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Four Channel Coupler

Type 5122

Operating Instructions

Four Channel Coupler

Type 5122

Your Competent Distributor:

Kistler Instrumente AG Winterthur, CH-8408 Winterthur, Schweiz Tel. + 41 52 224 11 11, Fax + 41 52 224 14 14

TABLE OF CONTENTS

Selection and Paragraph	Page
SECTION I DESCRIPTION	1-1
1.1 Introduction	1-1
1.2 Technical Data	1-2
1.3 Concept Explanation	1-4
1.4 Functional Description	1-5
SECTION II OPERATION	2-1
2.1 Installation	2-1
2.2 Hook-Up	2-1
2.3 Circuit Integrity Check	2-1
2.4 System Test	2-2
2.5 Controls	2-2
SECTION III CALIBRATION AND MAINTENANCE	3-1
3.1 Fuse Replacement	3-1
3.2 Current Adjustment	3-1
3.3 Calibration	3-1

FIGURES

1-1	Model 5122 Four Channel Coupler	1-2
1-2	Block Diagram	1-5

SECTION I

DESCRIPTION

1.1 INTRODUCTION

The Model 5122 Four Channel Coupler is the interface between up to four low impedance, eg. Piezotron Transducers or In-line Impedance Converters and readout equipment. The coupler operates on 115 or 230 Volt 50 to 440Hz power to furnish current limited DC to the transducer impedance converters.

Each channel includes a two-range amplifier, range switch, fixed filter, internally adjustable current regulator and a decoupling network that removes the DC bias and passes the dynamic signal to the output. A master 1X or 10X gain switch controls whether the four individual range switches are 1X/10X or 10X/100X gain.

A system check function is incorporated in this unit to provide a confidence check, when using the coupler with an FFT or similar instrument. By depressing a latching pushbutton on the front panel, a white noise source is simultaneously applied to all four channels. When the FFT calculates the transfer ratio between any of the channels, a properly configured system will yield an answer of one. While the system check is active, the transducer signals are disconnected from the coupler outputs.

Additionally, four momentary pushbuttons enable a meter circuit, a two color indicator displays green for a normal input bias of 3 to 21 Volts. Below 3 Volts the line is considered shorted, above 21 Volts the channel is considered open. In these instances, the indicator will display red. The meter circuit is always active regardless of the position of the system check pushbutton.

The Coupler is a rack mountable unit, approximately 5.75 inches high, 2.25 inches wide, and 7 inches deep.



FIGURE 1-1 MODEL 5122 FOUR CHANNEL COUPLER

1.2 TECHNICAL DATA

1.2.1 Piezotron Input:

Current supply	mA	2 to 18 internal adjustment
Full scale input	V p-p	10
Connector		BNC
Impedance, nominal	Ohms	> 60 K
Noise (1Hz to 10KHz referred to input):		
Gain = 1	µV RMS	10
Gain = 10	µV RMS	5
Gain = 100	µV RMS	3

1.2.2 Transfer Characteristics

Gain (front panel selected)		1 to 10 or 10 to 100
Frequency Response	Hz	1 to 10K
Time Constant (nom.)	Sec	3.05

1.2 TECHNICAL DATA (continued)

1.2.3 Output

Impedance	Ohms	<100
Full Scale Signal		
Voltage	V p-p	10
Current	mA p-p	5
Connector		BNC
Noise (1Hz to 10KHz):		
Gain = 1	µV RMS	10
Gain = 10	µV RMS	50
Gain = 100	µV RMS	300

1.2.4 System Check

Type		White Noise
Amplitude		
Gain = 1	mV RMS	10
Gain = 10	mV RMS	100
Gain = 100	mV RMS	1000
Amplitude Error	%	10
Frequency Range	Hz	1 to 10000
Flatness (Typical)	dB	± 3

1.2.5 Power

Input		105-125V 50-60Hz 210-250V 50-60Hz
Power Consumption	Watts	7 max.
Connector		3 wire detachable

1.2.6 Environment

Temperature		
Operating	°C	0 to 70
Storage	°C	-20 to 85
Humidity	%	10 to 90

1.2.7 Physical

Weight	pounds	3 (1.36 kg)
Size	inches	2.25W x 5.75H x 7.0D

1.2 TECHNICAL DATA (continued)

1.2.8 Accessories Furnished

Model	Description	Quantity
1508	Power Cord	2
1511	Output Cable, 1 meter	1

Accessories Optional

Model	Description	Quantity
1511sp...m	Output Cable, length(X) meter	As required
1721	Input Adaptor 10-32 to BNC	4

1.3 CONCEPT EXPLANATION

The Quartz Transducer

Quartz Transducers convert mechanical variables of pressure, force, and acceleration into electrical charge. The charge delivered by the transducer is proportional to the force acting on the quartz crystal. Accordingly, the measurement of a mechanical variable is always derived from a force measurement. For the transducer, the calibration factor is given in picoCoulombs per mechanical unit (i.e. pC/psi, pC/lb, pC/g, etc.)

The Low Impedance, PIEZOTRON®* Transducer

A miniature electronic circuit built into the transducer housing converts the high impedance charge signal generated by the quartz crystal into a high-level voltage signal, with an output impedance below 100 Ohms. This allows the use of a single, conventional, coaxial or two-wire cable between the transducer and a remotely located power coupler. Both the power to and signal from the transducer are transmitted over this two-wire system.

Piezotron Transducers are ideally suited for applications where long or moving cables are required or in high humidity or other contaminated atmospheres. They eliminate all the high impedance problems normally associated with piezoelectrics by providing a high level voltage signal with low impedance and good frequency response. The calibration factor for these transducers is given in millivolts per mechanical unit (i.e. mV/psi, mV/lb, mV/g, etc.).

*PIEZOTRON® is covered under U.S. Patent Nos. Re28596 & 3,599,747

PIEZOTRON Measuring System

A PIEZOTRON measuring system consists of the transducer (with built-in electronic circuit), a coupler, a readout instrument and the appropriate connecting cables.

A means of supplying electrical power to the transducer is necessary. The Piezotron concept is to power the transducer amplifier and receive an output signal over the same pair of wires. Normally coaxial cable is used with one side referenced to ground. The transducer amplifier is powered by a constant current source, typically 4 mA, although some instrumentation setups go as low as 500µA or as high as 18 mA. The amplifier within the transducer will produce a quiescent bias voltage of typically 11 Volts. As the transducer is exposed to stimuli, the instantaneous voltage at the transducer output will vary. The coupler, in its simplest form, is a constant current source and a C-R network to remove the 11 Volt DC component and pass only the AC signal.

1.4 FUNCTIONAL DESCRIPTION

Figure 1-2 shows a simplified block diagram of the Model 5122 Four Channel Coupler. The main components are the four Piezotron power supplies and the amplifier circuits.

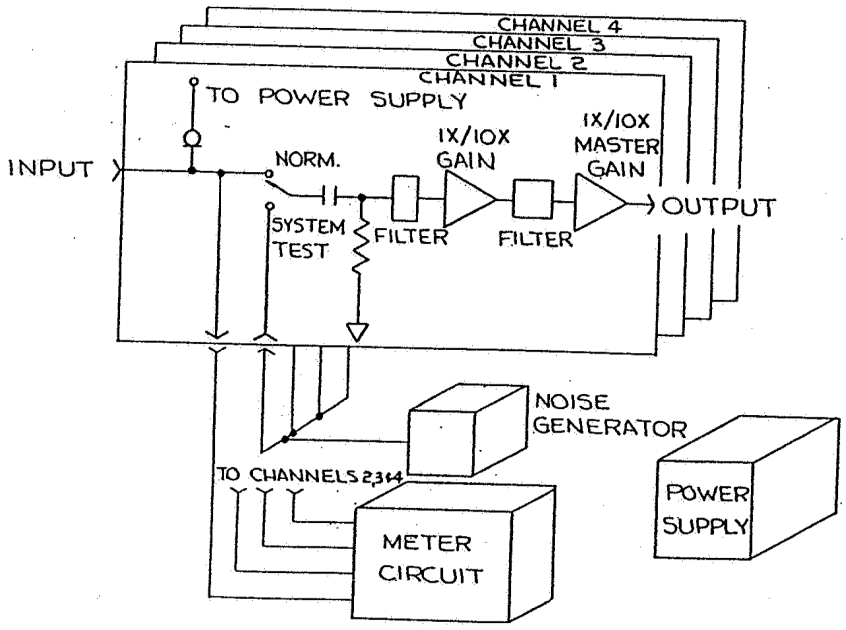


FIGURE 1-2 BLOCK DIAGRAM

1.4 FUNCTIONAL DESCRIPTION (continued)

In addition to the basic coupler function, the Model 5122 adds two gain stages to each channel as well as several system check functions to ensure data integrity. The two gain stages are cascaded amplifiers with switch selectable gains of 1X or 10X each. By selecting 10X on each stage simultaneously, the effective gain becomes 100X. Built-in filtering at each stage limits frequency response from 1 Hz to 100KHz ±5%. This filtering is desirable to reduce overall system noise.

The Model 5122 Four Channel Coupler includes two built-in test features. First, each channel may be tested for the presence of the DC bias voltage produced by transducer amplifiers. When each channel test pushbutton is pressed, the input voltage is compared by two level detectors and a logic circuit. If the voltage on the input is greater than 2.7 Volts and less than 21 Volts, the front panel LED will illuminate green. If the input voltage is less than 2.7 Volts or greater than 21 Volts, the LED will illuminate red. The bias voltage test is a reasonable test of the transducer functionality and cable integrity.

The second system test feature, unique to the Model 5122, is the system test. This test switches the amplifier input from the transducer output to a white noise generator. This noise generator is built into the Model 5122, as shown in Figure 1-2. A computer or FFT analyzer will give an answer of one when computing the ratios between any two of the channels.

SECTION II

OPERATION

2.1 INSTALLATION

The coupler may be placed in any secure site where it is protected from temperatures or environment in excess of specification. Signal cable (and in-line impedance converters) should be routed so as to avoid unnecessary flexing and damage.

Up to six 5122 Couplers can be mounted in a standard 19 inch rack adapter or operated as a tabletop/benchtop instrument.

2.2 HOOK-UP

a) Connect a PIEZOTRON transducer or the output from an in-line impedance convertor to the input receptacle of the coupler using cable Type 1514 or cable Type 1516 with a 1721 adaptor. (NOTE: Cables 1631 and 1635 may be used in place of Cables 1514 and 1516, respectively.)

The Model 5122 contains four constant current sources, each rated at 4mA. These current-controlled sources provide the power to the transducer impedance converter. The single coaxial cable simultaneously carries the operating power to the impedance converter and transmits the signal from it.

b) Connect a line cord Type 1508 to the rear panel line connector and to the appropriate power outlet (110 on 220VAC should be used as indicated on the back of the coupler).

c) Connect the readout equipment to the output receptacle using cable Type 1511 or suitable BNC-UG58A/U mating connector for equipment.

2.3 CIRCUIT INTEGRITY CHECK

By depressing any one of four momentary pushbuttons, the bias voltage and hence the signal integrity may be checked. The 5122 uses a two color LED to indicate one of these conditions:

a) A low reading of 0-3 volts indicates a short in the input circuit. The LED will light RED. (Exception: the 8614A500 and 8616A500 have a normal bias level of 2-3 volts).

b) A reading of 3-20 volts indicates normal operation. The LED will light GREEN.

2.3 CIRCUIT INTEGRITY CHECK (continued)

c) A reading in excess of 20 volts indicates an open input circuit. The LED will light RED.

Thus a green light indicates an operating channel, a red light tells the user to check for opens or shorts.

2.4 SYSTEM TEST

Useful for system integrity checks, this feature may be used with FFT analyzers. Since the FFT will compute the transfer function between channels, a test of the system is possible . The system test pushbutton is a latching pushbutton which must be in the out position for normal operation. When the button is in, all four channels have the transducer signal disconnected from the amplifier. The four transducers will remain powered by the 5122 and the circuit integrity check will still function. All four channels are fed a "white" noise signal. For normal use, the system test button is first depressed. Next the FFT is cycled and when completed, should give an answer of one (or ten depending on gain setting of the 5122) over the frequency range. The coherence function should also equal one.

2.5 CONTROLS

The 5122 is equipped with five gain controls, one individual for each channel, one through four, and a fifth master (multiplier) control. Each gain control is 1X or 10X. By cascading amplifiers, gain to 100X may be realized. When the multiplier button is out, the individual channel gains are switched between 1X or 10X. When the multiplier is in the in position, the individual channel gains are switched between 10X and 100X. It is not possible to have 1X and 100X gain settings within the same unit. Care should be used when using gain, since the electrical noise from the transducer is multiplied by the gain setting, and a large signal from the transducer will cause clipping.

SECTION III

CALIBRATION AND MAINTENANCE

3.1 FUSE REPLACEMENT

The fuse located on the bottom circuit board in the Model 5122 Four Channel Coupler is accessed by removing the unit side cover. A 5x20 mm fuse should be replaced only with the same type and rating of the original fuse. The correct fuses are listed below.

Line Voltage	Fuse Type	Part Number
100	63mA time lag	315-1102-005
220	32mA time lag	315-1102-002

The line voltage of the unit is selected by jumpers on the main printed circuit board. Changing the line voltage is not recommended in the field. When it is desired to change the line voltage, it is recommended that the unit be returned to Kistler Instrument Corporation.

3.2 CURRENT ADJUSTMENT

The constant current supplies for the four channels are factory set at 4 mA each. User adjustment of these supplies is not recommended as instrument or transducer damage may result from improper procedures. Current settings other than 4 mA are available at the time of order. The unit should be returned to the factory for adjustment or to change to another current level. The current may be tested by connecting a DC ammeter directly across the transducer inputs.

3.3 CALIBRATION

All gain settings within the Model 5122 are fixed by precision resistors and do not require calibration. Units that require repair beyond fuse replacement should be returned to the factory.

Warranty

The equipment supplied by KISTLER INSTRUMENTE AG WINTERTHUR is covered by a warranty against faulty material and workmanship.

This warranty extends 12 months from delivery date.

When submitting warranty claims, the items of equipment concerned are to be delivered to the manufacturer's works or to the regional distributor free of all charges, and full details should be stated as to the nature of the claims.

Settlement of warranty claims may be effected, at the manufacturer's discretion, either through reconditioning or replacement of the faulty items, or through a credit note to their value.

Items of equipment damaged as a result of improper use are not covered by the warranty.

Our responsibility under the warranty is strictly restricted to the above provisions and we specifically decline any liability for damages incurred consequent upon the use or operation of our equipment.

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