



10164

Sampler Control Cable for use with
Isco and Sigma Autosamplers



Please read first

About this manual

Please note that this manual was produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this. In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users. Differences include the U.S. standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. Please note, however, *that when a power supply adapter is ordered from Campbell Scientific it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials (antennas) may also not be applicable according to your locality. Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered.

Recycling information for countries subject to WEEE regulations 2012/19/EU



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the product's life should be removed from the product and also be sent to an appropriate recycling facility, per [The Waste Electrical and Electronic Equipment \(WEEE\) Regulations 2012/19/EU](#). Campbell Scientific can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories. For further support, please contact Campbell Scientific, or your local agent.

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1. General

The 10164 sampler control cable enables a data logger to trigger an Isco, American Sigma, or connector-compatible autosampler. Through this cable, the data logger can inhibit the sampler from running its programmed sampling routine and sense and record when the sampler indicates that it has taken a sample. Each of these functions is independent of the others and may be combined as desired.

2. Specifications

Sampler connection:	Mil-spec, 6-pin circular connector (shell size 14)
Data logger connection:	Pigtail with individual conductors
Current drain:	< 1 mA; consult the specifications of the connected sampler to determine its power considerations
Cable length:	50 ft standard; 1000 ft maximum (see Cable length considerations [p. 1])

2.1 Cable length considerations

In most applications, the 10164 cable connects the data logger to a sampler residing in the same instrumentation shack. Therefore, a cable length of 50 ft or less is typically used.

Cable lengths up to 1000 ft are possible if the sampler supports long event markers. For example, the Isco-brand sampler has a 3 second event marker, which is an adequate duration for a 1000 ft cable length.

CAUTION:

The 10164 does not include surge protection. Therefore, longer cables need to be protected from surges in order to safeguard the system from electrical transients. A recommended method of doing this is to place the cable in a metal conduit and then bury the conduit at a depth of at least one foot.

3. Wiring

3.1 General wiring information

Figure 3-1 (p. 2) shows a schematic of the 10164 and Table 3-1 (p. 2) shows pin connector and wire functions.

Triggering sampler (p. 3), Sense sample event markers (p. 3), and Inhibit sampler program (p. 3) provide information about connecting the wires to a data logger. The data logger wiring depends on the function.

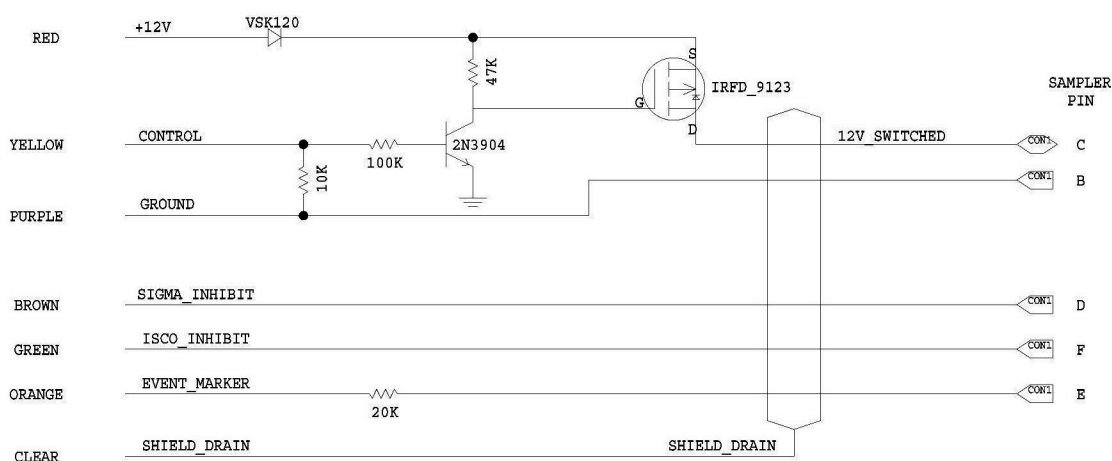


Figure 3-1. 10164 sampler control cable schematic

Table 3-1: Technical details of cable design		
Wire color	Via	Connector pin
Brown	Direct	D
Green	Direct	F
Purple	Direct	B
Yellow	Solid state relay circuit	None (controls C)
Red	Solid state relay circuit	C
Orange	20 kohm resistor	E
Clear	Cable shield	No connection

3.2 Triggering sampler

Table 3-2 (p. 3) shows the data logger connections required to trigger the sampler.

Table 3-2: Data logger wiring for triggering sampler				
Color	Description	CR800, CR850, CR1000, CR3000	CR500, CR510, CR10(X)	CR23X, 21X
Purple	Ground	G	G	⊥
Yellow	Control port	Control port (C1, C2,...)	Control port (C1, C2,...)	Control
Red	Power	12V	12V	+12
Clear	Shield	⊥	G	⊥

NOTE:

Insulate and tuck the unused wires out of the way.

3.3 Sense sample event markers

Table 3-3 (p. 3) shows the data logger connections required to sense the sampler events.

Table 3-3: Data logger wiring for sampler event marker				
Color	Description	CR800, CR850, CR1000, CR3000	CR500, CR510, CR10(X)	CR23X, 21X
Purple	Ground	G	G	⊥
Orange	Pulse	Pulse channel (P1, P2,...)	Pulse channel (P1, P2,...)	Pulse
Clear	Shield	⊥	G	⊥

NOTE:

Insulate and tuck the unused wires out of the way.

3.4 Inhibit sampler program

Some samplers run their own program that you might want to inhibit. The wiring for inhibiting the sampler onboard program depends on the program logic. Table 3-4 (p. 4) shows the wiring for Sigma samplers that require a control port to be set high to inhibit their onboard program.

Table 3-5 (p. 4) shows the wiring for Isco samplers that require a control port to be set low to inhibit their onboard program.

Color	Description	CR800, CR850, CR1000, CR3000	CR500, CR510, CR10(X)	CR23X, 21X
Purple	Ground	G	G	⏏
Brown	Control port	Control port (C1, C2,...)	Control port (C1, C2,...)	Control
Clear	Shield	⏏	G	⏏

Color	Description	CR800, CR850, CR1000, CR3000	CR500, CR510, CR10(X)	CR23X, 21X
Purple	Ground	G	G	⏏
Green	Control port	Control port (C1, C2,...)	Control port (C1, C2,...)	Control
Clear	Shield	⏏	G	⏏

NOTE:

Insulate and tuck the unused wires out of the way.

4. Programming

The data logger is programmed using either CRBasic or Edlog. Data loggers that use CRBasic include the CR800, CR850, CR1000, and CR3000. Data loggers that use Edlog include the CR10(X), CR510, CR500, CR23X, and 21X.

With this cable, the data logger can be programmed to:

- Trigger the sampler
- Sense and record when the sampler has taken a sample
- Inhibit the sampler from running its onboard sampling routine

Each of these functions is independent of the others and may be combined as desired.

4.1 CRBasic programming

4.1.1 Trigger sampler

To trigger the sampler, the data logger program must set the port high, delay for at least 50 msec, and then set the port low.

Color	Description	CR800, CR850, CR1000, or CR3000
Purple	Ground	G
Yellow	Control port	C2
Red	Power	12V
Clear	Shield	⏏

For example, if control port 2 is used (see [Table 4-1](#) [p. 5]), a data logger program that includes the following CRBasic instructions will trigger the sampler:

```
PortSet(2,1)  
DeLay(0,50,mSec)  
PortSet(2,0)
```

NOTE:

Above is only a portion of the CRBasic program.

4.1.2 Sense sampler event

To sense the sampler event, use the `PulseCount()` instruction with the `PConfig` parameter set to high frequency (code 0). The value stored in the variable should be totalized. The following example program will sense the sampler events when the cable is wired to pulse channel 1 (see [Table 4-2](#) [p. 5]).

Color	Description	CR1000
Purple	Ground	G
Orange	Pulse	P1
Clear	Shield	⏏

CRBasic Example 1: Sampler event marker program example

```
'CR1000 Series Data Logger

'Declare Public Variables
Public Events

'Define Data Tables
DataTable (Sampler,1,1000)
  Totalize (1,Events,FP2,False)
EndTable

'Main Program
BeginProg
  Scan (1,Sec,0,0)
  PulseCount (Events,1,1,0,0,1.0,0)
  'Call Output Tables
  CallTable Sampler
  NextScan
EndProg
```

4.1.3 Inhibit sampler program

To inhibit a sampler onboard program, use the `PortSet()` instruction. Whether the port should be set low or high depends on the onboard program logic. For samplers such as the products manufactured by Isco, the onboard program is inhibited by setting the control port low.

Table 4-3: Wiring for example of inhibiting an Isco onboard program

Color	Description	CR800, CR850, CR1000, or CR3000
Purple	Ground	G
Green	Control port	C1
Clear	Shield	⏏

For example, if the cable is wired as shown in [Table 4-3](#) (p. 6), a data logger program that includes the following CRBasic instruction will inhibit an Isco sampler onboard program:

```
PortSet(1,0)
```

NOTE:

Above is only a portion of the CRBasic program.

After an Isco sampler program has been inhibited, it can be allowed to run by setting the port high.

Color	Description	CR800, CR850, CR1000, or CR3000
Purple	Ground	G
Brown	Control port	C1
Clear	Shield	⏏

For samplers such as the products manufactured by Sigma, the onboard program is inhibited by setting the control port high.

For example, if the cable is wired as shown in [Table 4-4](#) (p. 7), a data logger program that includes the following CRBasic instruction will inhibit a Sigma sampler's onboard program:

```
PortSet(1,1)
```

NOTE:

Above is only a portion of the CRBasic program.

After a Sigma sampler program has been inhibited, it can be allowed to run by setting the port low.

4.2 Edog programming

4.2.1 Trigger sampler

Wire color CR10(X)

Purple G

Yellow C2

Red 12V

Clear G

To trigger the sampler, pulse port 2 using a set of instructions such as follows:

```
Do (P86)
  1:  42      Set Port 2 High

; Note: The 50 in the third parameter keeps the
; port high for 0.5 seconds. Some users have
; reported using a delay of 1 sec (100 in
; parameter 3) to ensure reliable triggering of
; the sampler.

Excitation with Delay (P22)
  1:  1      Ex Channel
  2:  0      Delay W/Ex (units = 0.01 sec)
  3:  50     Delay After Ex (units = 0.01 sec)
  4:  0      mV Excitation

Do (P86)
  1:  52     Set Port 2 Low
```

You can also supply the trigger signal from switched excitation if no control ports are available. In this case, connect the yellow cable to the desired excitation channel (say E3) and pulse the channel using Instruction 22 as follows:

```
Excitation with Delay (P22)
  1:  3      EX Chan (or the channel you select)
  2:  50     Delay w/EX (units=0.01sec)
  3:  0      Delay after EX (units=0.01sec)
  4:  2500   mV Excitation
```

4.2.2 Sense sampler event markers

4.2.2.1 Pulse port method

Wire color CR10(X)

Purple G

Orange P1

Clear G

To sense sampler events, use Instruction 3 with a configuration code of 0.

Excitation with Delay (P22)		
1:	1	Reps
2:	1	Pulse Input Chan
3:	0	High frequency (configuration code)
4:	2	Loc [:EVENTS]
5:	1	Mult
6:	0	Offset

To record the events in the data logger final storage area, remember to totalize the events temporarily stored in Input Location 2 in this example.

4.2.2.2 CR10(X) control port interrupt method

For the CR10(X), there is another useful method for sensing and recording sampler events. This method uses the control port 8/subroutine 98 interrupt feature of the CR10(X). Each time the sampler reports an event, the CR10(X) records the sample number with a time stamp in final storage. In this example, sampler events will show up as output arrays with an array ID of 400.

Wire color CR10(X)

- Purple G
- Orange C8
- Clear G

CR10(X) Program (Subroutine 98 in Program Table 3)		
*	3	Table 3 Subroutines
1: Beginning of Subroutine (P85)		
1:	98	Subroutine Number
2: Z=Z+1 (P32)		
1:	10	Z Loc [Sample_No]
3: Do (P86)		
1:	10	Set high Flag 0 (output flag)
4: Set Active Storage Area (P80)		
1:	1	Final Storage Area 1
2:	400	Array ID or location
5: Real Time (P77)		
1:	1110	Year,Day,Hour-Minute

```

6: Sample (P70)
  1:  1          Repr
  2: 10          Loc [ Sample_No ]

7: End (P95) ;of Subroutine Number 98

End Table 3

```

4.2.3 Inhibit sampler program

Wire color	CR10(X)
Purple	G
(Isco) Green	C1
(Sigma) Brown	C1
Clear	G

To *inhibit* an Isco sampler from running its own program, set control port 1 low using a program control instruction such as Instruction 86. To allow the sampler to run its program, set it high.

NOTE:

The logic for Sigma samplers is just the opposite. A high signal inhibits the sampler.

Example for inhibiting an Isco sampler program:

```

Do (P86)
  1: 51          Set Port 1 low ; (41 would set it high)

```


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Covered equipment is warranted/guaranteed against defects in materials and workmanship under normal use and service for the period listed on your sales invoice or the product order information web page. The covered period begins on the date of shipment unless otherwise specified. For a repair to be covered under warranty, the following criteria must be met:

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2. The defect cannot be the result of misuse.
3. The defect must have occurred within a specified period of time; and
4. The determination must be made by a qualified technician at a Campbell Scientific Service Center/ repair facility.

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Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of [regional offices](#) or visit www.campbellsci.com/contact  to determine which Campbell Scientific office serves your country.

When returning equipment, a RMA number must be clearly marked on the outside of the package. Please state the faults as clearly as possible. Quotations for repairs can be given on request.

It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment. In support of this policy, when equipment is returned to Campbell Scientific, Logan, UT, USA, it is mandatory that a "[Declaration of Hazardous Material and Decontamination](#)" form be received before the return can be processed. If the form is not received within 5 working days of product receipt or is incomplete, the product will be returned to the customer at the customer's expense. For details on decontamination standards specific to your country, please reach out to your [regional Campbell Scientific](#) office.

NOTE:

All goods that cross trade boundaries may be subject to some form of fee (customs clearance, duties or import tax). Also, some regional offices require a purchase order upfront if a product is out of the warranty period. Please contact your [regional Campbell Scientific](#) office for details.

Safety

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.com You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a hardhat and eye protection, and take other appropriate safety precautions while working on or around tripods and towers.
- Do not climb tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- You can be killed or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in contact with overhead or underground utility lines.
- Maintain a distance of at least one-and-one-half times structure height, 6 meters (20 feet), or the distance required by applicable law, whichever is greater, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Internal Battery

- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.

- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

Use and disposal of batteries

- Where batteries need to be transported to the installation site, ensure they are packed to prevent the battery terminals shorting which could cause a fire or explosion. Especially in the case of lithium batteries, ensure they are packed and transported in a way that complies with local shipping regulations and the safety requirements of the carriers involved.
- When installing the batteries follow the installation instructions very carefully. This is to avoid risk of damage to the equipment caused by installing the wrong type of battery or reverse connections.
- When disposing of used batteries, it is still important to avoid the risk of shorting. Do not dispose of the batteries in a fire as there is risk of explosion and leakage of harmful chemicals into the environment. Batteries should be disposed of at registered recycling facilities.

Avoiding unnecessary exposure to radio transmitter radiation

- Where the equipment includes a radio transmitter, precautions should be taken to avoid unnecessary exposure to radiation from the antenna. The degree of caution required varies with the power of the transmitter, but as a rule it is best to avoid getting closer to the antenna than 20 cm (8 inches) when the antenna is active. In particular keep your head away from the antenna. For higher power radios (in excess of 1 W ERP) turn the radio off when servicing the system, unless the antenna is installed away from the station, e.g. it is mounted above the system on an arm or pole.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

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