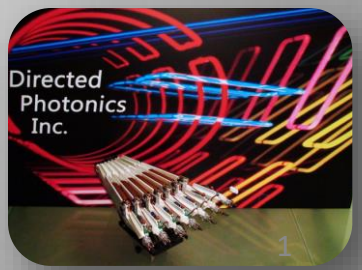
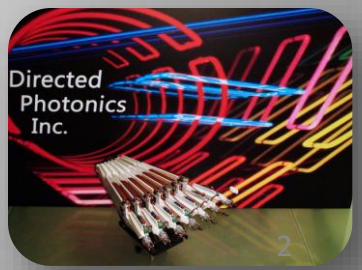
Directed Photonics, Inc.



DPI Company Overview



The Boys are Back in Town

DPI Principles

Robert Marusa

Chairman, CEO, Secretary and Treasurer

Dr. Lee Sutter

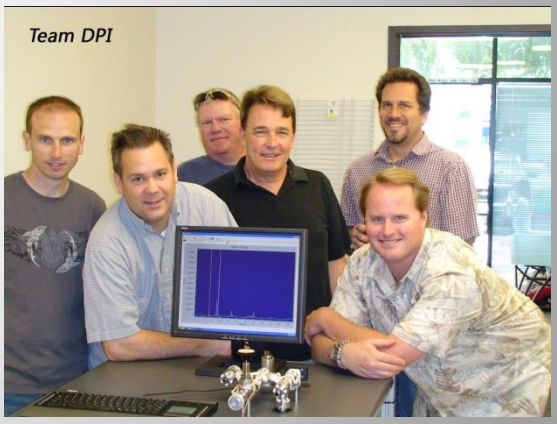
President, Director R&D

Dale Weber

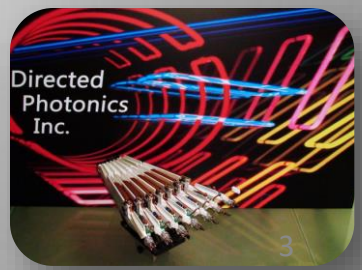
V.P. Operations and Engineering

March 4th 2010 Founders Day

Jason, Daryl, Drew & Ben who left and is replaced with Dominick Bradford (not yet pictured)

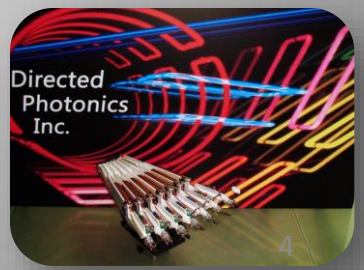


May 2013 DPI Crew



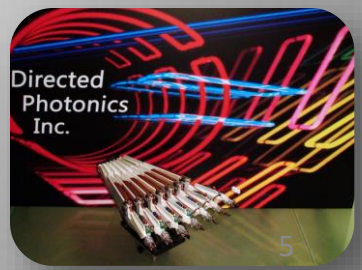
Where Did DPI Come From?

- 1982 Dr. Lee Sutter formed Directed Energy, Inc.
  - Invented the CO2 laser tube used in the DigiMark marking system now used in the DDC3 and “S” series systems evolved into the DPI line of Upgraded Replacement Laser Tubes for Domino Legacy Products, the DPI line of O.E.M. Laser Tubes and next the DPI LDR – Laser Digital Raster Marking Unit
- Lee Sold Directed Energy, Inc. to Domino August 1994 forming Domino Lasers, Inc. Rob brought on board as the Commercial Director.
- The DigiMark evolved into the DDC1 and was launched by DLI in 1994 at Pack Expo, the DDC2 in 1996 and the DDC3 in 1998
- Now DPI introduces the LDR in 2014



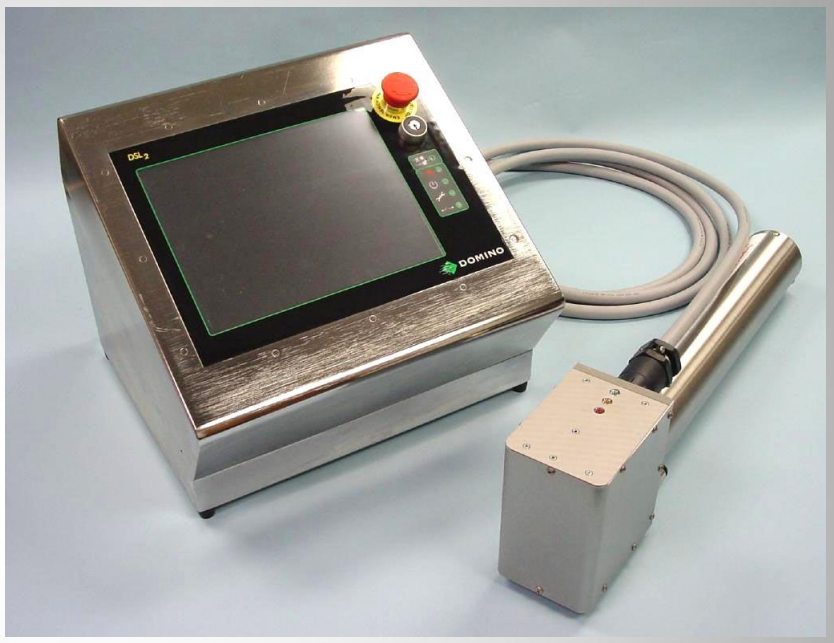
Worlds First Digital Marking System

Stone, Sutter & DigiMark circa 1984

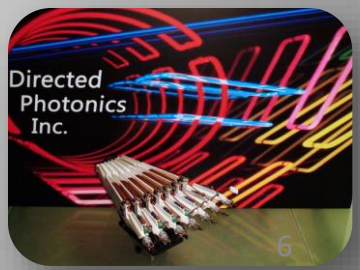


DLI Marking Systems Evolve From the DigiMark

DDC3 Production Unit #1, August 1999

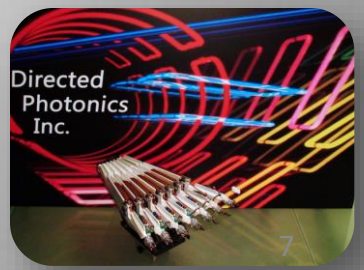


S-200 Laser System, April 2002

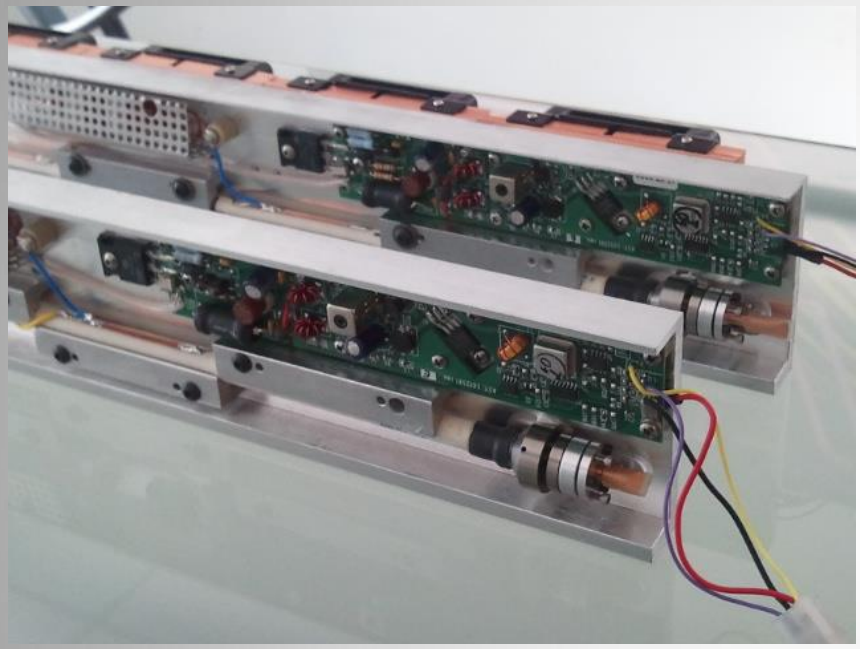


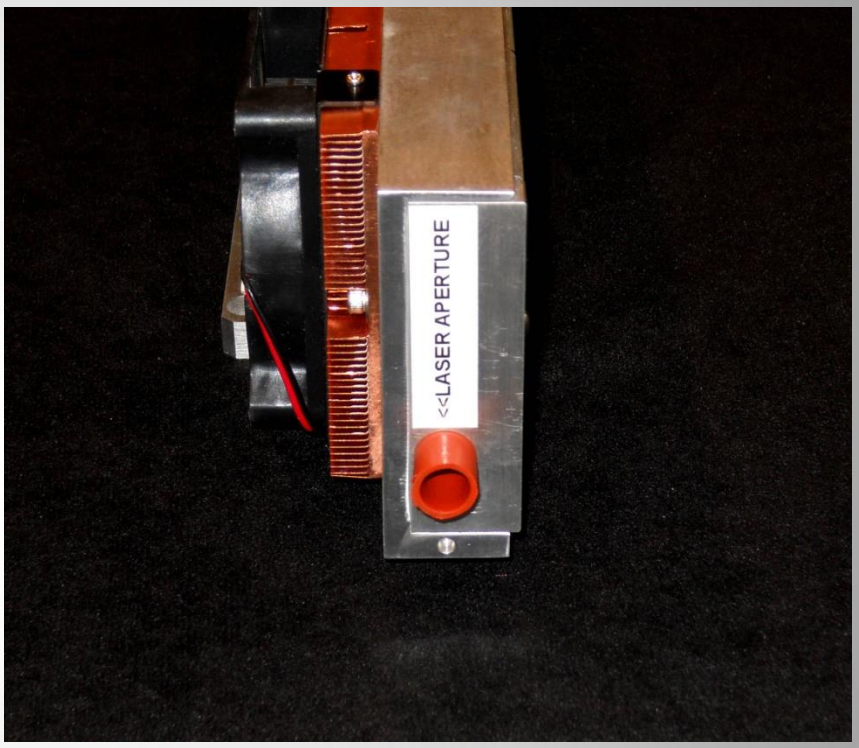
DPI Next Generation of DEI

- DPI formed in March 2010
- Refined basic laser tube technology
- Refined “S” series laser head with improved cooling
- Launched O.E.M. products S2, S4, Blade B2K and Micro Blade
- Evolved into Laser Equipment Service Center
  - Tube Reprocessing
  - Laser System Repair Center
  - Laser Tube Reprocessing Center for all Brands

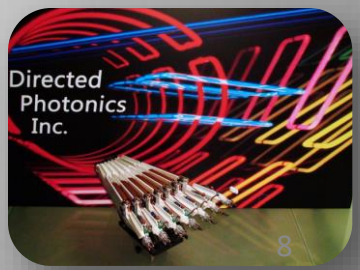


DPI O.E.M. Laser Tube Products





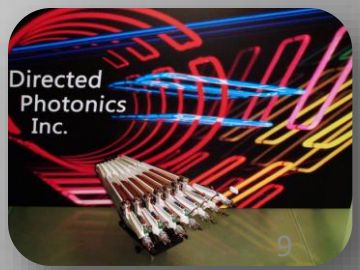
"DPI Blade B2K



DPI O.E.M. Laser Tube Products

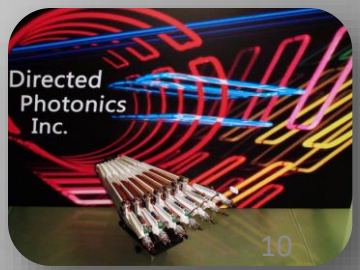
"DPI MicroBlade

"Titan-S_2"™ Gold Series



DPI Customer Sampling

- Anheuser Busch
- Access Laser Inc.
- Al Ni Lasers Inc.
- Alere Pharmaceuticals, Inc.
- Amcor Rigid Plastics
- Boumatic Equipment, Inc.
- Carestream Health
- Celebrity Laser Spa
- CG Roxanne
- Church & Dwight
- CMC Converting
- Coca Cola Enterprises
- Inopak
- Plastipack Packaging
- Cott Beverage
- CW Post
- Epilog Laser, Inc.
- General Mills, Inc.
- Illumatech
- Markem/Imaje
- McIlhenny Co.
- Nestle Inc.
- Nestles Waters, Inc.
- Nishikawa Standard
- Parker Group
- Penta Water

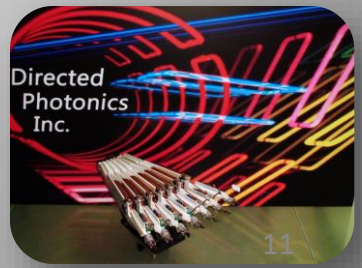


DPI Customers and Distribution Partners

- Perfetti VanMell
- Plasti Pack Packaging, Inc.
- R.C. Bigelow Tea
- Anheuser-Busch
- General Mills
- Vistakon
- US Plastics, Inc.
- Laser Integrations, Inc.
- Tropicana Inc.
- Epilog Laser
- Trotec Laser

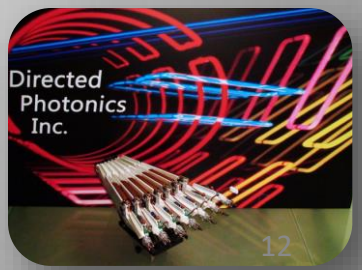
Distribution Partners:

- Mac Papers (Ales)
- Ante Laser
- Fumex
- Inopack
- REA-Jet
- Radian Laser, Inc.
- Sintec Optronics, Pte. Ltd.
- Sunny Technologies, Pte. Ltd.
- Domino Amjet
- World Laser, In



DPI Products

- Titan S_2 or S_4 Gold Series “Rocket”
  Upgraded Drop-In Replacement Laser Assembly for the S200 or S300 Laser Heads
- Complete S series Control Cabinet Repair, Reconditioning and Upgrade to IP65 with DPI Control Cabinet Cooler
- Accessories
  - Water Connection Kit
  - Water Flow Sensor
  - Solid State Hard Drives for S300
  - RF Power Modules and Board Repair



DPI S300 Upgrades

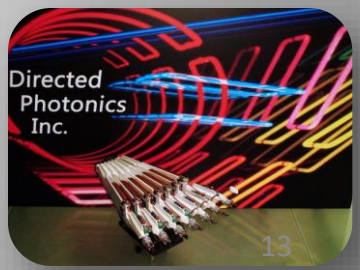
DPI S_4 Replacement Laser Assembly

S series Cabinet Dust and Heat Control Unit

Patent Pending Water Cooled Assembly

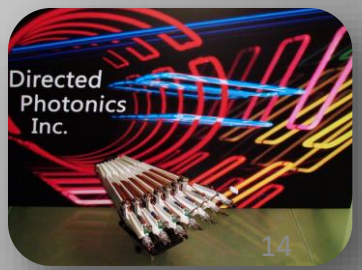
DPI Titan ABS_4 Pictured

Designed as a drop in fit for any currently Integrated S200 or S300



S series Laser Head Upgrade

FEATURES	**BENEFITS**
• DPI Upgraded Laser Tubes Installed	➢ 20%+ Increase in Laser Power ABS_4 is True 40 watts
• DPI Patent Pending Water Cooled Laser Assembly	➢ Eliminates Compressed Air Cooling Cost and Hazards to Laser from Compressed Air contaminates
• Upgrades Entire Laser Head to IP65	➢ The Way It Should Have Been Made Originally



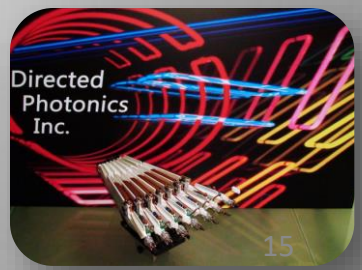
S series Laser Head Upgrade

FEATURES

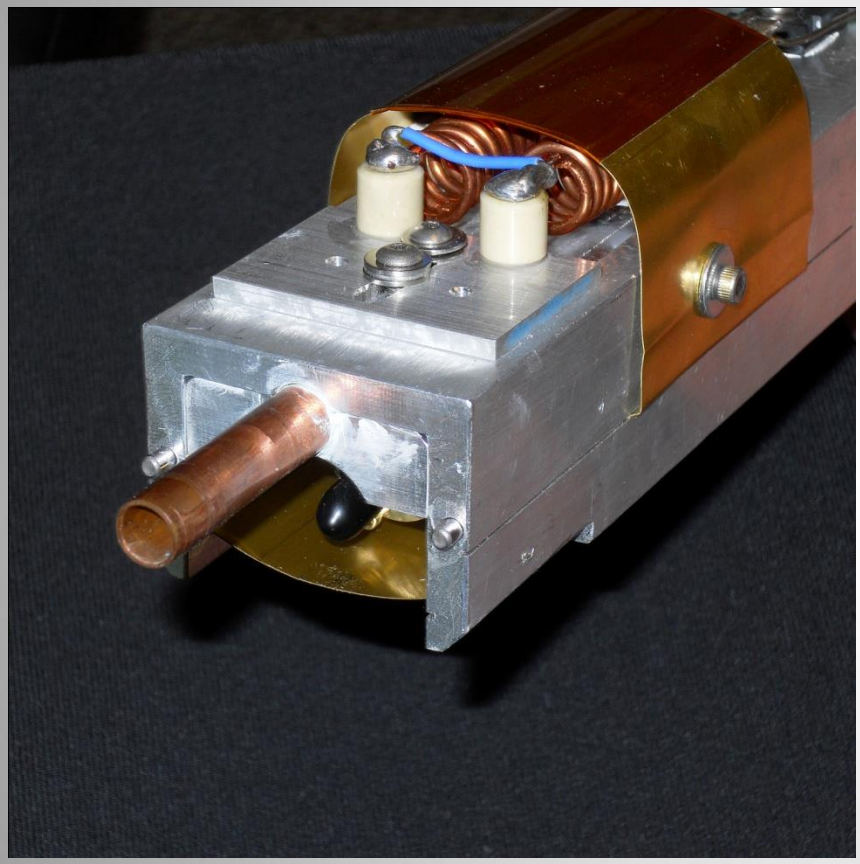
- DPI S_2 or S_4 Laser Assembly
- DPI S_2 or S_4 Laser Tubes

BENEFITS

- Easy/Affordable Laser Tube Reprocessing/Replacement for inexpensive future laser tube maintenance if needed
- Latest Tube Design eliminates mode drift and laser gas leakage

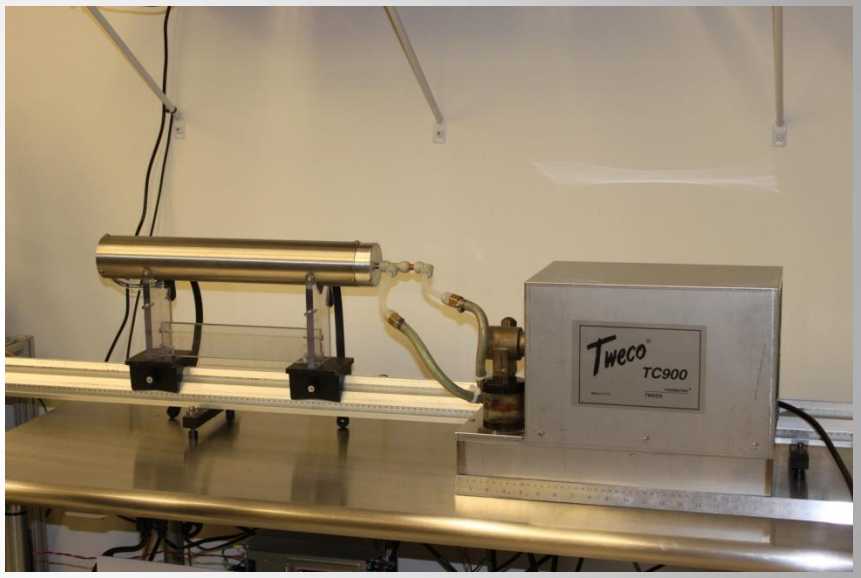


Titan Gold Series Laser Assembly

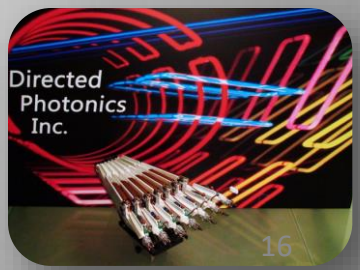


DPI Titan S_2 Laser Assembly Pictured

Patent Pending Water Cooled Assembly



DPI Titan S_2 Pictured connected to closed loop water cooler



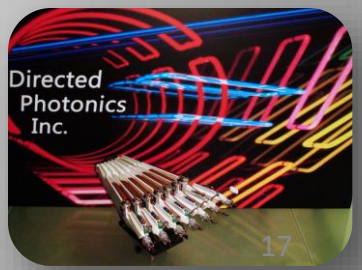
S series Laser Repair/Upgrade

- DPI Laser Assembly is Designed for Easy Repair With Quick Replace Components

DPI Titan S_2 Pictured

DPI Titan S_2 Pictured

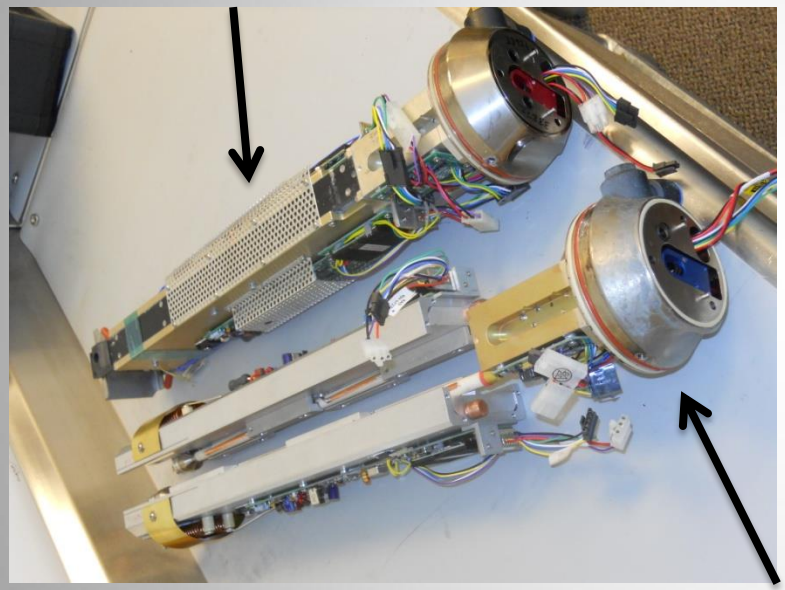
DPI upgraded S series units are reprocessed not replaced. As are all DPI produced laser tubes.

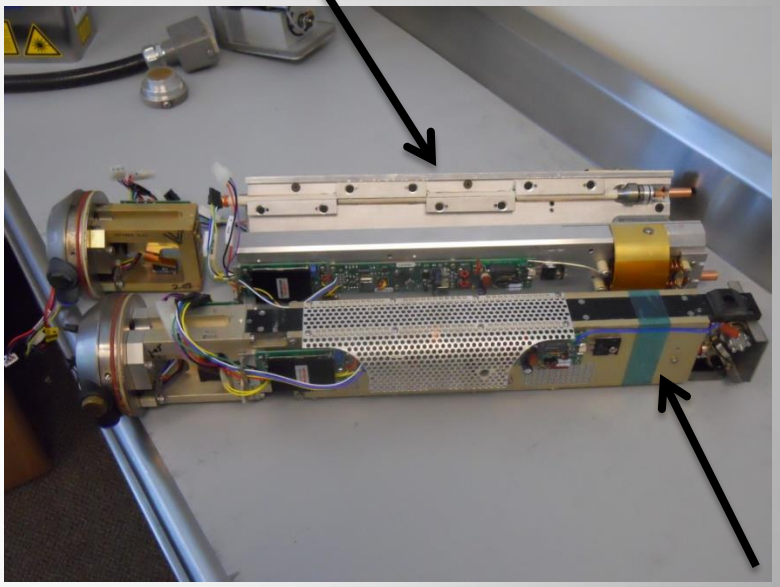


DPI ABS_4 Comparison

New DPI S_4 Laser Assembly (top)

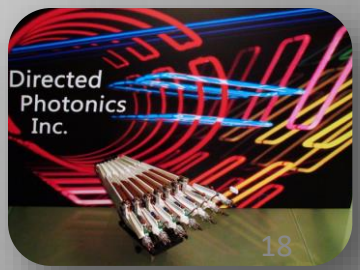
Old Domino Laser Assembly (top)





Old Domino Laser Assembly (bottom)

New DPI S_4 Laser Assembly (bottom)



S series Laser Control Cabinet Cooler

- Creates IP65 Control Cabinet
- Uses cooling water in series with ABS_4 laser assembly saving cooling costs
- Eliminates dust and heat damage to electronics

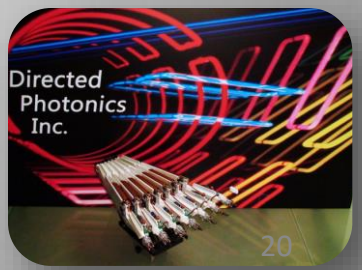
DPI Control Cabinet Upgrade

FEATURES

- IP65 Control Cabinet
- Water Cooled Cabinet
- Solid State Hard Drive

BENEFITS

- ➢ No infiltration of Dust or Water
- ➢ Eliminates heat damage to electronics and heat related shut downs
- ➢ Eliminates slow system response and slow response or data corruption shut downs



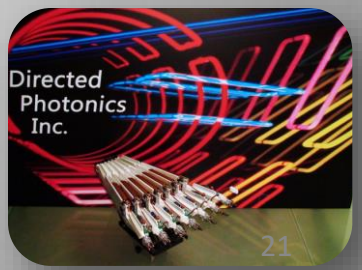
DPI Control Cabinet Upgrade

FEATURES

- All new cooling fans
- All components tested for reliable operation

BENEFITS

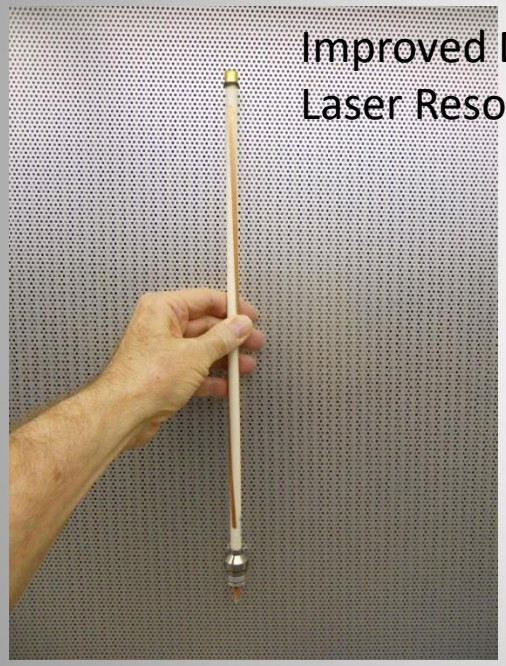
- ➢ Greatest cause of cabinet failures is heat related to ambient air contamination and fan failure
- ➢ Potential reliability issues identified and repaired at time of upgrade



DPI DDC3 Products

- Titan D_3 Gold Series Laser Tubes

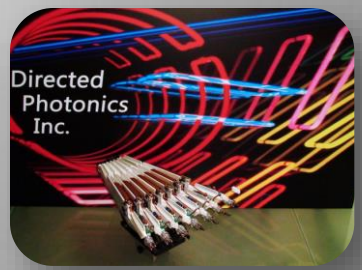
  Upgraded Drop-In Replacement Laser Tubes for the DDC2 and DDC3 Laser



Improved DPI Ceramic
Laser Resonator

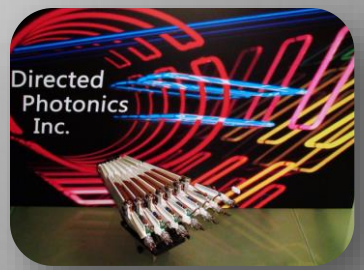
DPI Titan D3 Laser Tube

Available in 10.6 micron (BLACK), 10.3 micron RED and 9.3 micron (BLUE)
All Laser Tubes Perform at LEEP Tube Standards



DPI DDC3 Laser Tube Improvements

- Titanium Body
- Stable Mode with improved alignment structure
- Improved gas seal process and mounting of optics
- Improved laser optical resonator system
- Improved cooling fin on Titan D3-DDC3 Design
- Improved grounding
- Enhanced RF power coupling for more laser power
- Upgraded RF power supply design and components for long life
- DC decoupling of RF electrodes for safety and elimination of DC arcing

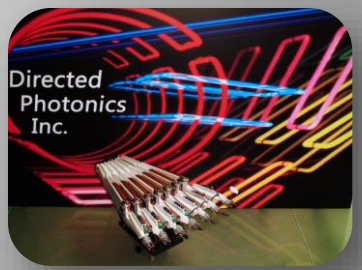


DPI Laser Tube Improvements Continued

- Single 360 degree rotation of RF “hot” electrode configuration
- “Die-Hard” RF power transistor with integrated electronic protection
- Corrosion Resistant Brass RF Cover With Kapton Sealing Creates “Gold Series”
- “Drop-Safe” shipping container
- patent pending “Never Leak” Front Optic Attachment
- Upgraded Heat Resistant Capacitors for Longest Laser Tube Life

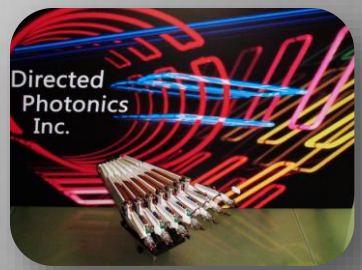
50K Hours of Operation

24 Month Warranty



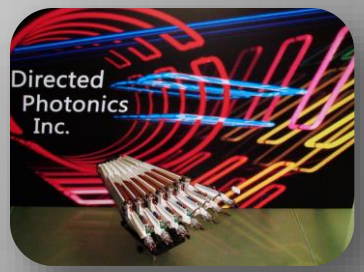
DPI Titan D_3 Gold Series Replacement Set

Complete Set of 7
DPI Gold Series Laser Tubes
For DDC3 Single or Dual Head



DPI Laser Tube Reprocessing

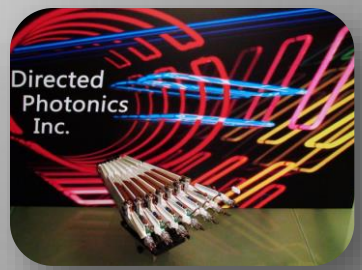
- Customer Sends Their Tube to DPI and Receives Their Tube in Return
- DPI Issues Analysis Report
- Customer chooses to reprocess or replace tube with Reconditioned tube or New DPI Titan D_3 Gold Series
- DPI Returns Tube to Customer Within 7 Days
- $885 per tube



DPI DDC3 Tube Reprocessing

Laser Tube Reprocessing Procedures

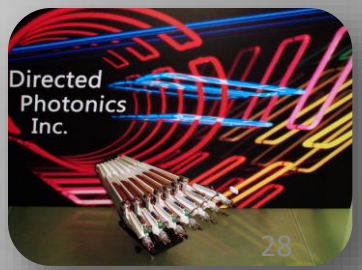
- **No Charge Evaluation**
- Check laser power @10% pulse mode
- Check laser power @ high duty cycle
- Check OPD (measure of laser decay)
- Check mode alignment
- Grade mode
- Inspect output coupler
- Inspect rear reflector
- Provide parts cost estimate
- Physical clean up
- Front optic clean & inspect
- Align ground structure
- Correct front fork size
- Install new fill tube
- Install new rear retainer assembly
- Vacuum process laser tube
- Check for leaks with mass spectrometer
- Seal vacuum leaks if necessary
- Replace ceramic resonator if leaks persist
- Refill tube with required gas mix/pressure
- Final optical alignment and RF tune
- Re-test laser power & OPD
- Overnight burn-in
- Re-test laser performance
- Complete detailed test report
- Mount laser to shipping rail in sealed bag
- Custom pack & ship to customer



Introducing the DPI Laser Marking Unit

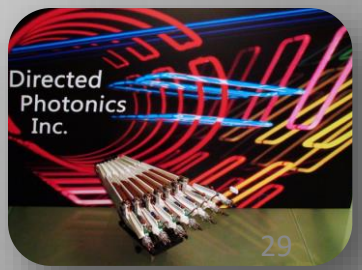
LDR Series

Totally Digital Laser Marking



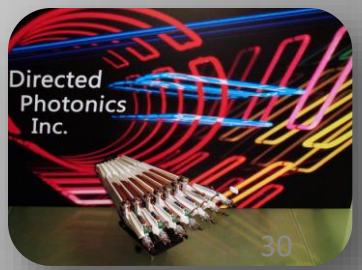
The LDR Name

- Laser Digital Resolution marking system
- Lee Dale Rob laser marking system
- LDR. Leader laser marking system
- The point is this is a simple laser marking unit that will lead the laser marking market to digital simplicity, marking speeds, quality and reliability



The LDR Concept

- NO moving parts (galvanometers, fans, motors)
- NLQ (near letter quality) now LDR (laser digital resolution)
- Highest possible line speed with multiple wavelengths for best material interaction
- Easy to Maintain, Long Life, Low Cost, Renewable
- IP 65, with Multiple Cooling Options
- Flexible easy installation by user, point and shoot installation and operation

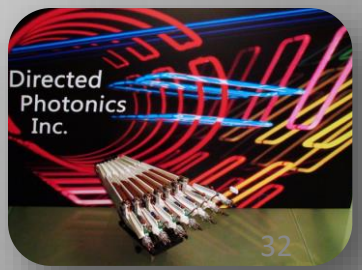


LDR Size

- Goal to be the same size and shape as the average scribing laser head
- Control cabinet: None required
- Power Supply and Control Electronics on a Cord like your laptop

LDR Marking Speed

- Always material dependent of course
- Keeping up with evolving technologies in blow molding, labeling and cartoning
- Three laser wavelengths offered but most applications will fit into BLACK 10.6µ, or BLUE 9.3µ with RED 10.3µ available.
- There can be No faster character generation from a laser marking unit than our digital design



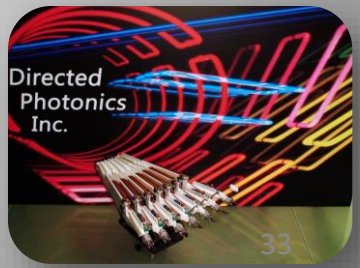
LDR Laser Tube the BLADE

- Newly designed laser assembly is built for simple user replacement.
- The laser assembly is a complete laser tube and power supply package. The ceramic based laser resonator with newly designed power supply board is a complete laser module.
- Lose a dot, snap out

laser module,

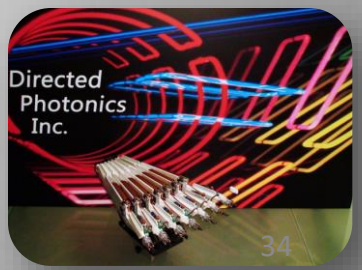
snap in a new

laser module.



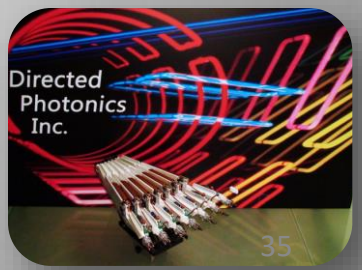
LDR Any Cooling

- Heat and dust are the killers of laser marking units. IP65 units are the most reliable
- Cooling is any way you want it or need it.
- Closed loop cooling with water is highly efficient, cheap and allows for IP65 Design.
- Use the same connections as closed loop water for compressed air.
- Low duty cycles can use ambient air fan cooling but sacrifices IP65 cabinet.



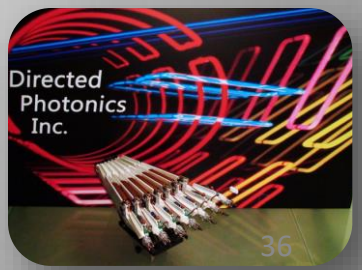
LDR Programming

- How do you control a unit with no controller?
- Computers, PLC, Mainframe no problem
- Stand alone units, we have an app for Android or Microsoft, tablet or smart phone.
- All electronics and control software developed by the noted micro-control developer Michael J. Karas of Carousel Design Solutions in Beaverton, Oregon.



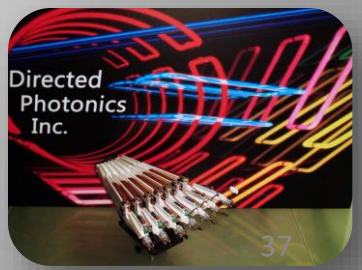
LDR Laser Tube

- All of the improvements designed into the DPI CO_2 laser tubes for Domino System Upgrades and the DPI line of O.E.M. laser tubes are packed into the BLADE or LDR Laser Assembly.



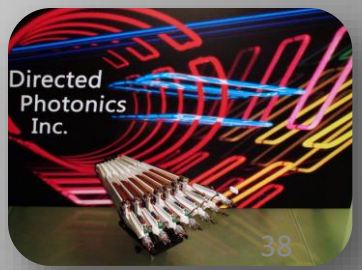
LDR Marking Configurations

- From the basic 5 dot unit one line of print, air cooled unit, to the 9 dot two lines of print, water cooled unit, the same laser tubes are arranged, fitting in the same footprint.



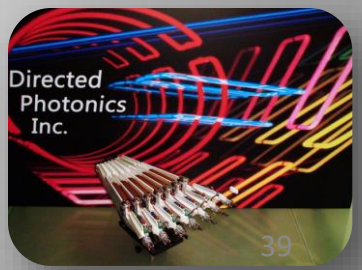
LDR Marking Configurations

- LDR-5,7,9 X X X (5,7 or 9)laser tubes
- LDR-X 1,2 X X (1 or 2 lines of print)
- LDR-X X 1,2,3 X (ambient air, compressed air or closed loop water cooling)
- LDR-X X X 1,2,3 (BLACK, RED or BLUE tubes)
- LDR-5111 = 5 laser tubes, one line of print, ambient air cooling, BLACK laser tubes.
- LDR-9233 = 9 laser tubes, two lines of print, water cooling, BLUE laser tubes

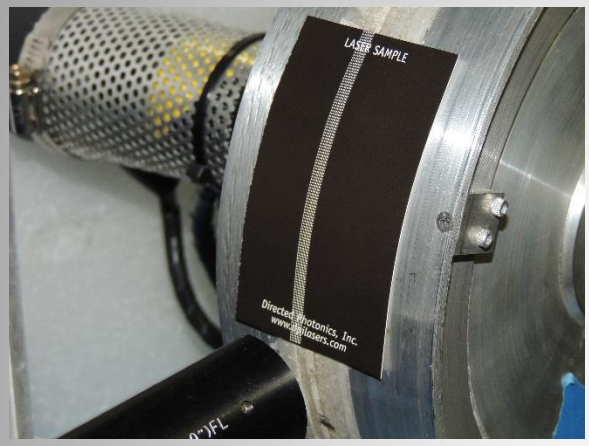


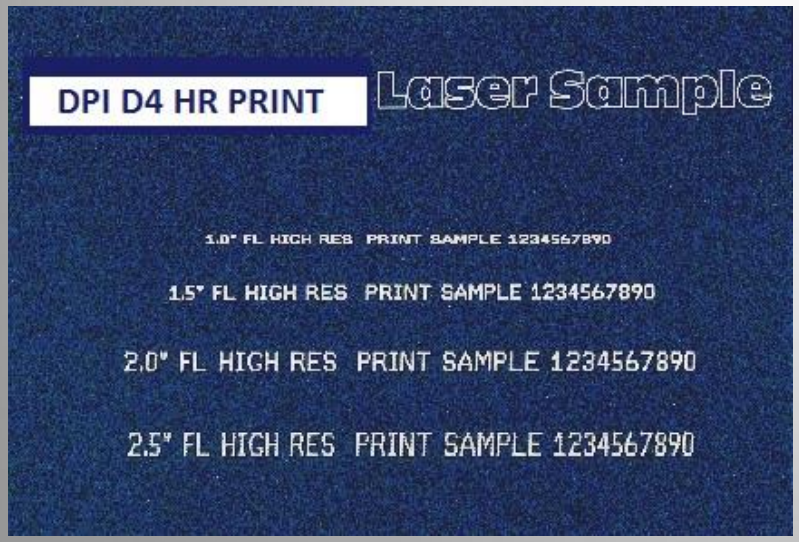
LDR NLQ Marking

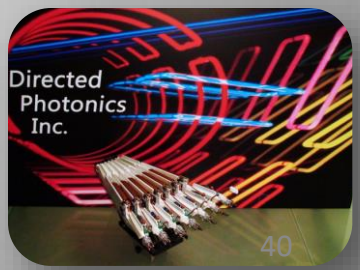
- Remember the 9-pin printers of the old days that offered Near Letter Quality printing?
- The LDR uses this concept. Dot matrix optically smoothed together for NLQ laser marking.
- Marking with pulse rise of 28 microseconds, all DPI laser tubes are now what used to be known as LEEP tubes.
- Pulse widths of 80 to 300 microseconds
- 20+ watts of power in each dot, not 30W in a single translated dot like a scriber



From Basic Dots, Fine Characters Emerge

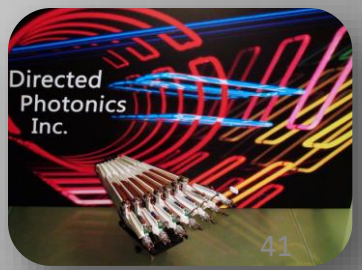






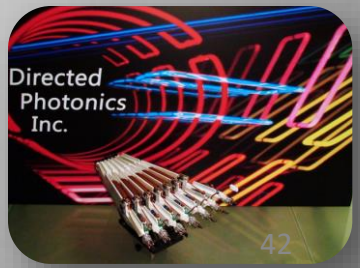
LDR Advantages

- Galvo based laser marking units have reached their speed limit. Digital Laser Marking is the revolution forward, to simplicity.
- Ideal for the Food and Packaging Market,
- Blow-molding, labeling and cartoning machine integration.
- Nothing Faster
- Nothing Simpler
- Nothing More Affordable
- No Lower Cost of Ownership
  (ink or laser)



Compare the evolution of digital laser marking

DDC2 in background, DDC3 with Marking head and beam extender next to the LDR marking head, E stop Key Switch and power supply.



Thank You