change designs and specifications without notice.

EQUIPMENT SPECIFICATIONS
FOR
5-WATT VISIBLE ARGON-ION LASER

All lines blue green (458nm-514nm)

Prism assembly to allow single line operation at 488.0nm and 514.5nm

Produce 95%-100% full power within 10 minutes of turn on.

Plus or minus 5% power accuracy at all individual wave lengths.

Power drift of less than 3% over a 10 hour period.

Electrical requirement not to exceed: 208 volt, 3 phase, 22kw, 60 amp.

Water requirement not to exceed: 9.5 I/M; 2.5 GPM; 15-50 PSI

(Vendors who exceed water requirement may present their requirement to City for determination as to whether they can be accommodated).

Power supply to include:

Fully instrumented front panel.

Master key switch to prevent unauthorized use.

Power on and off switch.

Low pressure indicator.

Malfunction meter.

AC phase lamps to indicate that power lines are properly connected.

Current and power adjustment switch.

Function selection switch.

Audible alarm and status fault indicator.

Microprocessor based control system to monitor and maintain:

plasma tube current; plasma tube voltage; output power;
magnetic field; water flow; water temperature; safety interlock
status; utility status; automatic shutdown capability; memory
of fault that caused shutdown; memory of current or most recent
operating status; pre-light check off list to ensure that
components are working prior to power turn on; full digital
readout of operating wavelength.

Fiber Optic Coupler to include:

Key activated control box.

Adjustable beam divergence (6° to 20+°)

Coupler assembly with X-Y adjustment lens.

Shielded fiber, 20' in length, with slack box.

Footswitch controlled electronically activated beam shutter.

Beam attenuator.

Adaptor ring.

5-year extended warranty to include:

Parts and labor to cover all mechanical, electrical, and optional
parts and assemblies, including plasma tube, unconditionally
warranted to be free from defects in workmanship and materials.

Must be able to work with a refrigerated re-circulating heat exchanger.

Successful bidder will be required to approve the cooling system to be supplied by the City.

GENERAL PROVISIONS

1. Independent Contractor. At all times during the term of this Contract, Contractor shall be an independent Contractor and shall not be an employee of the City. City shall have the right to control Contractor only insofar as the results of Contractor's services rendered pursuant to this Contract; however, City shall not have the right to control the means by which Contractor accomplishes services rendered pursuant to this Contract.

2. Licenses; Permits; Etc. Contractor represents and warrants to City that he has all licenses, permits, qualifications and approvals of whatsoever nature which are legally required for Contractor to practice his profession. Contractor represents and warrants to City that Contractor shall, at his sole cost and expense, keep in effect at all times during the term of this Contract any licenses, permits, and approvals which are legally required for Contractor to practice his profession.

3. Insurance.

(a) Comprehensive Auto and General Liability. During the term of the Contract, Contractor shall maintain in full force and effect a comprehensive auto and general liability insurance in an amount of no less than \$500,000 single limit per occurrence, issued by an admitted insurer or insurers as defined by the California Insurance Code, providing that the city of Sacramento, its officers, employees and agents are to be named as additional insureds under the policy, and the policy shall stipulate that his insurance effected by the City or other named insured will be called on to contribute to a loss covered thereunder.

(b) Workman's Compensation. During the term of this Contract, Contractor shall fully comply with the terms of the law of California concerning workman's compensation. Said compliance shall include, but not be limited to, maintaining in full force and effect one or more policies of insurance insuring against any liability Contractor may have for workman's compensation.

(c) Errors and Omissions; Malpractice. In the event City requests Contractor to carry errors and omissions insurance or malpractice insurance, Contractor shall take out and keep in full force and effect during the term of this Contract a policy in form and content satisfactory to City which shall indemnify City against errors and omissions or malpractice by Contractor. Said policy or policies shall provide liability coverage in an amount specified by City in its request.

(d) Certificate of Insurance. The Contractor will have a standard "Certificate of Insurance" completed prior to engaging in any operation or activity set forth in this contract/agreement. Said policies shall provide that no cancellation, change in coverage, or expiration by the

GENERAL PROVISIONS - continued

insurance company or the insured shall occur during the term of this contract, without 30 days written notice to the City prior to the effective date of such cancellation or change in coverage.

4. Contractor Not Agent. Except as City may specify in writing, Contractor shall have no authority, express or implied, to act on behalf of City in any capacity whatsoever as an agent. Contractor shall have no authority, express or implied, pursuant to this Contract to bind City to any obligation whatsoever.

5. Assignment Prohibited. No part to this Contract may assign any right or obligation pursuant to this Contract. Any attempted or purported assignment of any right or obligation pursuant to this Contract shall be void and of no effect.

6. Indemnity and Hold Harmless. Contractor agrees to indemnify City against any and all liability, losses, claims, damages, or judgement arising from any act by, or negligence of, Contractor or its subcontractors of the officers, agents, or employees of either while engaged in the performance of this contract or while in or about the building or protected premises for any reason connected in any way whatsoever with the performance of this contract, or arising from any accident or injury, not caused by an act or omission of City, its agents, or employees or anyone employed by the City other than this Contractor, to any person, licensee, Contractor or subcontractor, or any officer, agent, or employee thereof while engaged in the performance of this contract, or while in or about the building or premises for any reason connected therewith.

Should it become necessary for purposes of resisting, adjusting, or compromising any claims or demands arising out of the subject matter with respect to which indemnification is provided by this paragraph or for purposes of enforcement of this paragraph, for City to incur any expenses, or become obligated to pay any attorneys' fees or time, in no event to exceed thirty (30) days, after receiving written notice from the City of the incurring of such expenses, attorneys' fees, or costs.

Contractor shall pay City interest at an annual rate of seven percent (7%) compounded quarterly on all expenses or costs reasonably incurred by City in the enforcement of this paragraph and of any sums City may pay as a result of claims, demands, costs, or judgements with respect to the subject matter of this contract, from the date such sums are actually paid.

RECEIVED
SUPPORT SERVICES

1986 MAR 19 AM 8:26

CITY OF
SACRAMENTO, CA
MARCH 21, 1986

LASER PHOTONICS INC.

12351 Research Parkway - Orlando, FL 32826

City of Sacramento
Department of General Services
c/o City Clerk, Room 203
City Hall, 915 I Street
Sacramento, CA 95814

Reference: Proposal # 946

Thank you for sending the above referenced proposal to Laser Photonics, Inc. A review of the requirements and specifications indicates that our company would not be interested in pursuing this effort at this time, however, we would like to remain on your mailing list.

Regards,
LASER PHOTONICS, INC.



Richard P. Gluch, Jr.
Vice President
Marketing

RPG/mac

March 12, 1986

Sacramento City Council
c/o City Clerk, Room 203
City Hall, 915 I Street
Sacramento, California 95814

Reference: Your Request for Quotation No. 946

Unfortunately, Coherent must respond with a "NO-BID" to the above referenced request for quotation. We would, however, appreciate being retained on your bidder's list. Our product listing is enclosed for your reference.

Your interest in Coherent is appreciated. Please feel free to contact me if you have any further questions.

We look forward to serving you in the future.

Sincerely,



Phil Trotter
Sr. Sales Representative
Laser Products Division

PJT:as

Enclosure

FILED

APR 1 1986

By the
Office of the City Clerk



COHERENT®

3210 Porter Drive • Post Office Box 10321, Palo Alto, California 94303
Telephone: (415) 493-2111 • Telex: 34-8304

DYE LASER ACCESSORIES

Model 591	Dye Circulation Module	\$2,250	Model 7500	Angle Tuned Frequency Doubler for use with 699-02, -05, and -21. Specify either 7500-01, -02, -03, or -05 option.	\$12,000
Model 5920	Inert Dye Circulation Module	2,750			
Model 595	Etalon Assembly	3,200	Model 7501	Additional options for 7500	5,000
Model 7100	Etalon Assembly for 599-01—converts broadband to non-scanning, passively stabilized, single-frequency operation	7,800	Model 7502/03	Special rotation assembly required with -05 option when ordering with -01, -02 or -03 option, and vice versa.	1,000
Model 7110	Etalon Assembly for 699-01—converts broadband to non-scanning, passively stabilized, single-frequency operation	7,000	Model 01C	Kit to convert Traveling Wave 699 Laser to Standing Wave.	750
Model 7120	Etalon Assembly for 599-01—same as 7100, but can scan 30 GHz with appropriate input signals	8,400		Replacement Dye Jet Nozzle	150
Model 7130	Etalon Assembly for 699-01—same as 7110 except includes additional galvanometer drive for thin etalon to allow 30 GHz scanning—does not include scanning Brewster Plate	7,500	Model 7141*	Optical diode for use at wavelengths less than 500 nm (blue)	800
Model 7135	Length-changing vertex mounted Brewster Plate Assembly	1,000	Model 7140*	Optical diode 450 nm - 750 nm (standard)—includes both Faraday rotator and optical rotator	800
Model 7180	Reference Cavity for 599-21 and 699-21 Dye Lasers 450-750 nm	4,400	Model 7142*	Optical diode for use at wavelengths greater than 750 nm (red)—includes both Faraday rotator and optical rotator	800
Model 7181	Reference Cavity for 599-21 and 699-21 Dye Lasers 360-550 nm	4,400		Optical rotator for Model 7140	300
Model 7182	Reference Cavity for 599-21 and 699-21 Dye Lasers 650-960 nm	4,400		Optical rotator for Model 7142	300
			Birefringent Filters*	One-Plate Filter Insert	600
				Two-Plate Filter Insert	1,600
				Three-Plate Filter Insert	2,000
				Micrometer Drive	600

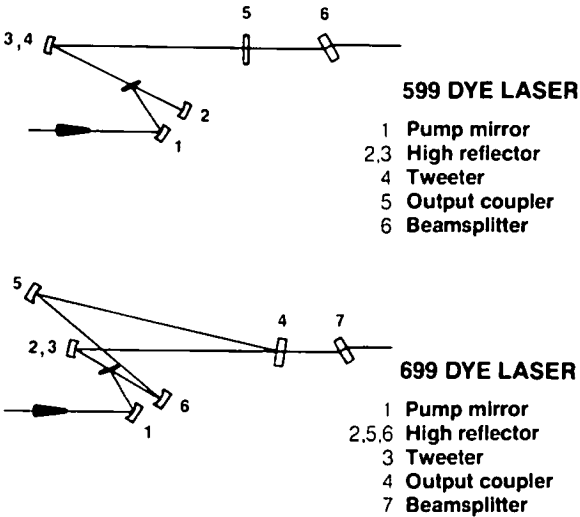
*Please specify wavelength.

DYE LASER OPTICS

Standard optics are available in the wavelength range of 405 nm-900 nm for standing wave lasers and 403 nm-840 nm for ring lasers. Please specify dye, dye laser model, pump laser and wavelength region in which optics are to be used. Special optics for operation at other wavelengths are also available. For further information on these optics, see product literature or contact your local representative.

Standard CW Dye Laser Optics

Output couplers	\$500
High reflector	325
Pump mirror	300
Tweeter assembly	1,250
Beamsplitter	300



ULTRAFAST LASERS

YAG LASER AND ACCESSORIES

Model 416	CW Nd:YAG	\$35,800	Model 324	Second Harmonic Generation system based on a KTP crystal for use with mode locked and Q-switched Model 416 YAG	\$ 7,800
Model 352	Mode locker for use with Model 416	11,400	Model 334	Third Harmonic Generation system for use with mode locked Q-switched Model 416 YAG	8,500
Model 351	Acousto Optic Q-switch for use with Model 416 YAG	7,000			



DYE LASERS AND ACCESSORIES

Model 701-3	Single jet sync pumped dye laser for pulse duration less than 6 picoseconds	\$15,500
Model 702-1	Double jet sync pumped dye laser with one-plate BRF for subpicosecond pulse duration	20,800
Model 702-2	Double jet sync pumped dye laser with two-plate BRF for pulse duration around 2 picosecond and extended tunability	20,400
Model 740	Accessory to Model 700 for use with mode locked Q-switched frequency doubled or tripled Nd:YAG laser to produce high energy pulses. Requires Model 7700 timing and synchronization module.	TBA
Model 7700	Timing and synchronization module	15,000
Model 468-AS	Actively stabilized mode locker utilizing ultrafast frequency synthesizer and shear-free mode locker head. Includes driver.	24,000
Model 7220	Cavity Dumper Driver for all Coherent ultrafast dye lasers. Attaches directly to the dye lasers invar resonator structure for stability, and exhibits very high extinction ratio. Please specify pump laser. Includes driver.	24,000
Model 7200	Cavity Dumper Driver for use with any commercial cavity dumper. It can be operated with or without a sync signal and may be slaved to another cavity dumper driver.	18,000

Model FR103	A rapid-scanning Autocorrelator allowing continuous and accurate measurements of the performance of a mode locked laser. It features linearity better than $\pm 2\%$ for a full width scan in both axes and can be used to measure pulses as short as 0.1 picosecond, FWHM.	\$9,750
	Additional doubling crystal for FR103	1,500

ULTRAFAST DYE LASER UPGRADE

Model 701 to 702 field upgrade. Parts only—does not include labor.



Standard Ultrafast Dye Laser Optics

Output couplers (8)	\$500
High reflector (2, 3, 4, 5, 6, 7)	325
Pump mirror (1)	300
Cavity Dumper optics	
High reflector (9, 10)	325

LAMBDA PHYSIK
LAMBDA CHROME LASER DYES*

High quality laser dyes manufactured by Lambda Physik in Acton, Massachusetts:

Lambdachrome® Dye	Corresponds To	Lambdachrome® No.	Price/Gram
Polyphenyl 1		LC 3800	\$200
Stilbene 1		LC 4100	120
Stilbene 3		LC 4200	20
Coumarin 2	C450	LC 4500	25
Coumarin 47	C460, 7D4MC, C1	LC 4700	20
Coumarin 102	C480	LC 4800	60
Coumarin 30	C515	LC 5150	75
Coumarin 6	C540	LC 5370	65
Rhodamine 110	Rhodamine 560	LC 5700	40
Rhodamine 6G	Rhodamine 590	LC 5900	20
Sulforhodamine B	Kiton Red S	LC 6200	23
DCM	—	LC 6500	50
Rhodamine 700	LD 700	LC 7000	80
Pyridine 1	LDS 698	LC 7100	75
Pyridine 2	—	LC 7300	75
Styryl 8	—	LC 7550	125
DOTC - Iodide	DOTC	LC 7880	85
Styryl 9M	LDS 821	LC 8400	120
IR 140	—	LC 9301	150
DQOCI	—	LC 5920/ML	70
DODCI	DODC-Iodide	LC 6550/ML+	55

Lambda Physik is a manufacturer of dyes, excimer lasers, and pulsed dye lasers for the research and applied market. In addition to the dyes listed on this page, Lambda Physik manufactures a complete line of pulsed dye laser dyes. Contact Lambda Physik for more information. (See page 9.)

Stock:	All dyes are normally in stock for immediate delivery in 1 gram bottles.
Prices:	F.O.B. Lambda Physik, 289 Great Road, Acton, Massachusetts 01720
Terms:	Net 30 days.
Discount:	Quantity discount may be available on dyes. Contact Lambda Physik for a quotation.

*NOTE: Lambda Physik dyes must be ordered directly from Acton. If ordered through Coherent, a service charge will be added to the purchase price.



COMMERCIAL PRODUCTS DIVISION

POWER METERS

The Coherent series of Power Meters covers the spectral range from ultraviolet to infrared. Analog or digital versions are available, measuring microwatts to kilowatts or in joules depending on the detector head and display meter selected. All detector heads are available with optional accessories.

POWER METERS MODEL 200 SERIES

201	Broadband power meter system with thermal disc up to 100 watts. Response time less than 1 second	\$1,995	212-01	Attenuator for Model 212 to increase maximum meter reading to 10 watts	\$ 325
			212-02	Silicon cell Sensor Head only	765
201-01	Range Extender for Model 201, to 300 watts (intermittent)	245	213	Kilowatt power meter system with thermal disc up to 1,000 watts. Response time less than 1 second	2,895
201-02	Sensor Head only, with stand	1,145			
203	Broadband power meter system with thermal disc up to 45 watts. Response time less than 1 second	1,855	213-01	Sensor Head only	1,995
			POWER METERS MODEL 2000 SERIES		
205	Broadband power meter system with thermal disc up to 20 watts. Response time less than 1 second	1,725	2201	Digital power meter system, 100 watts	\$2,195
			2203	Digital power meter system, 45 watts	2,025
205-01	Sensor Head only. No stand available.	875	2205	Digital power meter system, 20 watts	1,850
210	Broadband power meter system with thermal disc up to 3 watts. Response time less than 1 second	1,255	2210	Digital power meter system, 3 watts	1,710
			2213	Digital power meter system, 1,000 watts	3,075
210-01	Heat dissipating light shield for Model 210 to 10 watts	235	2000 AC	AC adaptor for 2000 series	65
210-02	Variable Aperture	210	2201	Sensor Head only	1,150
210-03	Sensor Head only, with stand	595	2203	Sensor Head only	900
210 AC	AC adaptor for Model 210	65	2205	Sensor Head only	870
212	Optical power meter system with silicon cell detector up to 100 mW Response time 200 microseconds minimum	1,650	2210	Sensor Head only	585
			2213	Sensor Head only	1,990

SPECTRUM ANALYZERS*

240PP	The Performance Package does not include Spectrum Analyzer; Spectrum Analyzer must be ordered separately.	\$ 995	240M-1-A	Mirror Set—7.5 GHz Free Spectral Range @ 450-550 nm	\$1,495
216PP	The Performance Package does not include Spectrum Analyzer; Spectrum Analyzer must be ordered separately.	1,295	240M-1-B	Mirror Set—7.5 GHz Free Spectral Range @ 550-650 nm	1,495
			240M-1-C	Mirror Set—7.5 GHz Free Spectral Range @ 775-875 nm	1,495
240-1-A	7.5 GHz Free Spectral Range Spectrum Analyzer 450-550 nm	3,250	240M-2-A	Mirror Set—Free Spectral Range @ 450-550 nm	1,495
240-1-B	7.5 GHz Free Spectral Range Spectrum Analyzer 550-650 nm	3,250	240M-2-B	Mirror Set—Free Spectral Range @ 550-650 nm	1,495
240-1-C	7.5 GHz Free Spectral Range Spectrum Analyzer 775-875 nm	3,250	240M-2-C	Mirror Set—Free Spectral Range @ 775-875 nm	1,495
240-2-A	1.5 GHz Free Spectral Range Spectrum Analyzer 450-550 nm	2,950	240M-3-A	Mirror Set—Free Spectral Range @ 450-550 nm	1,675
240-2-B	1.5 GHz Free Spectral Range Spectrum Analyzer 550-650 nm	2,950	240M-3-B	Mirror Set—Free Spectral Range @ 550-650 nm	1,675
240-2-C	1.5 GHz Free Spectral Range Spectrum Analyzer 775-875 nm	2,950	240M-3-C	Mirror Set—Free Spectral Range @ 775-875 nm	1,675
240-3-A**	30 GHz Free Spectral Range Spectrum Analyzer 450-550 nm	3,450	240-D	Photodiode Detector Assembly	195
240-3-B**	30 GHz Free Spectral Range Spectrum Analyzer 550-650 nm	3,450			
240-3-C**	30 GHz Free Spectral Range Spectrum Analyzer 775-875 nm	3,450			

DYE LASERS

Coherent's family of CW dye lasers is modular in construction and design. Standard dye laser systems can be upgraded to actively-stabilized, single-frequency operation. All Coherent dye lasers are built on massive Invar resonators to ensure the maximum in amplitude and frequency stability. Mirror controls are orthogonal, and all broadband models come with a birefringent filter. The ring laser 699 Series accepts vertically polarized pump radiation, eliminating the need for polarization rotators. Micro-

positioning of the dye jet streams and variable cavity geometries ensure unequalled stability and performance. All dye lasers are warranted to be free from defects for a period of 12 months. See TERMS AND CONDITIONS section for warranty details.

Standard price for a system includes dye circulation system, manual, dye solution, testing in, optics for and installation in one of the following dyes: S1, S3, C102, C6, R110, R6G, DCM, R700, Pyridine 2 or Styrl 9M.

BROADBAND DYE LASERS

Model 699-01	A broadband, tunable, ring dye laser tuned with and including a three-plate birefringent filter. May be used in either standing wave or ring configuration and will accept modules for conversion to specialized scientific applications including actively stabilized single-frequency. Please see the ring laser brochure and other Coherent literature for more information.	\$18,000
Model 599-01	A basic laboratory laser for standing wave broadband operation across the spectrum; 410 nm to 1.08 μ m. Includes either a three-plate birefringent filter (40 GHz linewidth) or a two-plate filter (100 GHz linewidth) or a one-plate filter (500 GHz linewidth) and will accept modules for conversion to specialized scientific applications including actively stabilized single-frequency.	1-plate 8,200 2-plate 8,400 3-plate 8,800

Actively Stabilized

Model 699-21	A 30 GHz scanning, single-frequency ring dye laser with a Model 7130 Etalon Assembly and a Model 7135 vertex mounted Brewster Plate. The 699-21 also comes standard with a reference cavity and ancillary optics to generate a frequency error signal, and with complete electronics for stabilization and all scan functions. The linewidth of the 699-21 is <500 KHz rms and the drift rate is <50 MHz/hour.	\$48,000
Model 699-29	A laser spectrometer that can scan over and seek out spectral features, and record and store the information it generates. This microprocessor-controlled dye laser system combines virtually unlimited spectral scan capability and wavemeter accuracy wavelength determination with high resolution data acquisition features. Please see the Autoscan literature for more information.	78,000
Model 599-21	A standing wave, single-frequency dye laser with high resolution (jitter below 1 MHz) and long-term stability (drift below 100 MHz/hour). This system has an electronically-controlled 30 GHz linear frequency scan.	40,000

SINGLE-FREQUENCY LASERS

Passively Stabilized

Model 699-02	A non-scanning, single-frequency ring dye laser tuned with a three-plate birefringent filter and incorporating the Model 7110 Etalon Assembly. The 7110 contains two etalons and enforces stable single-frequency operation.	\$26,000
Model 699-05	A passively-stabilized, scanning, single-frequency ring laser incorporating the Model 7150 Etalon Assembly which has a galvanometer mounted thin etalon and a servo-controlled thick etalon to avoid mode hops during scans. An intracavity Brewster plate gives a linear 30 GHz scan.	38,000
Model 599-03	A non-scanning, single-frequency, passively stabilized, standing wave dye laser incorporating the Model 7100 Etalon Assembly.	18,000

DYE LASER UPGRADES

The table below indicates the availability of dye laser upgrades. This is a factory procedure and all lasers undergoing upgrades must be returned to the factory. For upgrades to other configurations, please contact your local representative or Coherent.

From	To	Price
699-21	- 699-29	\$36,000
699-05	- 699-29	46,000
699-01	- 699-29	62,000
699-05	- 699-21	12,000
699-01	- 699-21	31,500
699-01	- 699-05	21,500
599-03	- 599-21	23,000
599-01	- 599-21	32,000

INNOVA REPLACEMENT PLASMA TUBES

Prices are for tube exchange only. Customers will be invoiced \$1500 for any replaced tube not returned to Coherent. Installation is additional. Please see TERMS AND CONDITIONS section for warranty details.

INNOVA 60-1	1 Watt (All Lines) Argon	\$ 4,500
INNOVA 70-2	2 Watts (All Lines) Argon	4,900
INNOVA 70-3	3 Watts (All Lines) Argon	5,400
INNOVA 70-4	4 Watts (All Lines) Argon	6,100
INNOVA 90-3	3 Watts (All Lines) Argon	6,400
INNOVA 90-4	4 Watts (All Lines) Argon	7,100
INNOVA 90-5	5 Watts (All Lines) Argon	7,500
INNOVA 90-6	6 Watts (All Lines) Argon	7,900
INNOVA 90-K	Krypton Tube	7,900
Retrofit Kit	for INNOVA 90 system with etalon manufactured up to July, 1985	1,000
INNOVA 100-10	10 Watts (All Lines) Argon	11,200
INNOVA 100-12	12 Watts (All Lines) Argon	12,000
INNOVA 100-15	15 Watts (All Lines) Argon	13,200
INNOVA 100-18	18 Watts (All Lines) Argon	14,500
INNOVA 100-20	20 Watts (All Lines) Argon	15,600
INNOVA 100-K2	Krypton Tube	17,200
INNOVA 100-K3	Krypton Tube	18,600

Notes: For optional wavelengths, see table on page 1.
INNOVA 90-6 replacement tube is not retrofittable in INNOVA 90-3, -4, -5 systems.

SUPERGRAPHITE SYSTEM REPLACEMENT TUBES

When ordering an INNOVA replacement tube which is to be installed in place of an existing SuperGraphite tube, a replacement tube retrofit kit must be ordered also. SuperGraphite lasers retrofitted with INNOVA plasma tubes will not have sealed intracavity space. The 20-watt all lines output is only available with the INNOVA 100 argon ion system and cannot be obtained by installing an INNOVA 20 tube in an existing SuperGraphite system. Prices are for tube exchange only. Customers will be invoiced \$1500 for any replaced tube not returned to Coherent. Installation is additional. Please see TERMS AND CONDITIONS section for warranty details.

INNOVA 20 SERIES REPLACEMENT TUBES

An additional retrofit kit is required only for INNOVA 20 systems with etalon. Prices are for tube exchange only. Customers will be invoiced \$1500 for any replaced tube not returned to Coherent. Installation is additional. Please see TERMS AND CONDITIONS section for warranty details.

INNOVA Retrofit Tubes for CR-2, -3, -4, -500K Systems

I-52-2	2 Watts (All Lines) Argon	\$ 7,600
I-52-3	3 Watts (All Lines) Argon	8,500
I-52-4	4 Watts (All Lines) Argon	9,500
I-52-K	Krypton	10,500
Retrofit Kit	for CR-2, -3, -4, -500K Systems	1,000

Note: For optional wavelengths, refer to the INNOVA 90 Series tube options in table on page 1. UV option not available for retrofit tubes.

ION/DYE LASER SYSTEM PACKAGE

INNOVA 70-4 Argon Ion Laser, Model 599-01 Dye Laser and Model 210 Power Meter	
If purchased separately	\$26,000
If purchased together—SPECIAL PACKAGE PRICE	21,900

INNOVA Retrofit Tubes for CR-6 and CR-8 Systems (only for systems without etalon)

I-53-6	6 Watts (All Lines) Argon	\$12,000
I-53-8	8 Watts (All Lines) Argon	13,500
Retrofit Kit	for CR-6, -8 Systems	1,000

Note: For optional wavelengths, refer to the INNOVA 90 Series tube options in table on page 1. UV option not available for retrofit tubes.

INNOVA Retrofit Tubes for CR-10, -12, -15, -18, 2000K, 3000K and INNOVA 10, 12, 15, 18, 20, K2000, K3000

INNOVA 10	10 Watts (All Lines) Argon	\$11,200
INNOVA 12	12 Watts (All Lines) Argon	12,000
INNOVA 15	15 Watts (All Lines) Argon	13,200
INNOVA 18	18 Watts (All Lines) Argon	14,500
INNOVA 20	20 Watts (All Lines) Argon	15,600
INNOVA K2000	Krypton	17,200
INNOVA K3000	Krypton	18,600
Retrofit Kit	for CR-10, -12, -15, -18, 2000K, 3000K Systems	1,000
Retrofit Kit	for INNOVA 20 Series with etalon	2,750

Note: For optional wavelengths, refer to INNOVA 100 Series tube option in table on page 1.

ION LASER OPTICS

Ion laser optics are available to operate at lines between 333.6 nm and 1090 nm. Detailed information on specific optics can be found in the INNOVA Ion Laser Systems brochure under "Ion Laser Optics". Optics should be ordered for a specified wavelength or wavelength range, and the type of ion laser with which the optics are to be used should be indicated. For further information, contact your local representative.

Wavelength Range	Price for Each Mirror (High Reflector or Output Coupler)
333.6 nm - 415.4 nm	\$275
454.5 nm - 1090 nm	175
UV/488 nm (INNOVA 90)	400
Broadband (INNOVA 90-K)	275
High Power Multimode Optics for INNOVA 100 and 90 systems (Argon Blue-Green and Krypton Red)	275
Output Couplers for Mode Locking	
For INNOVA 90 Extended	(Standard Optics) \$175
For INNOVA 100 series	500
Miscellaneous Optics	
Replacement Coated Etalon	(Argon Visible Laser and INNOVA 100-K2/K3 Only) \$500
Replacement Uncoated Etalon	(Argon-UV and IR, and INNOVA 90-K Only) 500
Replacement Prism for Wavelength Selector	200
Light Regulation Beamsplitter	(INNOVA 90 Series) 150
Light Regulation Beamsplitter	(INNOVA 100/20 Series, CR-18 Series) 300

Package includes Model 599-01 Dye Laser with three-plate birefringent filter in one of five following dyes: R110; R6G; DCM; Py2; S9M. Package price does not include installation by a Coherent service engineer. Installations may be purchased separately for \$1500.

216-A	300 MHz Free Spectral Range Spectrum Analyzer 450-550 nm	\$3,695	216M-B	Mirror Set—300 MHz Free Spectral Range @ 550-650 nm	\$1,495
216-B	300 MHz Free Spectral Range Spectrum Analyzer 550-650 nm	3,695	216M-C	Mirror Set—300 MHz Free Spectral Range @ 775-875 nm	1,495
216-C	300 MHz Free Spectral Range Spectrum Analyzer 775-875 nm	3,695	216-D	Photodiode Detector Assembly	195
216M-A	Mirror Set—300 MHz Free Spectral Range @ 450-550 nm	1,495	251	Spectrum Analyzer Controller	1,395

*Model 216 and Model 240 Spectrum Analyzers must be used with Model 251 or equivalent ramp generator. **Model 240-3-A, B, and C must be purchased as a Performance Package.
Special Coatings on Request

HELIUM NEON LASERS

Stabilized Single-Frequency HeNe Laser

Model 200 actively stabilized single-frequency hard seal HeNe Laser. The Model 200 is a complete system with a full one-year warranty.	\$3,795	Output Power (632.8 nm): Spatial Mode Structure: Polarization: Frequency Stability: Amplitude Noise (10 Hz - 10 MHz):	0.7-0.98 mW TEM ₀₀ Fixed Linear Less than or equal to 1 MHz/5 minute interval 0.1%
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MODULATORS

Acousto-optic Modulation Systems, engineered by Coherent's Commercial Products Division, provide the highest efficiency available for modulating laser beams. The Coherent system is complete—no additional optics are needed.

MODULATION SYSTEMS - ACOUSTO-OPTIC

304	A-O System includes head and analog or digital driver (DC to 3.5 MHz) with 40 MHz carrier	\$ 1,590
305	OEM A-O System includes head and analog or digital driver (DC to 3.5 MHz) with 40 MHz carrier	975

MODULATOR HEADS ONLY - ACOUSTO-OPTIC

304	A-O Modulator (DC to 3.5 MHz) with 40 MHz carrier	\$ 595
305	A-O Modulator (DC to 3.5 MHz) with 40 MHz carrier	595
408	A-O Modulator (DC to 10 MHz) with 80 MHz carrier	595

MODULATOR DRIVERS - ACOUSTO-OPTIC

304	Analog or Digital (please specify)	\$ 995
305	Analog or Digital (please specify)	475

TERMS AND CONDITIONS

1. **PRICE INFORMATION.** All prices listed are U.S. dollars, F.O.B. shipping point U.S.A. factory, unless otherwise agreed. Price and product information in this price list was current at the time the price list was approved for printing. In a continuing effort to provide the finest equipment available, Coherent, Inc. reserves the right to change specifications, models or prices without notice and without liability for such changes. Where price changes have occurred, prices prevailing at time of acceptance of your order will apply.
2. **QUOTATIONS (Pro Forma Invoices).** Upon request, your local Coherent representative will provide you with written quotations. Such quotations or Pro Forma Invoices on an F.O.B., F.A.S., C.&F. or C.I.F. basis are available upon request from your local representative or from our main office at 3210 Porter Drive, P.O. Box 10321, Palo Alto, California 94303.
3. **TERMS.** All sales are subject to terms of net thirty (30) days unless other arrangements are made and agreed to prior to shipping of goods.
4. **RETURNS AND CANCELLATIONS.**
- Return of Merchandise.** Discrepancies should be reported within thirty (30) days of receipt of shipment. No returns will be accepted unless a return material authorization has been obtained from our Order Administration Department of the respective division. Please return goods pre-paid.
- Cancellations.** Any order for standard products in this price list accepted by Coherent, Inc. and cancelled by the customer prior to delivery shall be subject to a cancellation charge of fifteen percent (15%) of the order value to cover costs of processing and order handling; cancellation thereof within thirty (30) days after delivery shall be subject to a cancellation and restocking charge of thirty percent (30%) of the order value for products which have not been installed. No other orders may be cancelled except by mutual agreement in writing. No order for non-standard products may be cancelled by a customer except by mutual agreement in writing.
5. **WARRANTY INFORMATION.** Unless otherwise specified, the warranty period as stated will begin upon delivery of the equipment to the F.O.B. point.
- A. INNOVA ion laser systems (excluding systems used in industrial/OEM applications) are warranted for parts and labor for a period of eighteen (18) months from date of shipment at FOB point. Travel expenses beyond one hundred eighty (180) days of shipment are charged at actuals.
- B. INNOVA replacement tubes purchased for fitting into INNOVA systems, included in (A) above, are warranted for parts and labor for a period of eighteen (18) months from date of shipment at FOB point. Travel expenses beyond ninety (90) days of shipment are charged at actuals.
- C. For INNOVA lasers covered by (A) and (B) above, up to

an additional three and one-half (3½) years of extended warranty coverage may be purchased, for a total of five (5) years warranty coverage. This extended warranty covers parts only. The additional charges are labor at standard rates and travel expenses at actual rates.

A warranty extension may be purchased at any time prior to ninety (90) days of the end of an active warranty contract.

Extended warranty rates		
per six (6) months:	SYSTEMS	TUBES
INNOVA 70/90 Series		
Blue to IR option (each)	\$ 550	\$ 500
Violet Option	75	75
UV Option	150	150
Broadband Option (Krypton)	150	150
INNOVA 20/100 Series		
Blue to IR option (each)	\$1,900	\$1,750
Violet Option	200	200
UV Option	400	400

- D. For INNOVA lasers used in Industrial/OEM applications, contact Coherent Marketing for special warranty policies.
- E. INNOVA tubes retrofitted into SuperGraphite ion laser systems (CR-2, -3, -4, 500K, -6, -8, -10, -12, -15, -18, 2000K and 3000K) are warranted for a period of twelve (12) months. No extension is available for these systems.
- F. Coherent does not warrant any of its water-cooled products against contingent or subsequent damage resulting from negligence in providing the required water-cooling or from unexpected events which cause the required water-cooling to be interrupted during operation of the equipment. Many Coherent water-cooled products include protective devices designed to deactivate the product in the event that water service has not been provided or that water service has been interrupted. However, Coherent's liability in the event of a protective device failure is limited to repair or replacement of the protective device and does not extend to subsequent damages to the rest of the Coherent product.
- G. All dye laser systems are warranted for a period of twelve (12) months.
- H. Coherent optical products are unconditionally warranted to be free of defects in materials and workmanship. Discrepancies must be reported to Coherent within thirty (30) days of receipt, and returned to Coherent within ninety (90) days. Adjustment is limited to replacement, refund, or repair at our option. Coherent assumes no liability for customer supplied material. This warranty supersedes all other warranties, expressed, or implied, and does not cover incidental or consequential losses.
- I. All warranty part shipments will be freight collect to customer.

LASER PRODUCTS DIVISION

ION LASERS

INNOVA® 70 SERIES — The INNOVA 70 Series standard systems include a laser head with extended gas supply, a SCR power supply with linear passbank, light and current control, and a Model 634 temperature-compensated wavelength selector. INNOVA 70 systems can be installed by customer, hence installation is not included in base price. All INNOVA systems come with a full **18-MONTH WARRANTY, EXTENDABLE TO 5 YEARS.** Please see TERMS AND CONDITIONS section for warranty details.

INNOVA 70-2	2 Watts (All Lines) Argon Ion Laser	\$13,200
INNOVA 70-3	3 Watts (All Lines) Argon Ion Laser	14,200
INNOVA 70-4	4 Watts (All Lines) Argon Ion Laser	15,900

INNOVA 70 SERIES OPTIONS:

Optional Wavelength Guarantee, per line	\$400
Light Show (multimode) option	100
Installation	1200
OEM Rackmounted version	less 250

INNOVA 90 SERIES — The INNOVA 90 ion laser systems consist of a laser head with Super-Invar™ resonator, a series regulated power supply, Model 934 temperature compensated wavelength selector, all lines mirror mount and integral controls. The integral controls feature a built-in power meter, diagnostic display, and complete laser control functions. An optional remote control module incorporates full system controls and can be used within a 10-foot radius of the power supply. All INNOVA systems come with a full **18-MONTH WARRANTY, EXTENDABLE TO 5 YEARS. Price includes installation.** Please see TERMS AND CONDITIONS section for warranty details.

INNOVA 90-3	3 Watts (All Lines) Argon Ion Laser	\$20,000
INNOVA 90-4	4 Watts (All Lines) Argon Ion Laser	22,000
INNOVA 90-5	5 Watts (All Lines) Argon Ion Laser	24,000
INNOVA 90-6	6 Watts (All Lines) Argon Ion Laser	26,500
INNOVA 90-K	Krypton Ion Laser	25,250
INNOVA 90-Extended	INNOVA 90 tube in a large frame resonator for picosecond/intracavity experiments.	27,000

INNOVA 90 Series laser without 934 Wavelength Selector less \$500

Note: For optional wavelengths see table.

INNOVA 90 SERIES ACCESSORIES

Remote Module	\$ 750
RS-232C Interface	750
IEEE 488 Interface (requires RS-232C)	1,500
External Light/Current Control	475
OEM Digital Interface Control	500
Rack Mounting of Power Supply	450
Model 934 Wavelength Selector	500
Model 934 UV Wavelength Selector	750
Model 923 Etalon Assembly	1,500
Remote Module Extender Cable - 10'	200
20'	250
30'	300

INNOVA 100 SERIES — The new INNOVA 100 ion laser systems consist of a laser head with Super-Invar™ resonator, a series regulated microprocessor controlled power supply, with RS-232C interface, digital remote control module, Model 434 temperature compensated wavelength selector, and all lines mirror mount. All INNOVA systems come with a full **18-MONTH WARRANTY, EXTENDABLE TO 5 YEARS. Price includes**

installation. Please see TERMS AND CONDITIONS section for warranty details.

INNOVA 100-10	10 Watts (All Lines) Argon Ion Laser	\$39,000
INNOVA 100-12	12 Watts (All Lines) Argon Ion Laser	41,500
INNOVA 100-15	15 Watts (All Lines) Argon Ion Laser	44,500
INNOVA 100-18	18 Watts (All Lines) Argon Ion Laser	47,500
INNOVA 100-20	20 Watts (All Lines) Argon Ion Laser	49,500
INNOVA 100-K2	Krypton Ion Laser	44,500
INNOVA 100-K3	Krypton Ion Laser	51,500

INNOVA 100 Series laser without 434 Wavelength Selector less \$ 500

Note: For optional wavelengths, see table.

INNOVA 100 SERIES ACCESSORIES

Model 434 Wavelength Selector	\$ 500
Model 434 UV Wavelength Selector	750
Model 924 Etalon Assembly	1,500
Remote Module Extended Cable—15'	300
IEEE 488 Interface	1,500

INNOVA OPTIONAL WAVELENGTHS TABLE

WAVELENGTHS¹	INNOVA 90 SERIES		INNOVA 100 SERIES	
Argon:	System²	Tube³	System²	Tube³
IR (1090 nm) option	\$ 500	\$ 500	\$ —	\$ —
Green				
(528.7 nm) option	500	500	650	650
Blue-Green				
(465.8-501.7 nm) option⁴	500	500	650	650
Blue				
(457.9 nm) option	500	500	650	650
Blue				
(454.5 nm) option	500	500	650	650
UV Multiline				
(351.1-363.8 nm) option⁵	2,000	1,500	—	—
UV Multiline				
(333.6-363.8 nm) option⁵	—	—	2,500	2,000
Krypton:				
IR (752.5-799.3 nm) option⁴	\$ 500	\$ 500	\$ 650	\$ 650
Yellow (568.2 nm) option	500	500	—	—
Green-Yellow				
(520.8-568.2 nm) option⁴	—	—	650	650
Blue-Green				
(476.2-530.9 nm) option⁴	500	500	—	—
Blue				
(468.0-482.5 nm) option⁴	—	—	650	650
Violet				
(406.7-415.4 nm) option⁶	750	750	2,500	2,000
UV Multiline				
(350.7-356.4 nm) option⁵	2,000	1,500	—	—
UV Multiline				
(337.5-356.5 nm) option⁵	—	—	2,500	2,000
Broadband (476.2-647.1)				
white light option	750	750	—	—

¹Standard system includes performance guarantee at 514.5 nm and 488.0 nm on all argon lasers and at 676.4 nm and 647.1 nm on all krypton lasers. Other options are available if an output is specified on the specification sheet and include optics, testing and guarantee.

²If ordered with system purchase.

³If ordered with tube purchase.

⁴Option guarantees all single-lines in wavelength range. **For Krypton systems, multiline output guarantee is \$500 additional.**

⁵Available only for INNOVA 90-4, -5, -6, -K and all INNOVA 100 Series.

⁶Option guarantees multiline output power on INNOVA 100 Series, each single-line guarantee in wavelength range is \$500 additional. For INNOVA 90-K, only multiline output power is guaranteed.

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ORDERING INFORMATION

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Prices listed are valid in the United States only, do not apply to OEM contracts and are subject to change without notice.

Each of Coherent's Divisions is responsible for its specific products. Quickest, most efficient attention to your order is given

at the appropriate location listed below. Should there be need to consolidate product groups on one order, please direct the order to the location most representative of your requirements.

1. WHERE TO PLACE ORDER

Orders for **Laser Products Division** products should be forwarded to your local representative or to:

Coherent, Inc.
Laser Products Division
3210 Porter Drive
P.O. Box 10321
Palo Alto, California 94303
Phone: (415) 493-2111
Telex: 34-8304

Orders for **Commercial Products Division** products should be forwarded to your local representative or to:

Coherent, Inc.
Commercial Products Division
2301 Lindbergh Street
Auburn, California 95603
Phone: (916) 823-9550
Telex: 37-7394

Orders for **Lambda Physik** dyes should be forwarded to:

Lambda Physik
289 Great Road
Acton, Massachusetts 01720
Phone: (617) 263-1100
Fax: 617-263-4296

2. HOW TO ORDER

1. Use catalog order numbers and descriptions.
2. Specify required voltage, frequency, and wavelength range when applicable.
3. Specify required delivery date and mode of shipment.
4. Specify required packing, markings, and insurance.

Coherent Around The World

Coherent is the leading manufacturer of ion, dye, excimer and carbon dioxide lasers for medical, scientific and industrial uses. These products are designed for the highest performance and reliability and reflect Coherent's continuing dedication to excellence in engineering. Coherent's subsidiaries and agents throughout the world provide comprehensive technical support and service for all Coherent products.

Coherent, Inc. Offices

Corporate Headquarters

Main Office
3210 Porter Drive
Palo Alto, CA 94304
P.O. Box 10321
Palo Alto, CA 94303
Phone Sales (800) LASER 86
Phone Service (800) 367-7890
Telex 34-8304

Commercial Products Division

2301 Lindbergh Street
Auburn, CA 95603
Phone (916) 823-9550
Telex 37-7394

Eastern United States

1000 West Ninth Ave., Ste. A
King of Prussia, PA 19406
Phone Sales (800) LASER86
Phone Service (800) 367-7890
Telex 84-6179

Canada

Allan Crawford Associates, Ltd.
5835 Coopers Avenue
Mississauga, Ontario O4Z 1Y2
Phone (416) 890-2010
Telex 06-968769

West Germany - Eastern Europe

Coherent GmbH
Senefelder StraBe. 10
6074 Rodermark
Ober-Roden
Phone 06074/914-0
Telex 841-4197785

France

Coherent Scientifique S.A.
52, Avenue de l'Europe
78160 Marly Le Roi
Phone (3)9162660
Telex 842-698000

Benelux

Koning en Hartman
Elektrotechniek B.V.
Energieweg 1
2627 AP Delft
Netherlands
Phone 015-609906
Telex 844-38250

Sweden

Saven AB
Box 49
S-185 00 Vaxholm
Phone 0764-31580
Telex 854-12986

Norway

Saven AS
Box 111
Bryn
N-0611 Oslo 6
Phone 02/64 83 30
Telex 856-71840

Switzerland

GMP S.A.
Case Postale 277
CH-1010 Lausanne 10
Phone 021-333328
Telex 845-24423

Italy

Laser-Optronic S.R.L.
Via Teocrito, 50
20128 Milano
Phone (02) 2550501
Telex 843-335516

Australia

OPSM Meditronics
66-72 Reservoir Street
Surry Hills
New South Wales 2010
Phone Sydney 217 1841
Telex 790-AA75997

Japan

Rikei Corporation
Shinjuku-Nomura Building
1-26-2 Nishi Shinjuku
Shinjuku-ku, Tokyo 160
Phone (03)345-1411
Telex 781-J24208

Taiwan, Republic of China

Superbin Company, Ltd.
6/F, 230-3, Sec 4, Jan Ai Road
Taipei
Phone (02)-705-4205
Telex 785-21206

Singapore

Laser Electronics S.E.A. Pte. Ltd.
19 Stevens Road
Singapore 1025
Phone 2355465
Telex 786-RS 35672

People's Republic of China

Global Technology Inc.
901 W. Victoria St., Unit F
Compton, CA 90220 U.S.A.
Phone (213) 635-7106
TWX (910) 346-6347

South Korea

Wooyang Trading Company
Chunwoo Yackpum Building
12-12, Bongik-Dong, Chongro-Ku
Seoul
Phone 742-4645, 46
Telex 787-K23309

South America

Tecno Laser
Sistemas e Equipamentos Ltda.
Rua Frederico Chopin, 226
01454 Sao Paulo - SP
Brazil
Phone 210-9117
Telex 391-1123600

India

Scientific Instruments
Marketing Co.
208, First Floor
Ajmeri Gate
Delhi 110006
Phone 264583, 279606
Telex 953-0315509

Spain

Fotonica, S.A.
c/. Arroyo, 12
28029 Madrid
Phone 2315507
Telex 831-27448

Israel

Landseas (Israel) Ltd.
Box 23011
Tel-Aviv 61 230
Phone (03) 299091-2, 3, 4
Telex 922-342216

Kuwait

Zaid Al-Kazemi Sons Trading Co.
Box 30
Safat
Phone 2410742 or 2437200
Telex 959-22339 or 23548

United Kingdom

Coherent (U.K.) Ltd.
Cambridge Science Park
Milton Road
Cambridge CB4 4BH, England
Phone (0223)68501
Telex 851-817466

Greece

Neotech O.E.
Esperou 19
Palaion Faliron, Athens
Telex 863-218472



DOMESTIC PRICE LIST

LASER PRODUCTS & ACCESSORIES
EFFECTIVE NOVEMBER 1, 1985

COHERENT.

Philip J. Trotter, Ph.D.
Scientific Sales Specialist
Laser Products Division

3210 Porter Drive
P.O. Box 10321
Palo Alto, CA 94303
(415) 858-7412

 **COHERENT.**
Laser Products Division
3210 Porter Drive
P.O. Box 10321
Palo Alto, CA 94303
(415) 493-2111

Coherent scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health (CDRH), on all systems ordered for shipment after August 2, 1976.

May 2, 1986

Arata Equipment Co.
100 California Drive
Burlingame, CA 94010

Dear Sir:

On April 29, 1986, the Sacramento City Council accepted your bid in the amount of \$12,925.00 for Bid No. 944 - Various quantities and types of Sewer Maintenance Tools, Items 6 through 9, 11 through 22, and 24 (P065132).

The City Support Services Administrator will contact you concerning the necessary contract.

Sincerely,


Lorraine Magana
City Clerk

LM/lw/6A

cc: Support Services Division

May 2, 1986

Flexible Systems
3221 Carter Avenue
Maria Del Rey, CA 90292

Dear Sir:

On April 29, 1986, the Sacramento City Council accepted your bid in the amount of \$3,291.89 for Bid No. 944 - Various quantities and types of Sewer Maintenance Tools, Items 1 through 5, 10, and 23 (P065133).

The City Support Services Administrator will contact you concerning the necessary contract.

Sincerely,


Lorraine Magana
City Clerk

LM/lw/6B

cc: Support Services Division

May 2, 1986

Cooper Lasersonics, Inc.
5674 Sonoma Drive
Pleasanton, CA 94566

Dear Sir:

On April 29, 1986, the Sacramento City Council accepted your bid in the amount of \$24,486.00 for Bid No. 946 - Laser Detection System (P065134).

The City Support Services Administrator will contact you concerning the necessary contract.

Sincerely,



Lorraine Magana
City Clerk

LM/lw/6C

cc: Support Services Division

May 1, 1986

Spectra-Physics, Inc.
1250 West Middlefield Rd.
P.O. Box 7013
Mountain View CA 94039-7013

Gentlemen:

This is to inform you that you were not the successful bidder for Bid No. 946 - Laser Detection System. The said bid having been awarded by the City Council at the regular meeting of April 29, 1986 to Cooper Lasersonics Inc., in the amount of \$24,486.00.

No bid security was required on the above bid.

Sincerely,

LORRAINE MAGANA, CITY CLERK

Deputy City Clerk

LM/mls/6C

May 1, 1986

Industrial Laser Service & Supply
1620 Zanker Rd.
San Jose CA 95112-1113

Gentlemen:

This is to inform you that you were not the successful bidder for Bid No. 946 - Laser Detection System. The said bid having been awarded by the City Council at the regular meeting of April 29, 1986 to Cooper Lasersonics Inc., in the amount of \$24,486.00.

No bid security was required on the above bid.

Sincerely,

LORRAINE MAGANA, CITY CLERK

Deputy City Clerk

LM/mls/6C

May 1, 1986

Royal D. Peterson
Continential Laser Corporation
805 E. Middlefield Rd.
Mountain View CA 94043

Gentlemen:

This is to inform you that you were not the successful bidder for Bid No. 946 - Laser Detection System. The said bid having been awarded by the City Council at the regular meeting of April 29, 1986 to Cooper Lasersonics Inc., in the amount of \$24,486.00.

No bid security was required on the above bid.

Sincerely,

LORRAINE MAGANA, CITY CLERK

Deputy City Clerk

LM/mls/6C