Manual

Prologger Field Termination Strip &

Input/Output Modules

Models 7100E, 7121A and 7121C

Revision History

File name / Revision	Date	Authors & Change Details	Checked/ Approved
Previous version BX	2004	RS/ JH	MS
Unidata Manual - 7100 7121 Macro Data Logger FTS & Isolated Input Module Issue 2.0	2007	AB/CB/JH/MS/KC	MS
Unidata Manual - 7100 7121 Macro Data Logger FTS & Isolated Input Module Issue 3.0	2013	MP	MS
Unidata Manual - 7100E Prologger FTS amd IO Modules Issue 4.0.docx	03 06 14	IM/CB Update	MS

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1.0 INTRODUCTION

This supplement explains how to use the Prologger Field Termination Strip (model 7100E).

A FTS extends a data logger's (model 7001E Prologger) input signal connections to rows of numbered screw terminals, simplifying on-site installation of a data logging system (particularly for complex applications).

This supplement also includes a detailed description of how to install the model 6103M-L Mounting Frame, and instructions for using signal conditioning modules (I/O Modules) which can be attached to the FTS. These modules are:

- Model 7121A Isolated Interface Input Module
- Model 7121C 4-20mA Current Loop Isolator

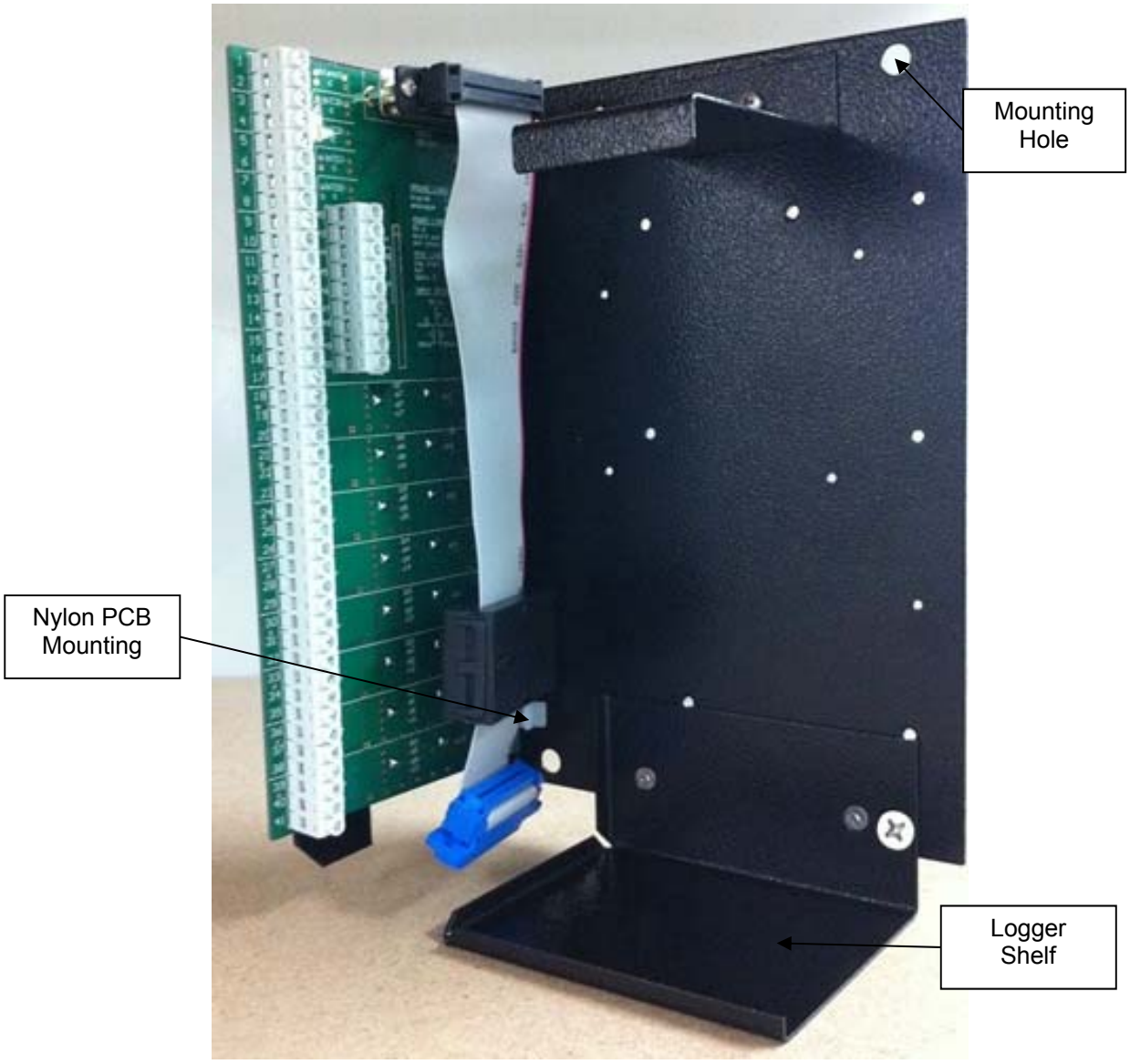
1.1 Introducing the Prologger Field Termination Strip

The Prologger Field Termination Strip (Model 7100E) was developed to take advantage of the technical advancements offered by the Model 7100E Prologger. It's features are:

- More links for signal conditioning and custom configuration.
- More terminals for scan synchronised power, continuous Micro power and continuous external power.
- Built-in facility to add special purpose modules.
- An extra three terminals for custom use.
- An Analog Ground is provided for all channels

2.0 INSTALLATION OF FRAME AND STRIP

This frame is designed to be mounted inside a Model 6701 Weatherproof Enclosure.



Model 6103E FTS and 6103M-L Mounting Frame

The frame provides:

- a shelf on which the data logger is held in place
- Holes for nylon PCB mountings for the Termination Strip
- 4 x 6 mm mounting holes (at each corner) for the frame to be mounted In 6701 waterproof enclosure

3.0 TERMINATIONS

This section provides a table and a diagram listing each termination on the Prologger FTS. The diagram also shows the locations of signal conditioning and the table below lists each termination. It includes a brief description, the corresponding channel used in Starlog Software, and the corresponding pin in the prologger input signals connector.

Terminal	Description	Channel	Pin
1	External power input		16
2	Power ground		34
3	16 bit counter (20kHz)	C3	30
4	Digital ground		28
5	16 bit counter input (3kHz)	C2	12
6	Digital ground		28
7	16 bit counter input (3kHz)	C1	29
8	Digital ground		28
9	16 bit counter (20kHz)	C0	11
10	Digital ground		28
11	High speed synchronous Serial Port Data 0 TTL level Input / Output	S0-S7	32
12	High speed synchronous Serial Port Clock 0 TTL level output		14
13	Digital ground		28
14	High Speed Synchronous Serial Port +5V Sync		18
15	High Speed Synchronous Serial Bus Data 1 TTL level input and output	S8-S15	31
16	High speed synchronous serial bus Clock 1 TTL level output		13
17	Digital ground		28
18	A7 Input +ve, single and differential	A7	5
19	ANALOG Ground		1
20	A15 +ve single (A7 -ve differential)	A15	9
21	A6 Input +ve, single & differential	A6	23
22	ANALOG Ground		1
23	A14 +ve single (A6 -ve differential)	A14	27
24	A5 Input +ve, single & differential	A5	4
25	ANALOG Ground		1
26	A13 +ve single (A5 -ve differential)	A13	8
27	A4 Input +ve, single & differential	A4	22
28	ANALOG Ground		1
29	A12 +ve single (A4 -ve differential)	A12	26
30	A3 Input +ve, single & differential	A3	3
31	ANALOG Ground		1
32	A11 +ve single (A3 -ve differential)	A11	7
33	A2 Input +ve, single & differential	A2	21
34	ANALOG Ground		1
35	A10 +ve single (A2 -ve differential)	A10	25
36	A1 Input +ve, single & differential	A1	2
37	ANALOG Ground		1

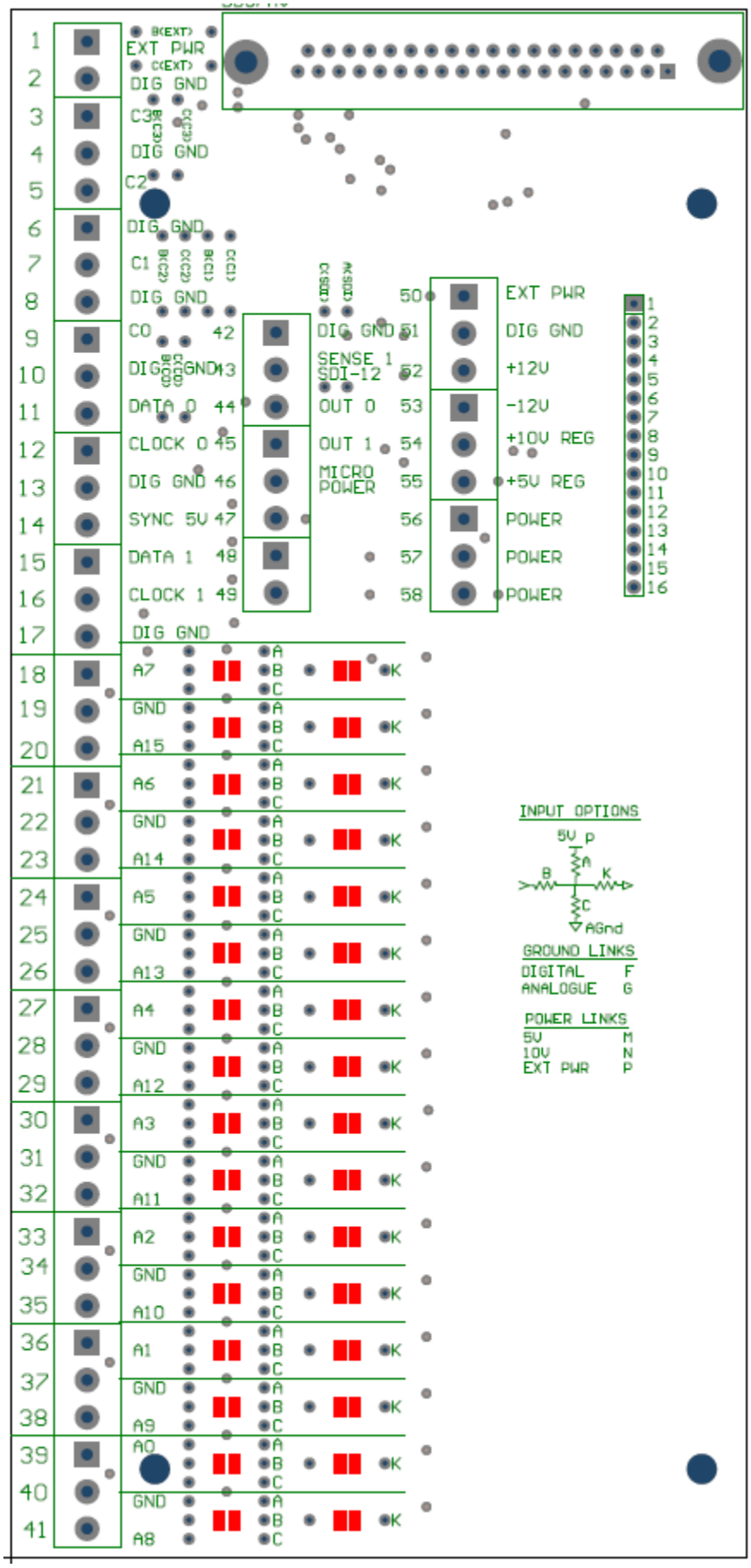
Terminal	Description	Channel	Pin
38	A9 +ve single (A1 -ve differential)	A9	6
39	A0 Input +ve, single & differential	A0	20
40	ANALOG Ground		1
41	A8 +ve single (A0 -ve differential)	A8	24
42	Digital Ground		28
43	Sense 1/SDI-12		19
44	Control, open collector output, 30V max, 100mA drive 5us -250ms pulse width	Out 0	33
45	CMOS output, HSIO Sync/5us -250ms pulse	Out 1	15
46	+6V continuous power for external instruments (1mA maximum)	Micro Power	17
47	Available terminals		
48	Available terminals		
49	Available terminals		
50	2nd external power input		16
51	Power ground		34
52	+12V unregulated power source		37
53	-12V unregulated power source		36
54	+10V regulated power source		35
55	Scan synchronized +5V regulated power source		18
56	User assignable power terminals		
57	User assignable power terminals		
58	User assignable power terminals		

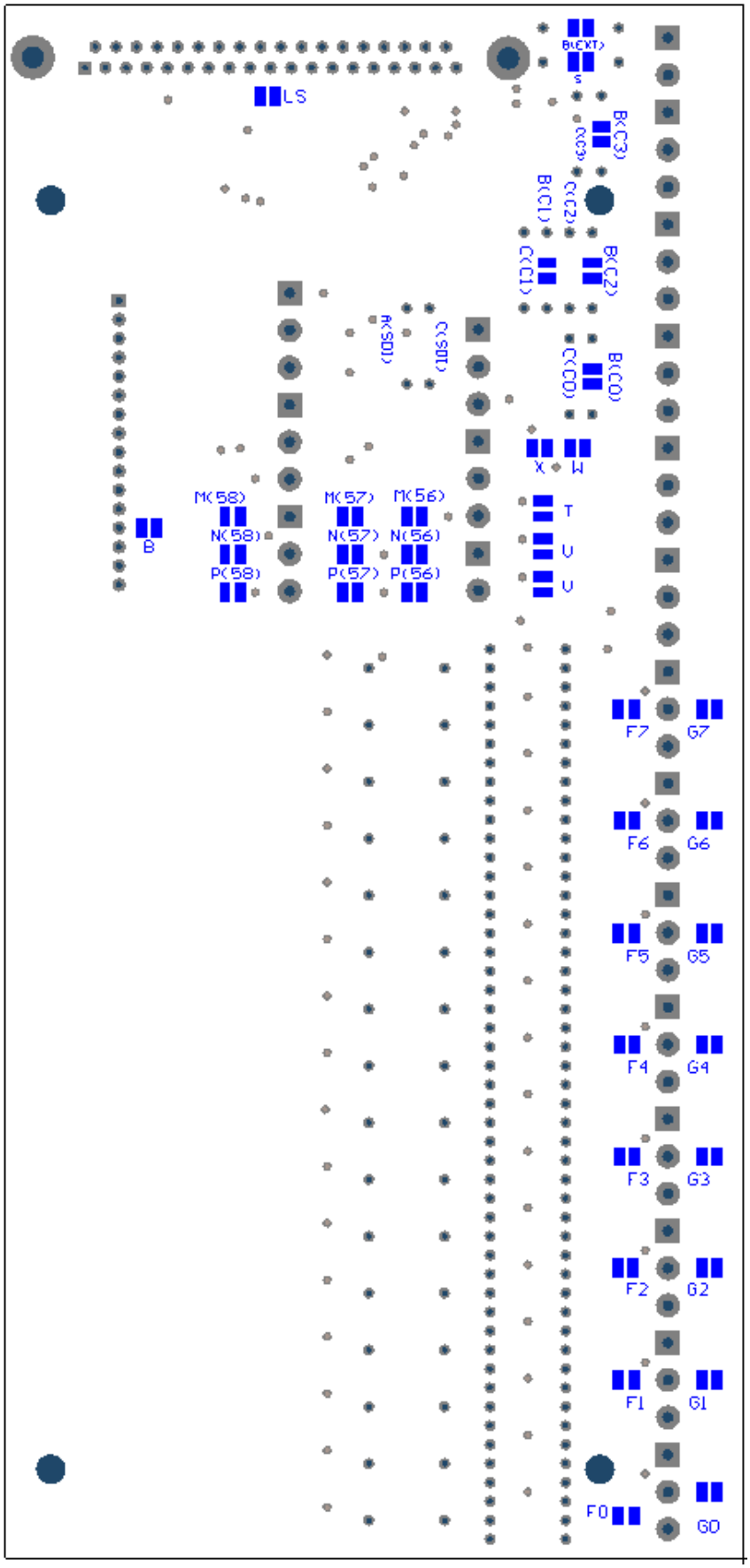
3.1 Special Purpose Modules

Hole	Description
1	Clock 0
2	Data 0
3	Sense 1/SDI-12
4	Data 0 (Terminal 11) via link X
5	Micropower
6	Out 0
7	External power (Terminal 1) via link B(ext)
8	Out 1/HSIO Sync
9	5Vp (scan synchronised 5V pulse from logger)
10	Digital Ground
11	Analog Ground
12	Counter 0 (C0) (Terminal 9)
13	Counter 0 (C0) via Link B
14	Terminal 47 via link T
15	Terminal 48 via link U
16	Terminal 49 via link V

3.2 Links

Link	Description
LS	Sense 0 (Log Start, pin 19) connected to Ground
A	Pull up to +5vp
B	Divider Series Resistor
C	Pull down to Digital Ground
F	Ax ground to Digital Ground
G	Ax ground to Analog Ground
K	Ax+ terminal to Ax input of Logger
M	Assignable power terminal to +5V scan synchronized power supply
N	Assignable power terminal to +10v regulated power supply
P	Assignable power terminal to external power supply
S	S.P.M. hole 14 to external power supply
T	Terminal 47 to S.P.M. Hole 14
U	Terminal 48 to S.P.M. Hole 15
V	Terminal 49 to S.P.M. Hole 16
W	Data 0 Terminal to Data 0 pin of Logger
X	Data 0 Terminal to S.P.M. Hole 4


EXT PWR
DIG GND
C3
DIG GND
C2
DIG GND
C1
DIG GND
CO 42
DIG GND 43
DATA 0 44
CLOCK 0 45
DIG GND 46
SYNC 5V 47
DATA 1 48
CLOCK 1 49
DIG GND
DIG GND 51
SENSE 1
SDI-12 52
OUT 0 53
OUT 1 54
MICRO
POWER 55
56
57
58
50
EXT PWR
DIG GND
+12V
-12V
+10V REG
+5V REG
POWER
POWER
POWER
A7
GND
A15
A6
GND
A14
A5
GND
A13
A4
GND
A12
A3
GND
A11
A2
GND
A10
A1
GND
A9
A0
GND
A8
INPUT OPTIONS
5V p
A
B
K
C
AGnd
GROUND LINKS
DIGITAL F
ANALOGUE G
POWER LINKS
5V M
10V N
EXT PWR P

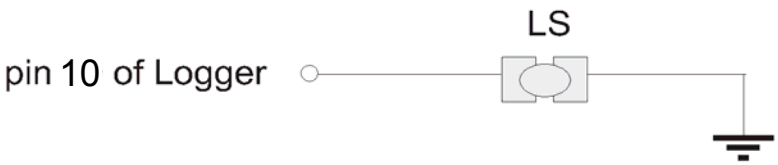

LS
B(EXT)
B(C3)
B(C1)
C(C2)
C(C1)
B(C2)
A(SDI)
C(SDI)
C(CO)
B(CO)
X
W
T
U
V
M(58)
N(58)
P(58)
M(57)
N(57)
P(57)
M(56)
N(56)
P(56)
B
F7
G7
F6
G6
F5
G5
F4
G4
F3
G3
F2
G2
F1
G1
F0
G0

4.0 SIGNAL DESCRIPTION

The Prologger accepts many different kinds of signals. The Field Termination Strip has terminals for each input and output. In addition, using links on the field termination board, most terminals can be customised extending the range of possible inputs and outputs. This section describes each signal possible using the FTS, its links and terminals

4.1 Log Start Sense (Link LS)

Normally, the data logger only begins to record when an instrument is connected to the input signals. To sense this condition, there is a link (LS) on the back of the FTS which connects Pin 10 (Log Start Sense 0) to ground. It is normally connected so that when the FTS is plugged into the logger, Sense 0 is connected to ground. This causes the logger to begin operating.



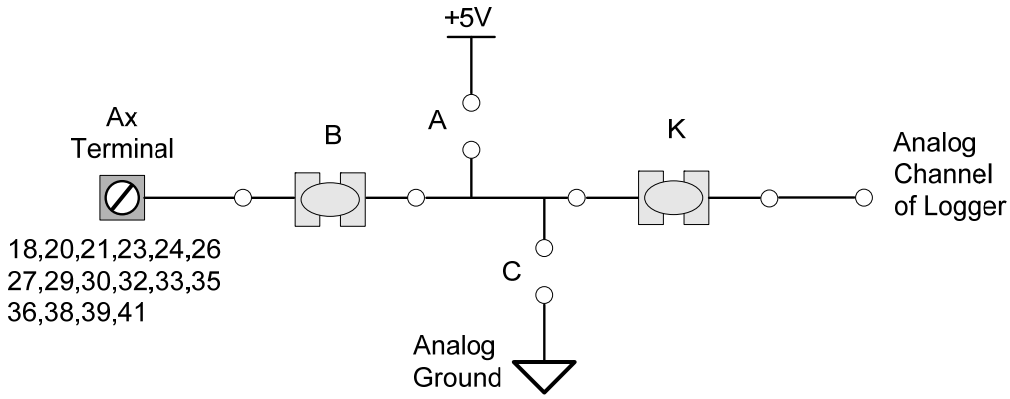
4.2 Analog Inputs

Terminals labelled A0 – A15 can be logged as low resolution values (8 bit data) or high resolution values (16 bit data). Their usage depends on how you refer to the input using Starlog V4 software. The software interprets analog inputs as low resolution channels when you refer to them as a0 – a15 and high resolution channels when you refer to them as A0 – A15.
Analogue inputs can be single ended or differential. All Analog channels are programmable to carry a signal in one of four ranges:

- -5.00 to +5.00V (155uV per bit)
- -500 to 500mV (15.5uV per bit)
- -50 to 50mV (1.55uV per bit)
- -5 to +5mV (155nV per bit)

Input impedance (when logger is active) is greater than 1MΩ. Load impedance (when logger is inactive) for signals less than 500mV is greater than 1MΩ while for signals greater than 500mV is 10kΩ. The recommended source drive impedance is <10 kΩ.

Analog signals can be conditioned using the following links on the FTS.



Link A - Pull-up to +5V

This location is used to install thermistor reference resistors or to convert an analog channel for ON/OFF sensing.

Link B - Protection Series Resistor or Protection Series Resistor

This location is used as part of a voltage divider network (for example, with Model 6104A/B/C/D Voltage Resistors.) Can also be used for a series resistor or a filter resistor on counter channels.

Or can be used to install a resistor in series with the input signal to prevent excessive external power being applied to the logger. Used for externally powered signals (e.g. voltages, active pulses).

Link C - Pull-down to GND

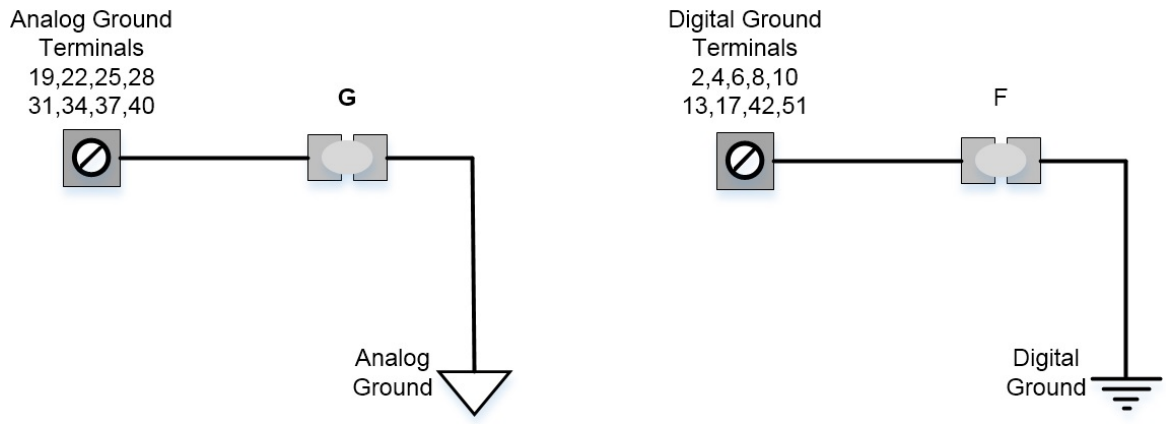
This component location is used to install a filter capacitor (for pulse inputs) or voltage divider resistor (for voltage attenuation).

Link K - Protection Series Resistor or Direct Input

This location is used to install a resistor in series with the input signal to prevent excessive external power being applied to the logger. Used for externally powered signals (e.g. voltages, active pulses).
By default this link is installed to connect the data logger channels to their associated Terminals when an isolation module is not being used to pre-condition the input signal.
The 'K' link is removed when an isolation module is fitted.

4.3 Analog and Digital Ground

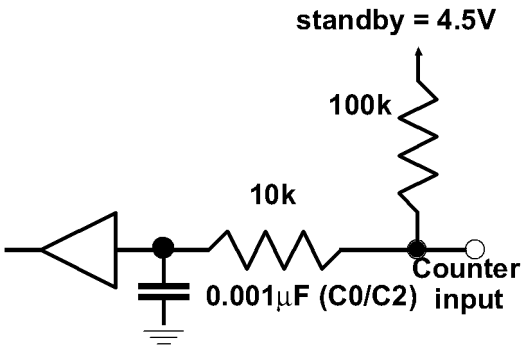
Terminals labelled Ground can be used as Analog or Digital Grounds depending on which links are installed (see diagram).



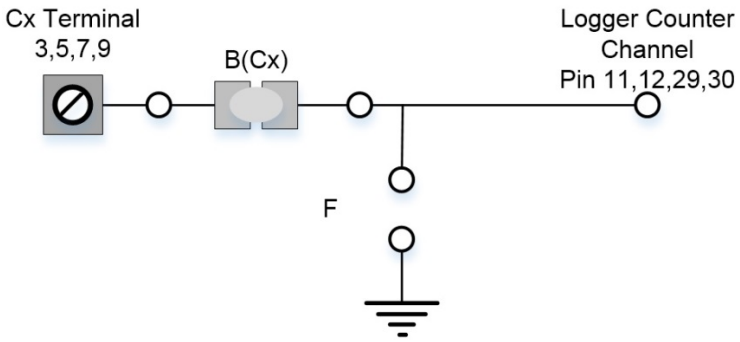
4.4 Counters and Sense Inputs

Counters are CMOS inputs, suitable for 3kHz or 20 kHz potential free contacts, open collector outputs or 0–5V to 0–12V DC digital signals.

Maximum pulse rate to C0 & C3 is 20 kHz, and to C1 & C2 is 3kHz. Pulse rates must also be related to scan rate, to ensure counters do not overflow before being scanned by the Logger.



Links B and **F** can be used if attenuation or extra filtering is required.



4.5 Outputs

There are two outputs:

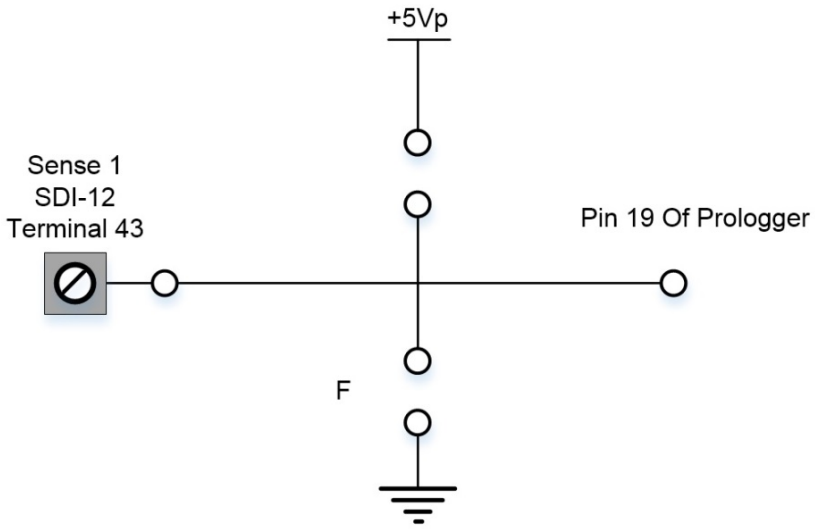
Out 0	Open Collector Output	Terminal 44
Out 1	CMOS Output	Terminal 45

The Open Collector Output (Out 0) is rated at 100mA and can be used to switch on/off relays controlling experiments.

4.6 SDI-12 Serial Digital Interface

The Prologger supports the SDI-12 standard for serial data interchange between the logger and intelligent instruments.

SDI-12 is implemented as an alternate use of Sense 1 (Terminal 43). Up to ten SDI-12 compatible instruments may be connected onto this bus. Programming the SDI-12 interface is supported in Starlog Software V4.

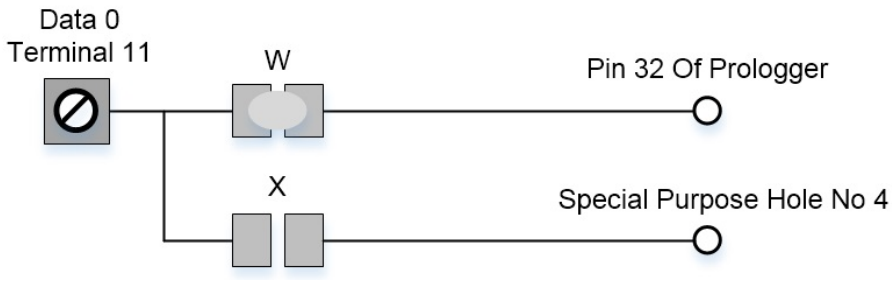


4.7 High Speed Serial Input / Output Ports

There are two serial input ports:

Port 0	Terminal 11 (Data 0)	s0 - s7
	Terminal 12 (Clock 0)	
Port 1	Terminal 15 (Data 1)	s8 - s14
	Terminal 16 (Clock 1)	
	Terminal 14	+5V sync signal

The Data 0 Terminal can also be linked (via **Link X**) to hole 4 of the Special Purpose Modules.

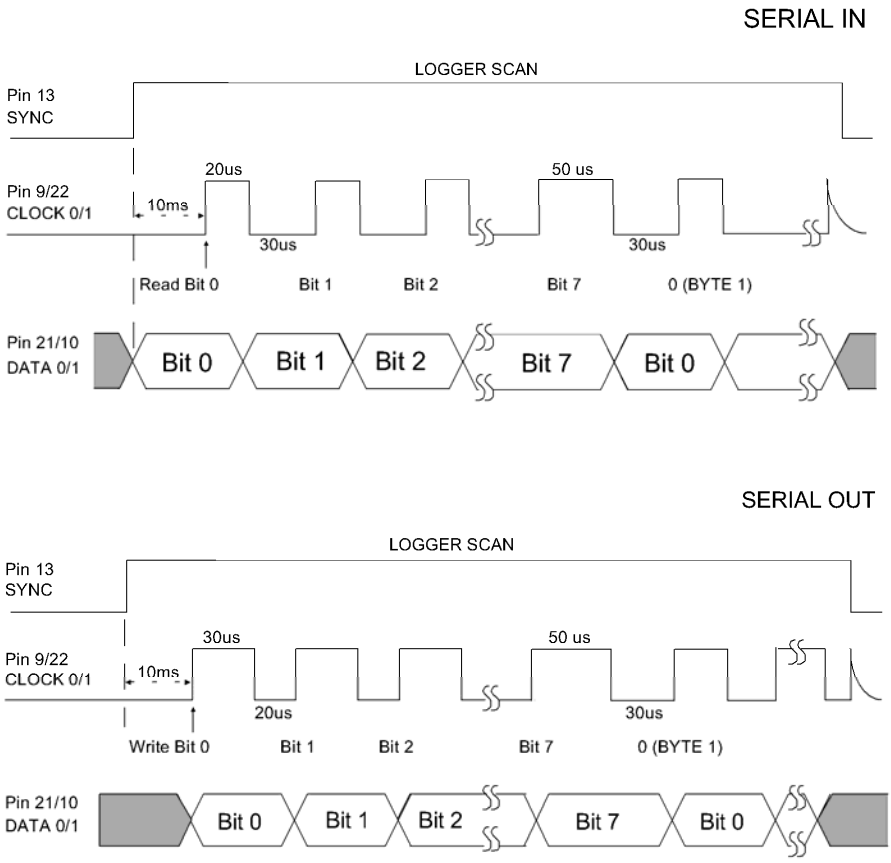


Each logger scan, the High Speed Serial Channels are read. The Sync signal (Terminal 14) is used to indicate to the remote equipment that a logger read scan is about to begin. This signal is usually used to load the serial shift register(s) in the remote equipment in preparation of being read.

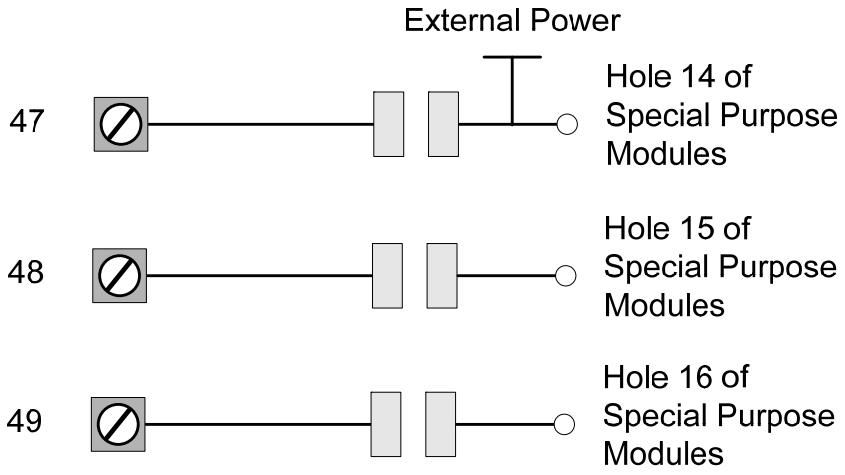
Note: The first data bit LSB must be present on the Data (0/1) signal within 7ms after the Sync signal.

The serial transfer rate is 50 microseconds per bit with a 30 microsecond gap between each byte.

Note: Every 1 millisecond a logger interrupt sequence adds a 50 microsecond delay to the serial transfer sequence. Transfer starts with the least significant bit of the least significant byte and each clock reads the next most significant bit.



4.8 Available Terminals (47, 48, 49)



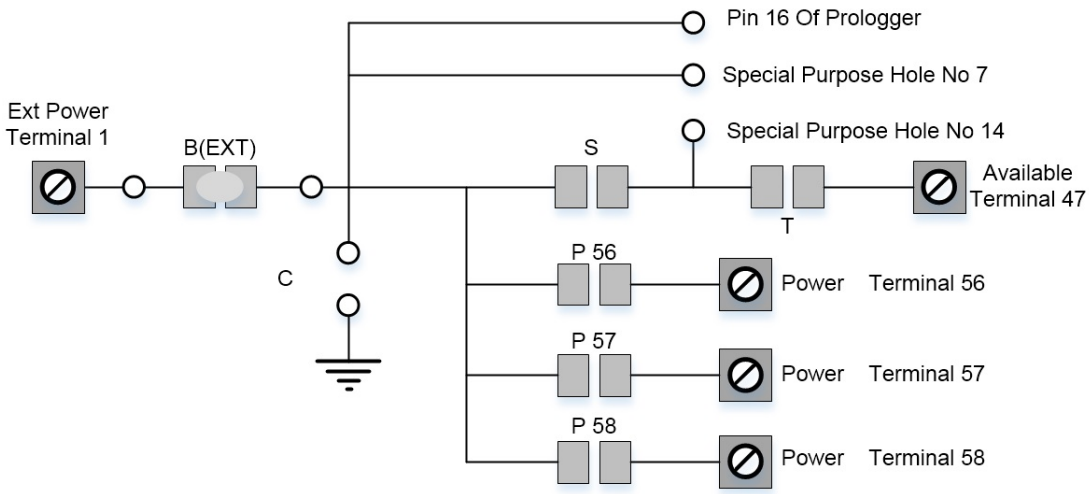
4.9 External Power

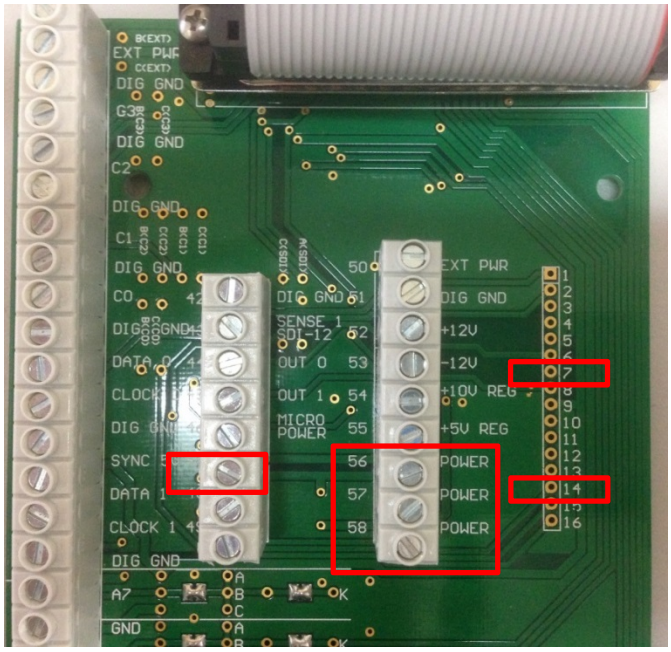
There are several ways to use External Power via the Field Termination Strip. The external power may be used with an alkaline battery pack as a backup power source or simply on its own.

The External Power circuit has been designed so that more than one external power source can be used at the same time. Power can be made available to the Logger, Several power terminals, the I/O modules and special purpose modules

IMPORTANT - The supply voltage to the data logger must be maintained at all times to ensure correct logger operation and data integrity. Voltage to the logger must be in the range of 9V to 20V and able to supply a load of 100mA peak

The diagram below shows the External Power circuit.





To install an External Power Supply:

1. Connect +ve to Ext. Power Terminal 1.
2. Connect -ve to Terminal 2 (or any other Digital Ground).
3. Check that Links are installed or removed depending on how the installation is using the power

4.9.1 Back-up Power, Power Supply for Data Logger

Power is supplied from Ext. Power Terminal 1 to Prologger pin 16 when **Link B(EXT)** is installed. **Link C** can be used with a zener diode to regulate the voltage.

4.10 Instrument Power Sources

There are several options for providing power via the Field Termination Strip to instruments in a data logging system. The following connections can be used to provide power:

Instrument Power Sources	Terminals
Pwr Terminals	50,56,57,58
User Power Source (UPS) +5V regulated, scan synchronised	14,55
Micropower +6V unregulated, continuous	46

4.10.1 User Power Source

The User Power Source (UPS +5V regulated, scan synchronised) is intended to power instruments associated with the data logger. The full load output capability is 250mA in pulsed mode.

The UPS switches on and off (synchronised with the logger scan). Any loads connected to these outputs will contribute to the drain on the data logger battery (and reduce battery life).

The UPS may be programmed to switch on prior to the logger scan by setting the Prescan in the prologger configuration table.

The UPS is immediately available through Terminals 14, 55 and via hole 9 of the Special Purpose Modules. It is also available through the Ax Terminals via **Link A**.

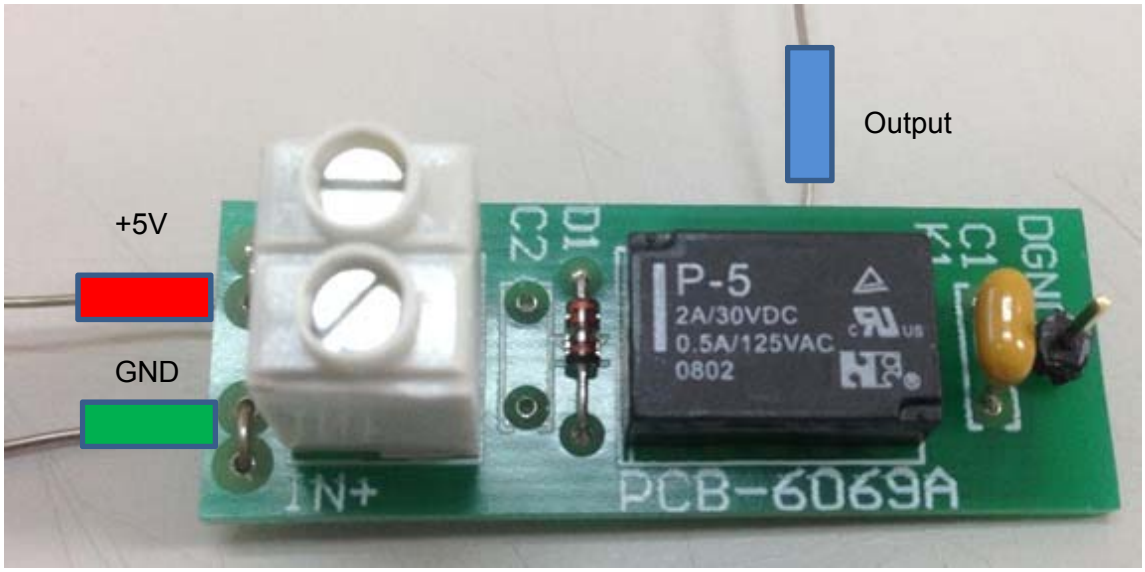
4.10.2 +6V Unregulated, Continuous Micropower

The Micropower source provides +6V unregulated, continuous power for external instruments. The full load output capability is 1mA.

Micropower is immediately available through Terminal 46 and via hole 5 of the Special Purpose Modules.

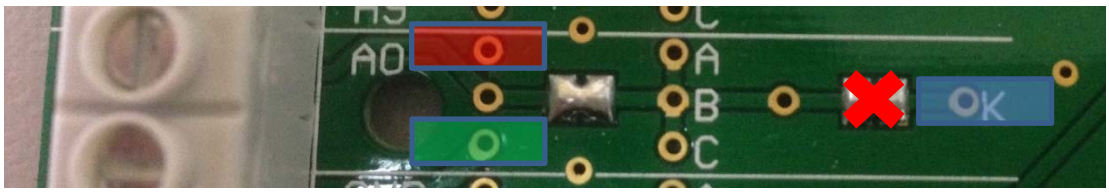
5.0 PRO-LOGGER ISOLATED INPUT MODULE

5.1.1 Model 7121A – Isolated Input Module



The isolated input module 7121A provides isolation for transducers which cannot be directly connected to the Logger, e.g., current loop transducers powered from separate supplies. Sixteen modules can be filled onto the 7100E FTS

1. Remove link K and install module as:



2. Connect signals to terminals on the isolated module as indicated
3. A loop resistor may be soldered onto the Module between the terminal block and the relay at location C2 (250 Ohm for 4-20mA signals)
4. Solder a wire to the DGND pin and connect this to terminal 42 on FTS.
5. Define the Scheme using Starlog Software V4

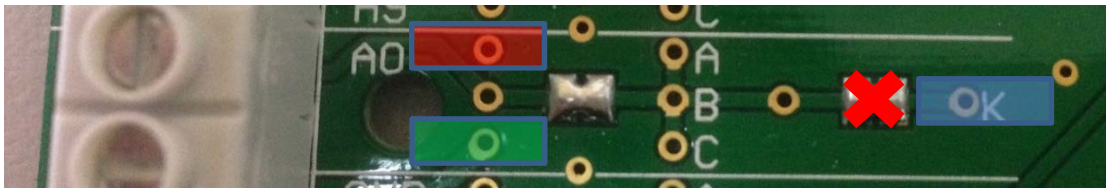
Specifications

Input Signal:	Single-ended or differential, 0 to ± 5V DC
Output Signal:	Isolated input signal, not amplified
Isolation:	Flying capacitor, relay isolated
Power:	5V DC, 25mA from Logger

5.1.2 Model 7121C – 4-20mA Current Loop Isolator

4-20mA Current Loop Isolator isolates a Prologger from the current loop and converts the signal to a voltage compatible with the logger. The isolator is designed for very low power consumption, provided by the logger and the current loop.

1. Remove link K and install module as:



2. Connect signals to terminals on the isolated module as indicated
3. Define the Scheme using Starlog Software V4

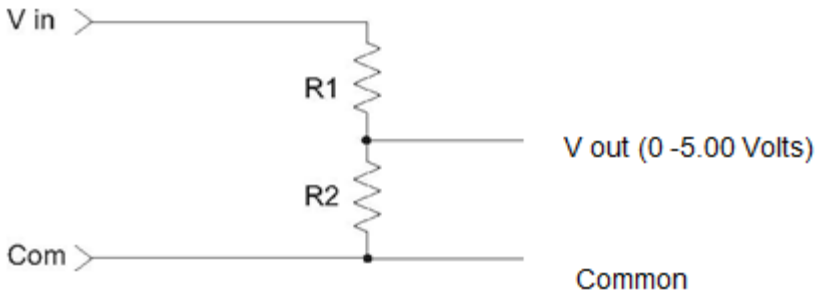
Specifications

Input Signal:	0 to 20mA
Output Signal:	0.5 to 2.5V (factory calibrated)
Non Linearity:	0.25% maximum
Isolation:	>300V
Operating Temp.:	-20°C to 60°C
Power:	<1mA from Logger's 5V User Power Source

5.0.3 Model 6104A/B/C/D – Voltage Divider

Do the following:

1. Remove the solder Blob from link B
2. Insert 100kOhm resistor in link B
3. Insert second resistor in Link C
4. Do not remove link K



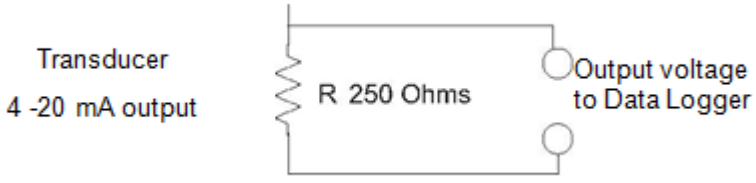
The formula for calculating voltage divider resistors is:

(Vin) / (Vout) = (R1+R2) / R2

5.0.4 Model 6104J – Current Loops

Do the following:

1. Fit the loop reference resistor to Link C (250 Ohm)
2. This will then convert a 4-20mA signal to 1000mV – 5000mV which is then readable by the Pro-logger
3. Leave links B and K connected
4. Up to sixteen current loops can be measured by the Pro-logger. To use more than one current loop device, it is recommended that you use an isolated input module (7121A or 7121C) to isolate the device from the logger and avoid errors caused by ground loops.
5. If isolation modules are not used please ensure that it is permissible to common all current loop grounds at the Data logger end.



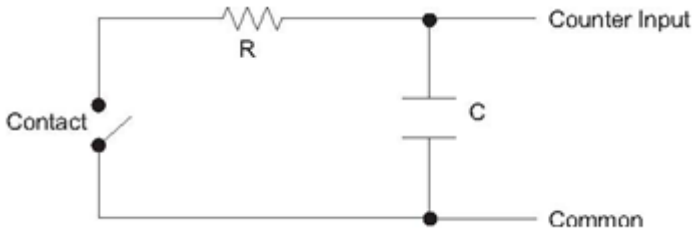
5.0.5 Input Filtering for Counter Inputs

All counter inputs are filtered to remove noise and unwanted signals.

For certain types of input (normally relay contacts) the internal filtering may not be sufficient.

A slowly actuating relay contact may have sufficient “contact bounce” to produce errors usually in the form of a larger number of pulses recorded than were actually applied.

The problem can solved by using an external filter circuit. The form of an external filter used will vary depending on maximum pulse rate to be recorded and the severity of the bounce problem, but would typically take the form of a capacitor across the contacts with a series resistor as demonstrated in the diagram below.



The value of C would typically vary from 0.01uF to 1uF depending on the application.

The resistor R may not be required for small values of C and robust contact types but would typically be 100 Ohm to 1k Ohm.