



NEOS TECHNOLOGIES

A Gooch & Housego Company

OPERATING MANUAL

DUAL CHANNEL RF DRIVER

MODEL NUMBER

390XX-YYDMFPS-2CH

HIGH POWER Q-SWITCH DRIVER

DOCUMENT NUMBER: 51A15441A

This Operating Manual is for use with Q-Switch Drivers with model numbers:

XX = 24, 27, or 41 **YY** = 50, 100 **D** = Digital Modulation **M** = OEM Module
FPS = First Pulse Suppression Option **2CH** = Two RF Outputs

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I. DESCRIPTION

The **390XX-YYDMFPS-2CH** is a High Power RF Driver With two outputs from one oscillator, designed to drive two Q-Switches and is manufactured as an OEM Module. The two acousto-optic Q-Switch, usually mounted at right angle to each other, are used typically in a random polarized Nd:YAG laser. The Q-Switch, when excited, exhibits a high loss because it deflects a large portion of the light beam off the optical axis. When the system modulates the RF signal off, the Q-Switch becomes transparent and a light pulse is output from the laser. The RF energy can be turned off in a short period of time (60 ns typical). The Choices of Frequency (XX), Output Power (YY) and First Pulse Suppression (**FPS**) Option are "Factory Set" When Ordered.

The Unit has Two Digital Modulation Inputs: Fixed and Variable. These Controls Allow the Customer to Issue a Pulse Command of a "Fixed" Pulse Width, The Duration determined by the Drive's Pulse Width Control, Settable by the Customer, or Issue a "Variable" Pulse Command, the Duration Determined by the Input Signal Pulse Width. The RF Driver Produces Up to 50 Watts Power to Each Output. The RF driver system may be modulated in fixed duration mode at any frequency from 1 Hz to 100 kHz by an external frequency source. In variable duration mode, the system can be modulated from DC to 100 kHz. The modulation is common to both output channels.

The RF driver system is configured with a **First Pulse Suppression** circuit. The FPS circuit is designed to eliminate the large light pulse that is output from the laser after a long period of inactivity. Normally, the first pulse from a Q-Switched laser that has been held off for over 100 μ s will be much larger than the standard pulse. This excess energy can cause unwanted damage to the target of the laser. The FPS circuit does this by scaling the energy sent to the Q-Switch. The result is that this first pulse has the same energy as the following pulses.

II. SPECIFICATIONS**390XX-YYDSFPS-2CH**

The 390XX-YYDMFPS-2CH System is a RF Driver with Two Outputs from One Oscillator, Digital Modulation Inputs Common to Both Outputs, and First Pulse Suppression Option. The RF Driver Produces up to 50 Watts into a 50 Ohm Load on Each Output.

PARAMETER:**SPECIFICATION:**

Number of Channels	2 Outputs (<u>RF Power Split from One Oscillator.</u>)	
Output Frequency is " <u>Factory Set When Ordered</u> "	<u>XX</u> = 24, 27, 41	Where RF Frequency = 24.00, 27.12, 40.68 MHz \pm 0.01%
Spurious Levels:	-50 dBc Maximum	
Harmonic Distortion	-30 dBc Maximum	
Digital Modulation Inputs:	<u>Modulation Common to Both Outputs.</u>	
Fixed Mod In	TTL Levels, Triggered on TTL Rising Edge. Pulse Width Applied >50 ns.	
Variable Mod In	TTL Levels TTL HIGH = RF Off	
Extinction Ratio:	35 dB Minimum	
RF Rise Time 10% to 90%	500 ns Maximum	
RF Fall Time: 90% to 10%	100 ns Maximum	
Modulation Repetition Rates:	1 Hz to 100 kHz for Fixed Modulation DC to 100 kHz for Variable Modulation	
Fixed Modulation Output Pulse Width Adjustment Range:	1 to 14 μ s , Customer Adjustable	
Pulse Suppression Mode is " <u>Factory Set When Ordered</u> ".	FPS = First Pulse Suppression	See Figure 3
FPS Trigger / Analog input for Pulse Suppression.	TTL Levels, Triggered on TTL Rising Edge.	
RF Output Power Per Channel " <u>Factory Set When Ordered</u> " <u>YY</u> =25 or 50 Watts Nominal, Adjustable from 12 to 50 Watts.	<u>Both Outputs Must Have 50 Ohm Load.</u> 40.68 MHz Unit Limited to 25 Watts.	
Output Impedance:	50 Ohms Nominal	
Shutter Output:	0.3 sec delay. Opens on fault. Capable of Sinking 1 Amp at 28 Volts Maximum.	
Supply Voltage Input	+28 VDC \pm 5%	
Supply Current Input	6.5 A for 50W units	9.0 A for 100W units
Operating Temperature	+10°C to +55°C	
Air Flow through Heat Sink	> 36CFM (> 17 litres / second) @ 25°C	

MAXIMUM RATINGS:

Supply Voltage:	30 Volts DC Maximum
Power Output:	No DC Feedback Allowed
Storage Temperature:	-20°C to +85°C

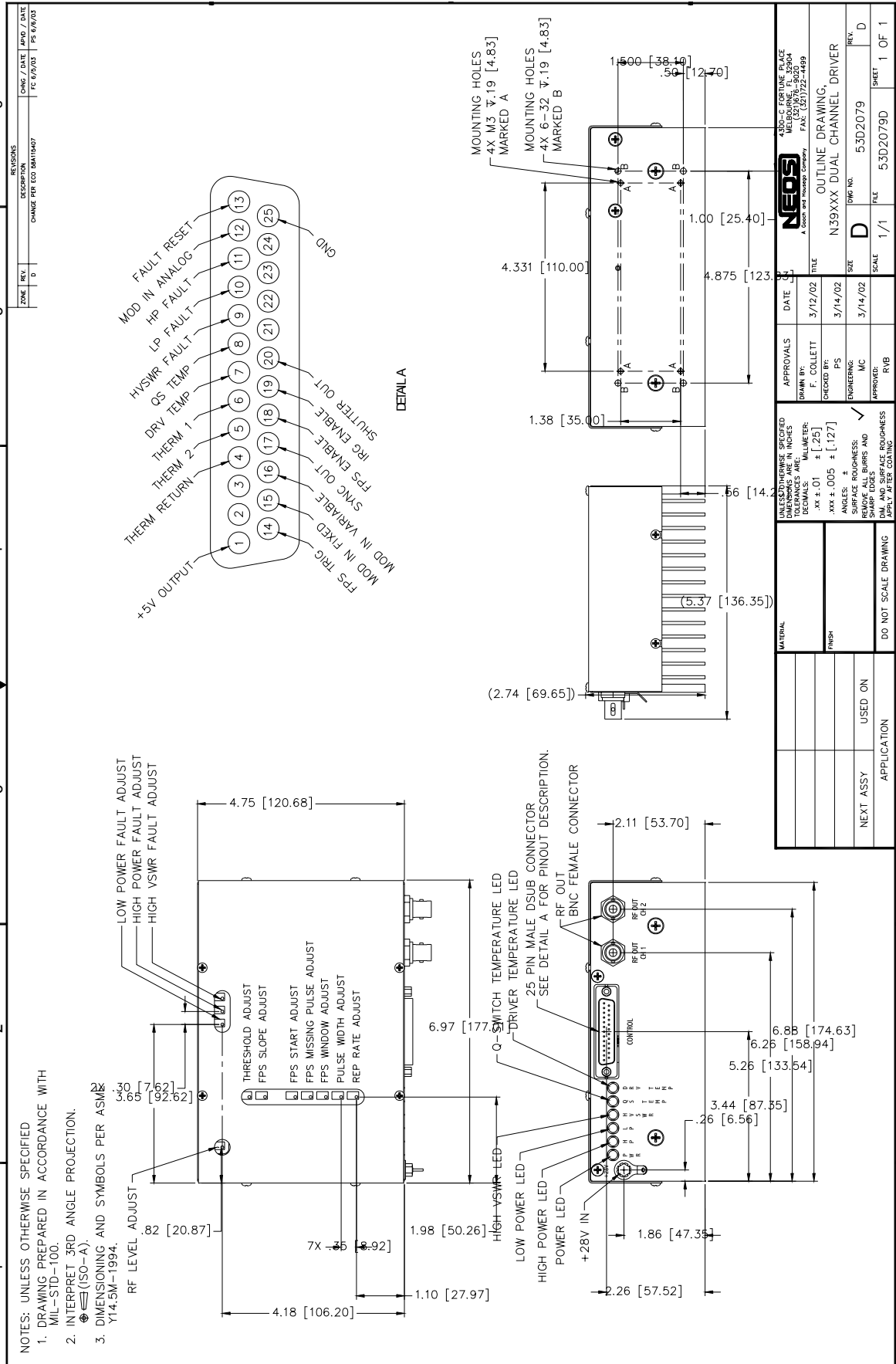
CONNECTORS & MECHANICAL:

RF Output Connector:	BNC Female (2X)
Modulation Input Connector:	25Pin Sub D Connector
Power Supply Connections:	Vcc Solder Post Return Ground Lug

RELATED DOCUMENTS:

Outline Drawing:	53D2079
Acceptance Test Results Form:	52A12986 (50 W)
Acceptance Test Results Form:	52A14223 (25 W)

III. OUTLINE DRAWING



IV. CONTROLS

"RF Level"

"**Threshold**" – This adjustment is not used on units configured with FPS.

"**FPS Slope**" – Adjusts how quickly the RF pulses return to their normal level after the FPS has been triggered.

"**FPS Start**" – Adjusts the initial power level of the first pulse.

"**FPS Window**" – Adjusts the duration of the suppression pulse cycle. The range available is 20 μ s to 300 μ s.

"**Pulse Width**" – Adjusts the length of time the driver outputs no RF energy after receiving a trigger. The range available is 1 μ s to 14 μ s.

"**Maximum RF Power**" – Adjusts the maximum power threshold for the module. If the module's output rises above this threshold, the module will cease output until it is reset.

"**Low RF Power**" – Adjusts the minimum power threshold. If the module's output goes below this set value, the low power warning light will turn on, but the driver will continue to output power. This is a warning, not a true fault condition.

"**VSWR Fault**" – **Is not field adjustable!** If a mismatch is detected, the driver will cease outputting power until it is reset.

V. INDICATORS

"PWR" – Power Indicator – The module has 28V applied on the DC connector.

"HP" – High Power Indicator – The module attempted to output more power than the maximum allowable level, as set by the Maximum RF Power control. The module will not output power when this indicator is on.

"LP" – Low Power Indicator – The module is outputting less power than the Low Power control has been set for. This indicator will come on even if the driver has had its output turned off by another fault condition.

"HVSWR" – High Voltage Standing Wave Ratio – The module has been connected to a load that does not match 50Ω. The module will not output power when this indicator is on.

"QS TEMP" – Q-Switch Temperature Fault – The Q-Switch the module is connected to has overheated. The driver will not output power when this indicator is on.

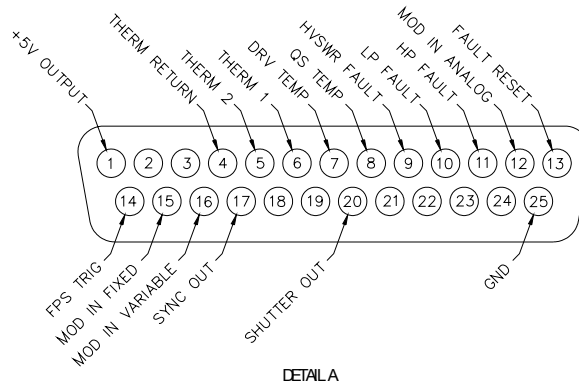
"DRV TEMP" – Driver Temperature Fault – The internal temperature of the module has reached 60°C. The driver will remain in this fault condition until it cools down.

VI. CONNECTIONS

"**+28V**" – connection for 28V DC power supply.

"**RF Out**" –RF Output, BNC female connector. (2X)

"**CONTROL**" -25 pin sub-D connector



1	+5V	+5V output for external fault indicators, 75 mA available.
2 – 3	NC	No connection.
4	THERM RTN	Ground – to be used as a return for THERM.
5	THERM 1	Thermostat connection – driver enters a fault condition unless this is shorted to ground.
6	THERM 2	Thermostat connection – driver enters a fault condition unless this is shorted to ground.
7	DRV TEMP	Normally HIGH, goes LOW when the driver is in an overheat fault.
8	QS TEMP	Normally HIGH, goes LOW when no short present on THERM.
9	HVSWR	High VSWR fault, normally HIGH, goes LOW during fault.
10	LP	Low RF Power indicator, normally HIGH, goes LOW while driver output is below the Low RF Power threshold.
11	HP	High RF Power fault, normally HIGH, goes LOW during fault.
12	MOD IN ANALOG	Not used in FPS operating mode
13	FAULT RESET	Pulse LOW to reset the driver from a fault condition. This line should not be held LOW or it will defeat some of the fault conditions.
14	FPS TRG	Triggers a suppression pulse on a RISING edge.
15	MOD IN FIXED	On a RISING edge: Turns the driver off for the duration set by the pulse width control.
16	MOD IN VARIABLE	Turns the driver off while this input is HIGH.
17	SYNC OUT	Outputs a signal synchronized to the modulation output.
18-19	NC	No Connections
20	SHUTTER OUT	0.3 sec delay. Opens on fault. Capable of sinking 1 Amps at 28 Volts maximum
21 - 24	NC	No Connections
25	GND	Ground Return

VII. TURN ON AND OPERATING PROCEDURE

TURN ON AND TESTING:

1. Unpack the module and check for obvious shipping damage. If the unit is not damaged, continue with the next step. If the unit is damaged, notify the carrier and your supplier.
2. Attach a 50 Ω load capable of dissipating 25 W or 50 W*, or a Q-Switch, to **each** RF output of the unit. It is recommended to use RG-58 coaxial cable. *See the Acceptance Test Report for output power setting for this unit. The unit must have a 50 Ω load or a "good" Q-Switch attached to **each** output when operating or damage may occur.
3. Attach the shutter if needed. The shutter circuit will open on driver any fault.
4. Ensure proper airflow across the heatsink of the unit and water cooling to the Q-Switches.
5. The THERM pin 5 and 6 must be grounded or connected to a normally closed thermal switch on the Q-Switch.
NOTE: If not connected to a Q-Switch, no protection for thermal overload is offered.
6. Apply the proper voltage to the 28 V connector and the return.
7. Modulation control: Apply modulation as desired. See control signal diagram.
 - a. Variable
Apply a TTL level modulation signal to pin 16 on the CONTROL connector. When the signal is a TTL HIGH, the driver's RF output is off. When the signal is a TTL LOW, the driver RF output is at the normal output level, as set by the RF LEVEL ADJUST.
 - b. Fixed
Apply a TTL level modulation signal to pin 15 on the CONTROL connector. On the rising edge of a TTL signal, the driver's RF output will be off for a time duration set by the PULSE WIDTH control (1 μ s to 14 μ s). At the end of the pulse time, the driver RF output is returned to the normal output level, as set by the RF LEVEL ADJUST.

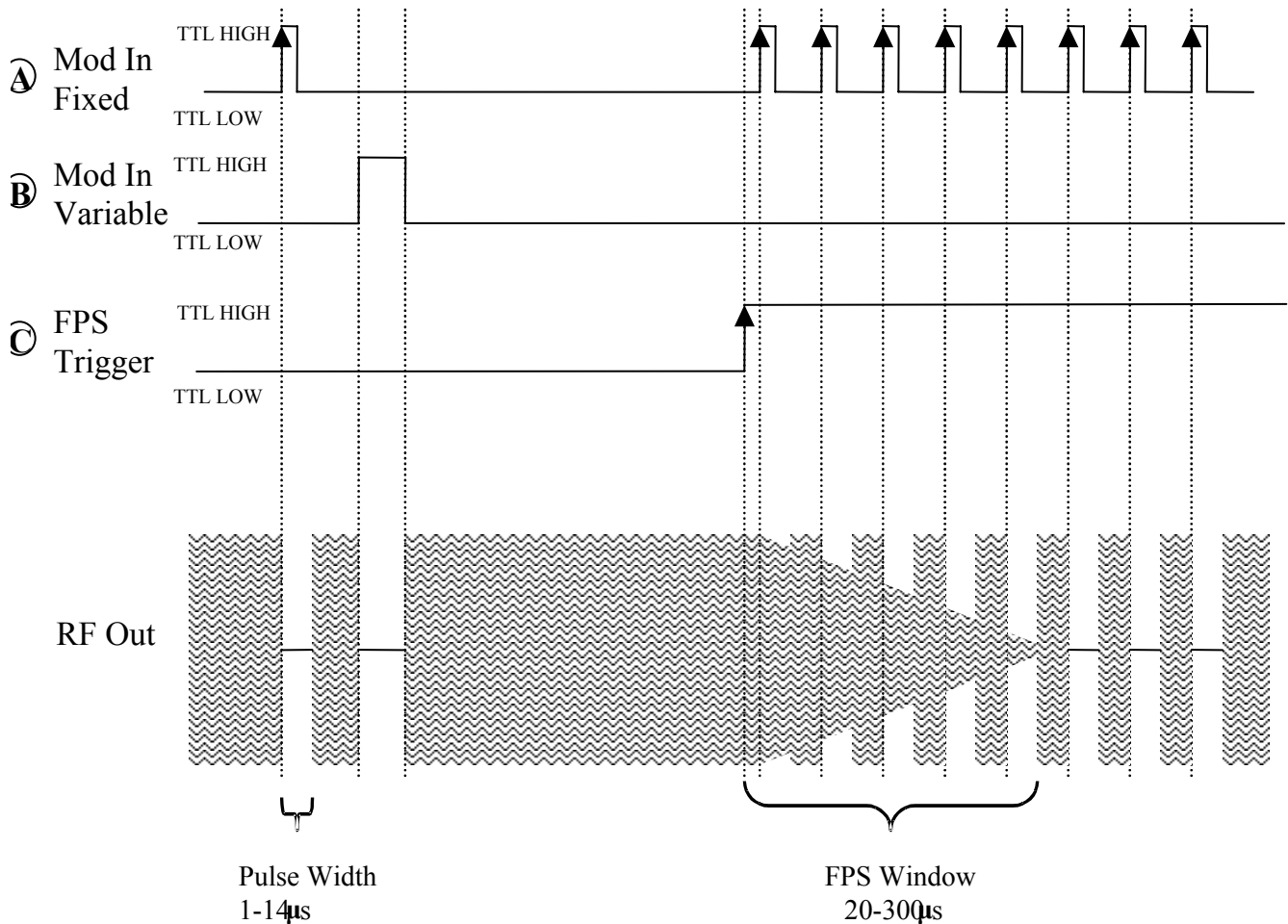
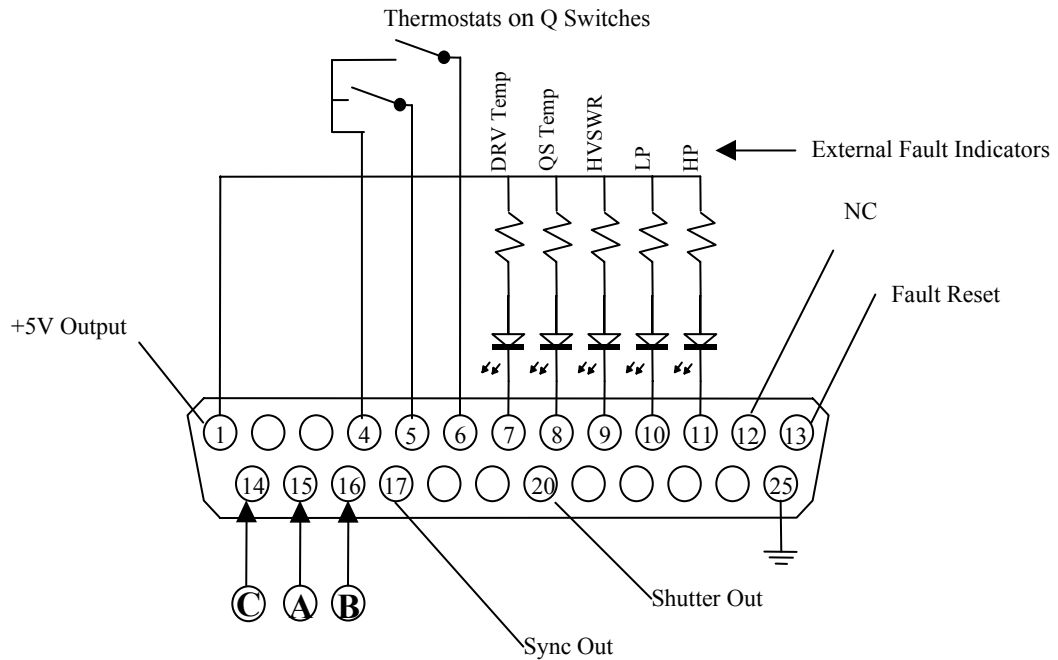
The width of the pulse applied must be greater than 50 nanoseconds. Fixed modulation will operate to a maximum rate of 100 kHz.
 - c. First Pulse Suppression
Apply a control signal to pin 14 on the CONTROL connector to activate a first pulse suppression cycle. On a rising edge, the module will slowly reduce the low level of the RF output being applied to the Q-switch.
The initial level is set by the FPS START adjustment.
The rate of this change is controlled by the FPS SLOPE adjustment.
The duration of this pulse is controlled by FPS WINDOW adjustment.
8. Refer to Section IV 'Controls' for descriptions of the variable potentiometers that may be adjusted using a screwdriver, through openings in the driver casing.

OPERATING PROCEDURES:

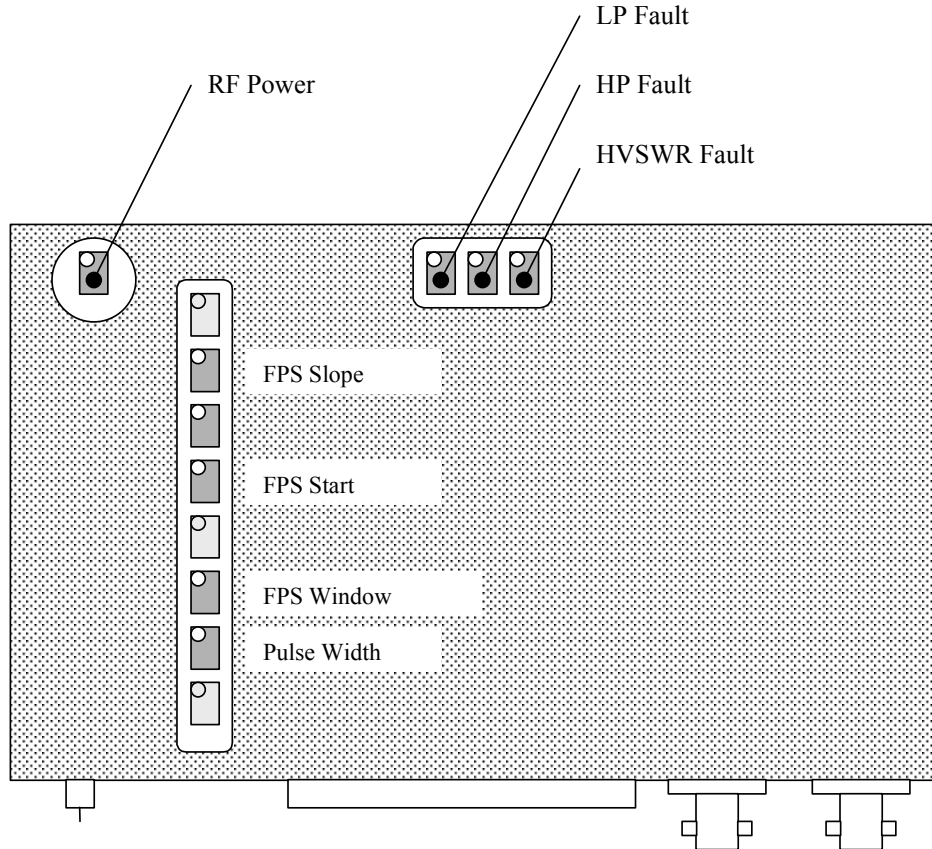
1. Attach a Q-Switch capable of dissipating 25 W or 50 W*, to **each** RF output of the unit. It is recommended to use RG-58 coaxial cable.
2. The "THERM" pin 5 and 6 must be connected to a normally closed thermal switch on each Q-Switch.
NOTE: If not connected to a Q-Switch, no protection for thermal overload is offered.
3. Ensure proper airflow across the heatsink of the driver unit and water cooling to the Q-Switches.
4. Attach the shutter if needed. The shutter circuit will open on driver any fault
5. Apply the proper voltage to the 28 V connector and the return.
6. **Follow the procedures listed in the Q-Switch Operating Manual for mounting the Q-Switch(es) in the laser and for adjusting it for minimum insertion loss and maximum output power.**
7. Apply the appropriate modulation signals to the "Mod in Fixed" pin 15 or the "Mod in Variable" pin 16 to set the modulation rate of the driver to modulate the output of the laser.
8. Apply the appropriate modulation signals to the "Mod in FPS" pin 14 to suppress the large first pulse that normally occurs after the modulation has been off for a period longer than several milliseconds. See the signal control diagram figure 4.

VIII. CONNECTION AND CONTROL DIAGRAMS

N390XX-YY DMFPS-2CH (HIGH POWER) Control Diagram



FPS CONTROL ADJUSTMENT PLACEMENT

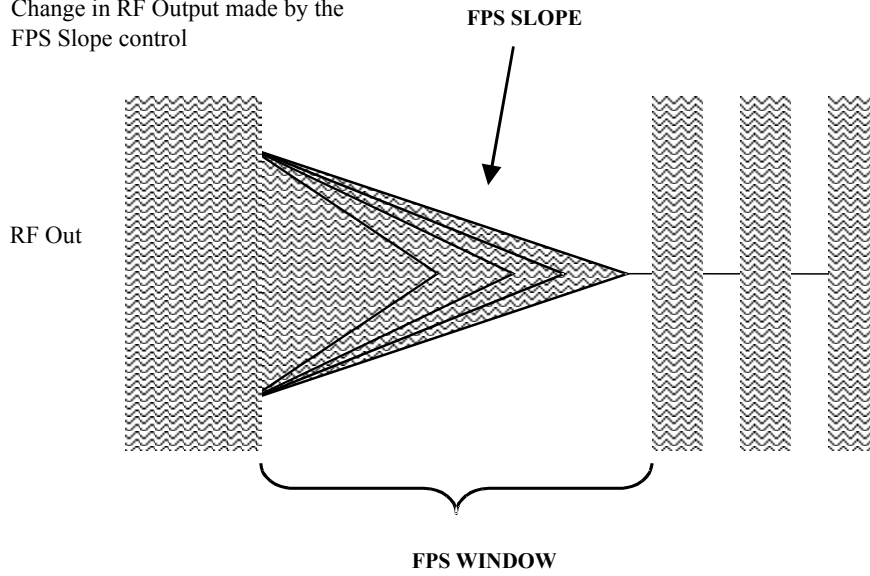


Top View

FPS ADJUSTMENTS

Driver Adjustments

Change in RF Output made by the
FPS Slope control



Change in RF Output made by the
FPS Start control

