



## **Integrated AO Modulator and Driver**

**Including: Basic Alignment**

### **Instruction Manual**

### **IMDD Series – Digital Modulation**

Key to model types : **IMDD-Pff-H**

Base model features 5.0V, analog modulation input level and operates from a +12Vdc supply.

'P' indicates the crystal type

P	:	PbMoO4
T	:	TeO2

'ff' indicates the AO centre frequency

80	:	80MHz
110	:	110MHz

'H' indicates the active aperture height

1	:	1mm
1.5	:	1.5mm

ISOMET CORP, 5263 Port Royal Rd, Springfield, VA 22151, USA.

Tel: +1 703 321 8301, Fax: +1 703 321 8546, e-mail: [isomet@isomet.com](mailto:isomet@isomet.com)

[www.ISOMET.com](http://www.ISOMET.com)

ISOMET (UK) Ltd, 18 Llantarnam Park, Cwmbran, Torfaen, NP44 3AX, UK.

Tel: +44 1633-872721, Fax: +44 1633 874678, e-mail: [isomet@isomet.co.uk](mailto:isomet@isomet.co.uk)

## 1. GENERAL

The IMDD series is a range of acousto-optic modulators integrated with drive electronics and supplied in a single compact package. The centre frequency of the integral driver is determined by a free-running quartz-crystal oscillator at 80 or 110 MHz. This frequency is accurate to within +0.005% and its stability is better than +0.003%; the oscillator is not temperature stabilized. See the block diagram in Figure 1 below. A high speed balanced mixer is used to modulate the RF signal in response to an externally applied modulation input. This input allows ON-OFF “digital” control of the output laser beam intensity. The required modulation input should be a low impedance source such as a 110ohm line driver or similar device. A positive of > 3V at the Modulation Input drives the RF fully ON; a ground level or < 0.8V drives the RF Output OFF.

### **The video input must not exceed 7V peak.**

The device includes a multi-turn potentiometer for adjusting the RF power of the final output stage driving the AO crystal.

### **Anti-clockwise / Counter clockwise (CCW) rotation increases the RF power output**

A d-c power supply is required for operation of the IMDD series devices. The required voltage is +12Vdc (or + 15Vdc) at a current drain of < 330mA. The external power source should be regulated to +2% and the power supply ripple voltage should be less than 100m V for best results.

**NOTE:** The IMDD series includes a protection diode on the DC supply input. Nevertheless, damage to the device may result if the polarity of the supply connection is reversed or the input voltage exceeds +15Vdc

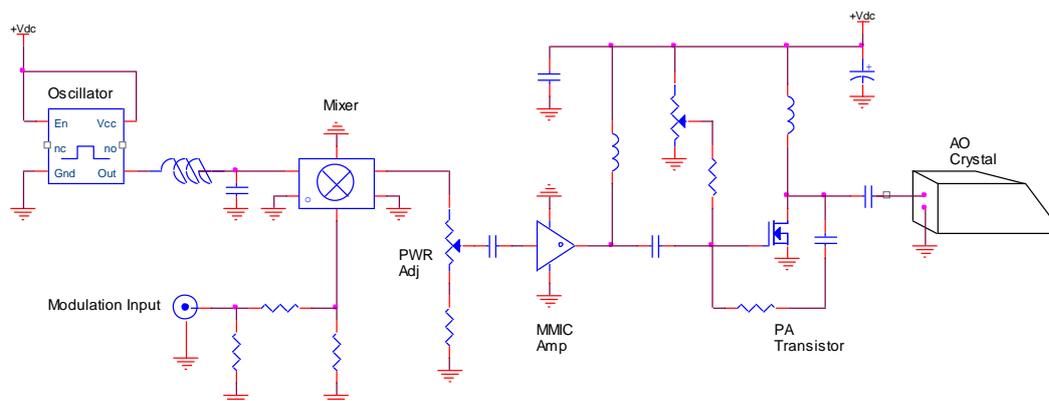


Figure 1: IMAD Block Diagram



## 2. INSTALLATION AND ADJUSTMENT

Please refer to Figure 2 . See specific test data sheet for supplied device settings.

The optimum RF power level required for the modulator to produce maximum first order intensity will be different at various laser wavelengths. Applying RF power in excess of this optimum level will cause a decrease in first order intensity (a false indication of insufficient RF power), and make accurate Bragg alignment difficult. It is therefore recommended that initial alignment be performed at a low RF power level.

The IMDD is fitted with a multi-turn Power Adjust potentiometer. **Clockwise REDUCES RF power.**

- a. With an insulated alignment tool or screw driver, rotate the recessed potentiometer fully CW, then CCW approximately 5 turns.

***CW rotation decreases RF power output***

***CCW rotation increases RF power output***

- b. Connect the Modulation Input pins of the 4 way mini-connector to a digital modulation drive source ( $0 < V < +5\text{Vdc}$ ). Apply a Logic High level of  $3.0 < V < 5.0\text{V}$
- c. Apply + 12 VDC (or + 15 VDC) to the DC input pins of the 4 way mini connector.
- d. From a position with either optical apertures perpendicular to the input laser beam, slightly rotate the unit (either direction). Observe the diffracted first order output from the Acousto-optic modulator and the undeflected zeroth order beam (higher orders may also be visible).

Adjust the Bragg angle to maximize the first order beam intensity.

- e. After Bragg angle has been optimized, slowly increase the RF power until maximum first order intensity is obtained.

After the Bragg angle has been optimised, slowly increase the RF power (rotate PWR ADJ counter CW) until maximum first order intensity is obtained. This peaked RF drive level is termed the saturation power;  $P_{\text{sat}}$ . For applications using a well focussed input beam into the AOM, the correctly adjusted Bragg angle condition is indicated when the zero order shows a characteristic dark line through the middle of the beam at or near the  $P_{\text{sat}}$  drive level.

- f. The device is now ready for use.



Conduction cooling of the device from the mounting face to a heat sink or forced-air convection cooling is mandatory. The mounting face temperature must not exceed 70°C.

**SERIOUS DAMAGE TO THE AMPLIFIER MAY RESULT IF THE TEMPERATURE EXCEEDS 70°C.**

Figure 3 illustrates the key parameters of this AO modulator.

### 3. MAINTENANCE

#### 3.1 Cleaning

It is of utmost importance that the optical apertures be kept clean and free of contamination. When the device is not in use, the apertures may be protected by a covering of masking tape. When in use, frequently clean the apertures with a pressurized jet of filtered, dry air.

It will probably be necessary in time to wipe the coated window surfaces of atmospherically deposited films. Although the coatings are hard and durable, care must be taken to avoid gouging of the surface and residue of the cleaning solution. It is suggested that the coatings be wiped with a soft ball of brushed (short fibres removed) cotton, slightly moistened with clean alcohol. Before the alcohol has had time to dry on the surface, wipe again with dry cotton in a smooth, continuous stroke. Examine the surface for residue and, if necessary, repeat the cleaning.

#### 4.2 Troubleshooting

No troubleshooting procedures are proposed other than a check of alignment and operating procedure. If difficulties arise, take note of the symptoms and contact the manufacturer.

#### 4.3 Repairs

In the event of deflector malfunction, discontinue operation and immediately contact the manufacturer or his representative. Due to the high sensitive of tuning procedures and the possible damage which may result, no user repairs are allowed. Evidence that an attempt has been made to open the optical head will void the manufacturer's warranty.

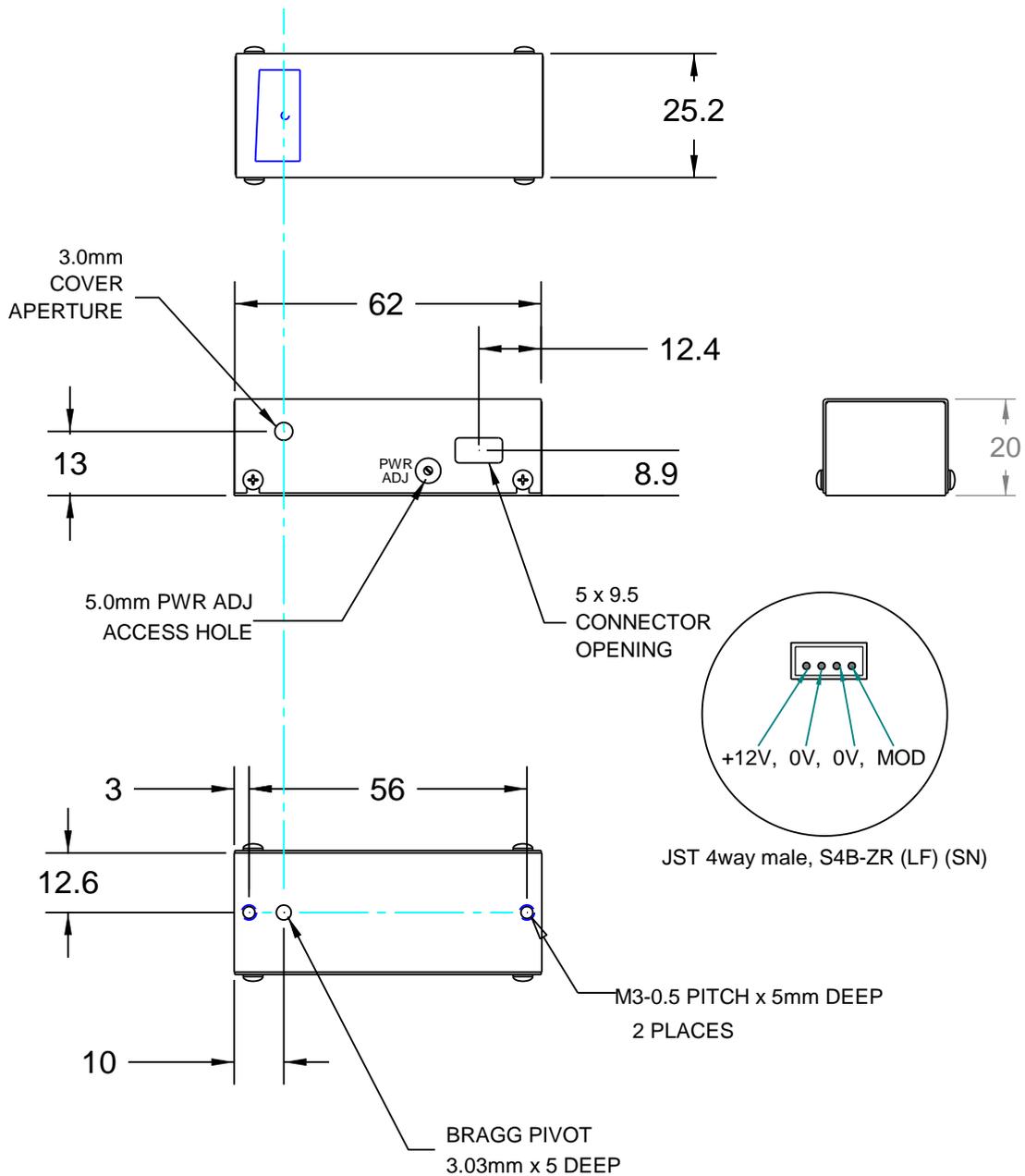
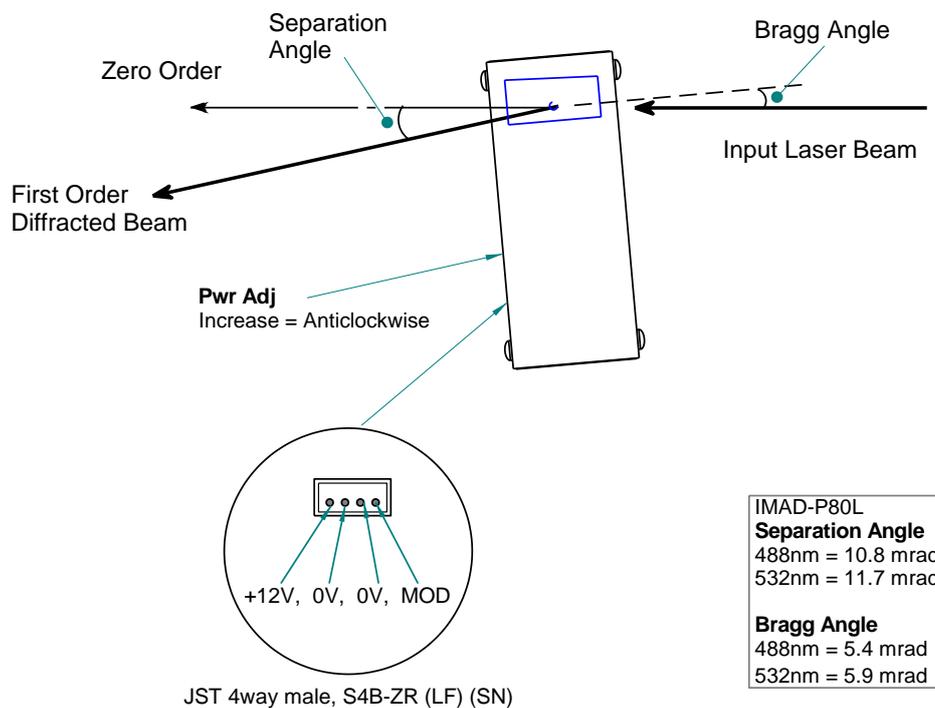


Figure 2: Driver Installation

Notes:

- Mount on heat conduction surface
- Connector pin outs viewed looking into the device. Connector with flying lead is supplied (Blue = +12Vdc, Black = Gnd/0V, Black = Rtn/0V, Red = Mod)
- Anti-clockwise rotation of the PWR ADJ pot INCREASES the RF power

**Schematic for an IMDD series integrated Modulator/Driver**



The input Bragg angle, relative to a normal to the optical surface and in the plane of deflection is :

$$\theta_{BRAGG} = \frac{\lambda \cdot fc}{2 \cdot v}$$

The separation angle between the zeroth order and the first order outputs is :

$$\theta_{SEP} = \frac{\lambda \cdot fc}{v}$$

Optical rise time for a Gaussian input beam is approximated by :

$$t_r = \frac{0.65 \cdot d}{v}$$

where :  $\lambda$  = wavelength

fc = centre frequency

v = acoustic velocity of AO interaction material = 4.21mm/usec (TeO<sub>2</sub>)  
= 3.63mm/usec (PbMoO<sub>4</sub>)

d =  $1/e^2$  beam diameter

Figure 3: Modulation System