Dual Channel AMPLIFIER

Instruction Manual DA104-2

Precautions

NEVER OPERATE THE DRIVER WITHOUT PROPER COOLING.
THE MOUNTING FACE TEMPERATURE MUST NOT EXCEED 60*C.

NEVER OPERATE THE DRIVER INTO AN OPEN OR SHORT CIRCUIT LOAD

PLEASE READ BEFORE ATTEMPTING OPERATION
(I know, who needs manuals but make an exception !!)

ISOMET CORP, 5263 Port Royal Rd, Springfield, VA 22151, USA.
Tel: (703) 321 8301, Fax: (703) 321 8546, e-mail: isomet@isomet.com
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

1. GENERAL

The DA104-2 Modulator/Deflector Driver, figure 1, is a modular, dual independent output RF power amplifier specifically designed to operate with Isomet acousto-optic devices such as the LS110A. The driver accepts two frequency inputs in the order of -6dBm (e.g. from the Isomet iDDS-2 series frequency synthesizer) and provides dual phase delayed RF outputs suitable for beam steered acousto-optic deflectors. A summary of the DA104-2 driver specification is shown in the following table:

Model	Use with	Frequency Range	Output Power
D104-2	LS110A	75 - 125MHz (Nominal)	> 1.0 Watt / channel

Figure 2 is a block diagram of the D104-2 Driver. Any phase delay or shift between the outputs is defined by the phase delay between the frequency inputs only. This value can be defined and controlled using the iDDS-2 series synthesizer as the input source. A low level output signal at the operating frequency is provided for monitoring or feedback purposes.

The input signals are amplified to a preset level in the power amplifier stages. The output hybrid amplifiers are designed to operate at full rated power into a 50* load with 100% duty cycle. The output power level is set by the power adjust potentiometer at the output of the diode ring modulator.

Conduction cooling of the driver from the mounting face to a heatsink or forced-air convection cooling is mandatory. The mounting face temperature must not exceed 60°C. Serious damage to the amplifier may also result if the RF output connector is operated open-circuited or short-circuited.

A low impedance source of d-c power is required for operation of the D104-2 Driver. The required voltage is +24VDC at a current drain of 800 mA. The external power source should be regulated to ± 2% and the power supply ripple voltage should be less than 200mV for best results.

2. SPECIFICATIONS

Amplifier Type:	Broadband Class A
Output RF Power:	> 1.6 Watt per channel
Output Impedance:	50* nominal
Load VSWR:	< 2.5:1 for best results
Output RF Power Variation vs.Frequency	
	< 1 dB
Spurious Outputs:	Harmonics > 25dB below fundamental
Frequency Input Level	-6dBm Specified
	0 dBm Maximum
Frequency Range:	20 to 200 MHz Maximum
	75 to 125MHz Specified
Input Impedance:	50 ohm source
DC Power Input:	+24VDC at 800 mA regulated to * 0.25%
Temperature Range:	0*C to 60*C ambient, temperature at
	mounting face must not exceed 70*C
Mounting Orientation:	Any

3. THEORY OF OPERATION

Figures 4 and 5 illustrate the key operating parameters. Further explanation is given in the accompanying application notes 'Acousto Optic Deflectors'.

4. INSTALLATION AND ADJUSTMENT

a. Install the D104-2 Driver on a heat sink as shown in Figure 1. Use heat conducting compound between the Driver mounting face and the heat sink.

b. With no d-c power applied, connect the + 24Vdc line to the 2-pin DC connector as shown in Figure 1. DO NOT APPLY POWER UNTIL THE LOAD IS CONNECTED.

c. Connect a suitable frequency source to the frequency input ‘IN1’
(e.g. from the Isomet iDDS-2 series)

d. Connect a suitable frequency source to the frequency input ‘IN2’
(e.g. from the Isomet iDDS-2 series)

e. Connect the AO input or suitable 50ohm load to the output ‘X1’

f. Connect the AO input or suitable 50ohm load to the output ‘X2’

4.1 GENERAL ACOUSTO OPTIC ALIGNMENT

Apply approximately half the required RF power (say 0.2 - 0.4W) at the centre frequency. Rotate the AO device slightly until deflection of the light beam occurs. The deflection will occur in the horizontal plane. Select the diffraction spot next to the undiffracted beam and monitor the light intensity by using either a photodetector or a light power meter. Re-adjust the Bragg angle for maximum deflected light intensity. Fine tuning of the incident light beam position may be necessary for optimum results.

Adjust RF power level carefully for the desired efficiency at the minimum RF power necessary. Do NOT exceed the RF power level at which maximum efficiency is achieved (Psat). Over driving the AO deflector will reduce efficiency and may result in serious damage to the AO crystal.

Optimizing Efficiency.

- RF Power

Do not apply excessive RF power. This can reduce scan efficiency and degrade flatness

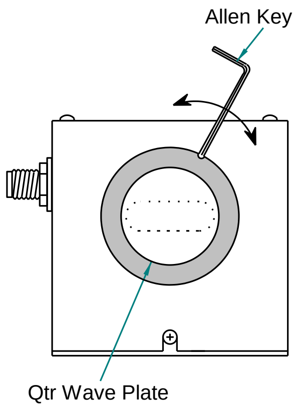
- Start Frequency.

Adjust the frequency start +/-15% about the nominal value
This can help to improve the flatness over the desired scan bandwidth.

- Polarization. See AO deflector requirements.

e.g. the LS110 series AO deflectors require circular polarized input.
A quarter waveplate is factory fitted to the LS110 to transform linear into the circular polarization.
To align and adjust this polarizer, locate the hole(s) around the quarter wave ring holder. Place a small Allen key or screw driver into the hole and use a lever to rotate the ring clockwise or counter clockwise. See illustration below. (The ring is a friction fit in the AOD cover secured by a circlip)

Carefully rotate to maximize the diffraction efficiency



5. THERMAL EFFECTS

We must consider the thermal effects of this device - both due to optical and acoustic absorption. The majority of heat is generated by RF drive power. As the temperature of the material increases beyond the recommended level, undesired refractive index changes will occur in the material. This results in beam distortion. Ultimately, the crystal will crack due to thermal stresses, if excessive RF power is applied. (>3.0W for a typical visible AO deflector).

6. MAINTENANCE

6.1 Cleaning (AO device)

It is of utmost importance that the optical apertures of the deflector optical head 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.

6.2 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.

6.3 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.

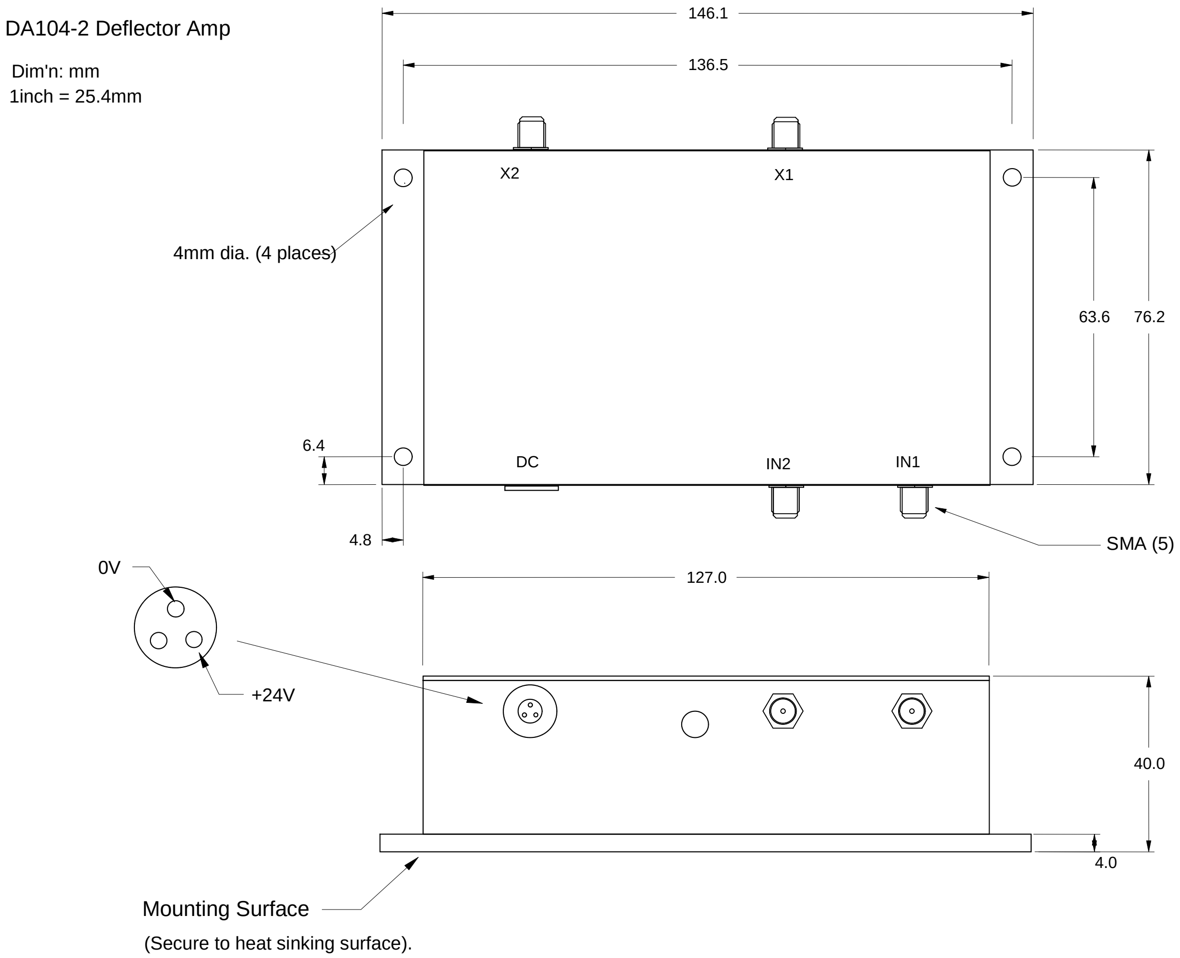


Figure 1, DA104-2 driver

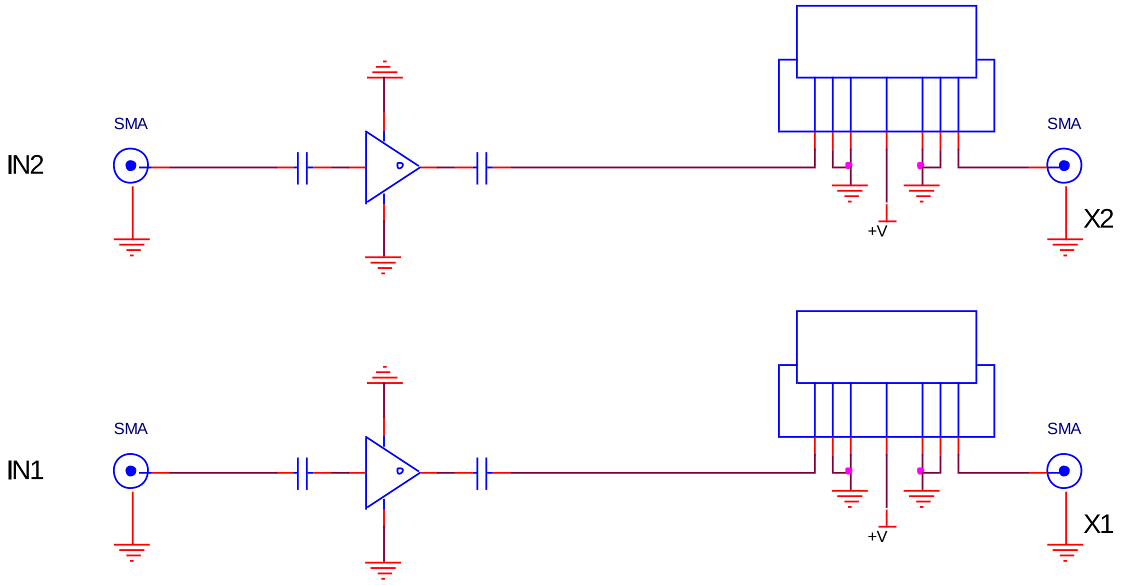


Figure 2, Driver Block Diagram for DA104-2 driver

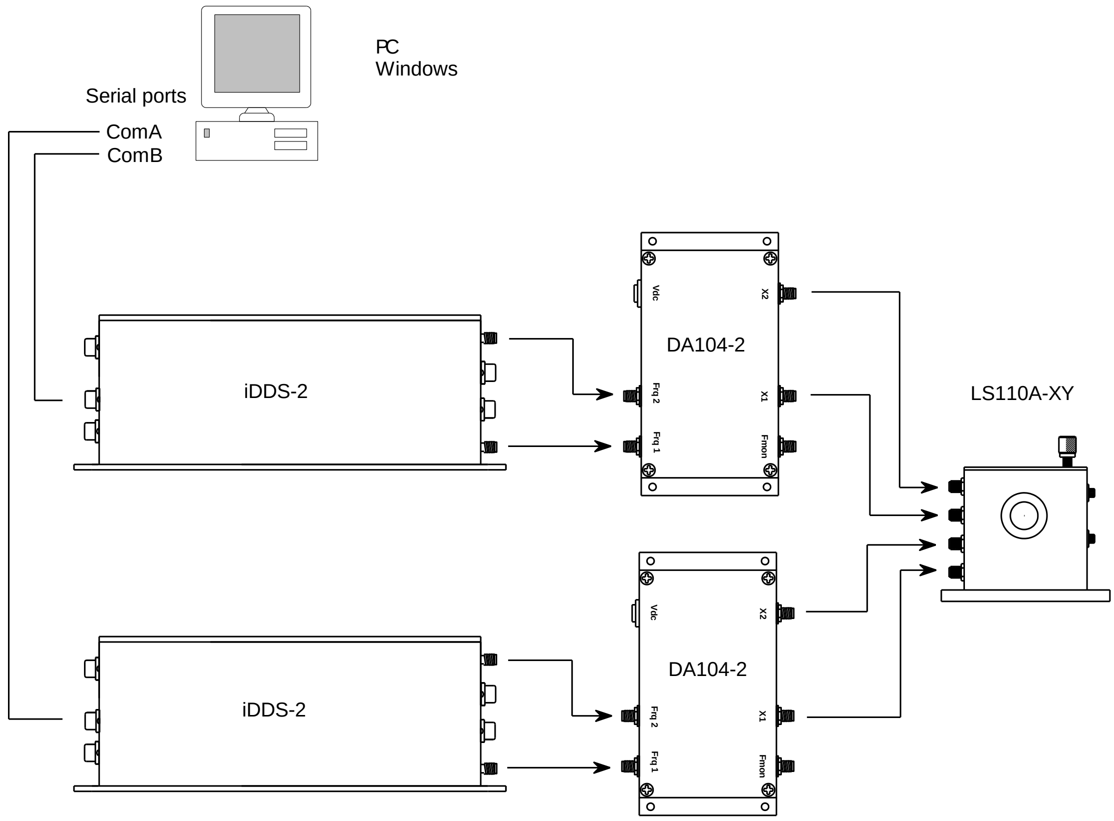
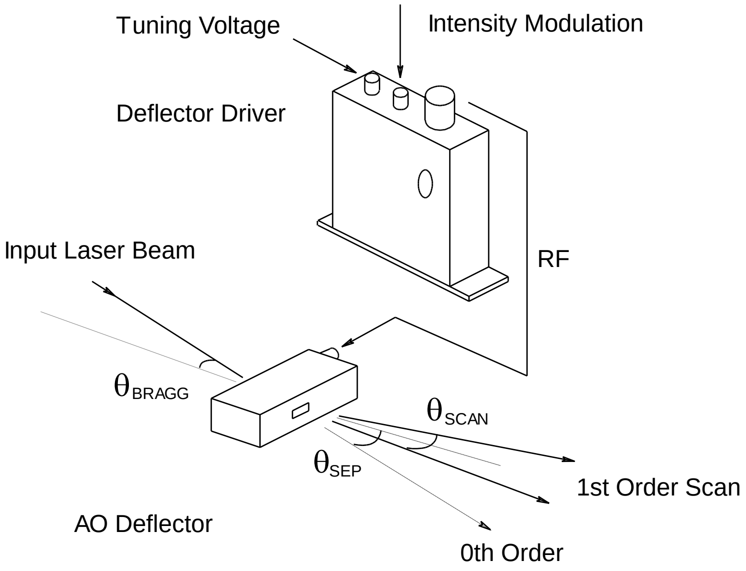


Figure 4, LS110 –XY AO deflector configuration

Schematic of a single electrode acousto optic deflector and tunable driver



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

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

The separation angle between the zeroth order and mid scan point of the first order is given by:

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

The first order scan angle is given by:

$$\theta_{SCAN} = \frac{\lambda . \delta f}{v}$$

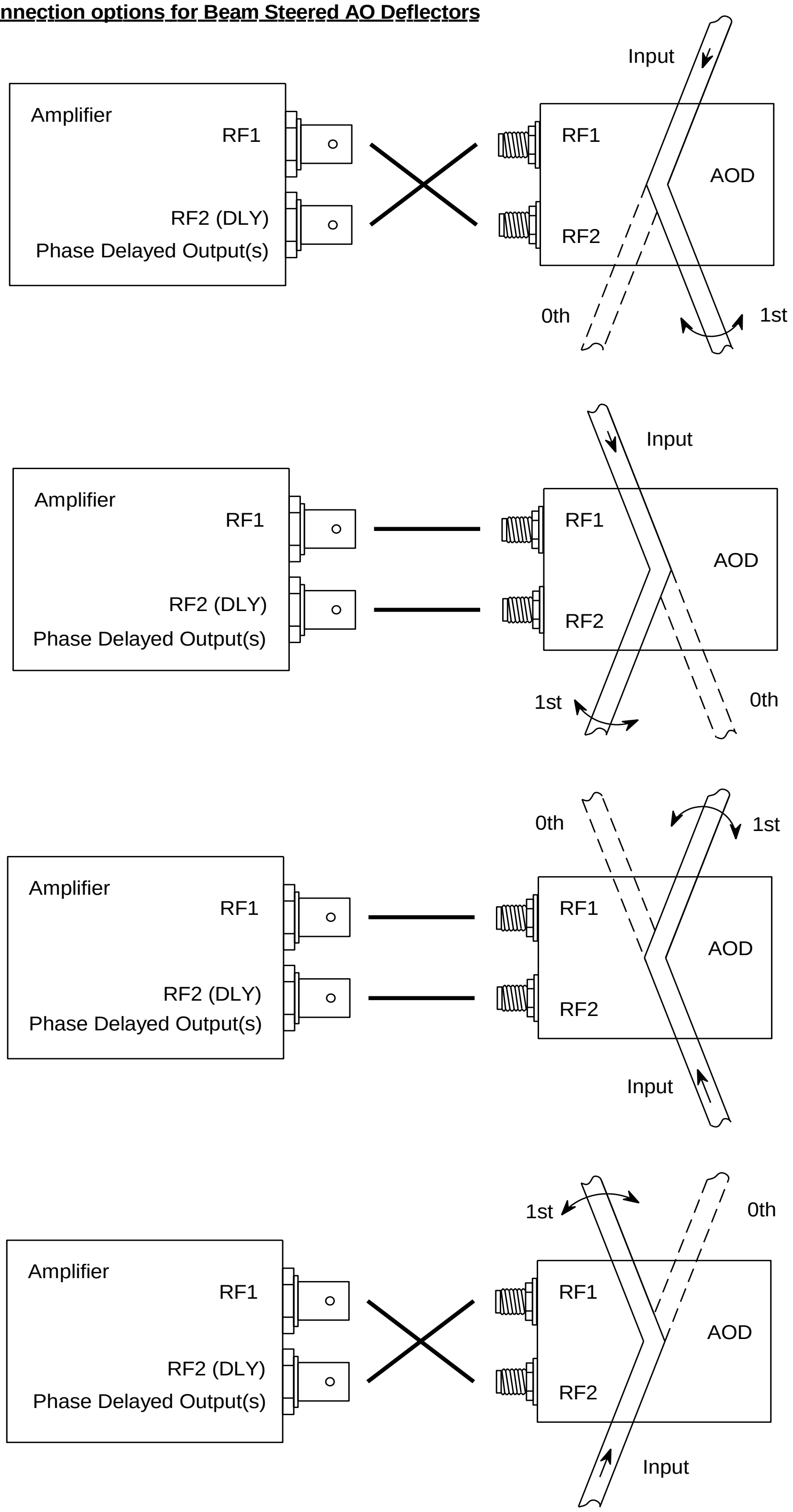
The access time or time aperture is given by:

$$T_{acc} = d/v$$

where : λ = wavelength
δf = scan frequency bandwidth
fc = centre frequency
v = acoustic velocity of the crystal material
d = beam diameter

Figure 5, Deflector Parameters

Connection options for Beam Steered AO Deflectors



Correct orientation as viewed from top of AOD
(Connector identification may differ)