

Optotrak Certus Marker Strober Guide

Revision 2
August 2005

IMPORTANT
Please read this entire document
before using the Marker Strober

Revision Status

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Revision 2	31/08/05	Removed ToolBench reference. General update

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Read Me First!

Read this section before continuing with the rest of the guide.

Warnings



In all NDI documentation, warnings are marked by this symbol. Follow the information in the accompanying paragraph to avoid personal injury.

1. An e-type strober must be connected to an e-type port on the e-type System Control Unit to maintain Type BF isolation. Check that the colours of both connectors match. The keying for the different types of connectors is unique to prevent using an s-type strober in an e-type port.
2. The s-type marker strober is not suitable for patient applied parts.
3. To maintain type BF isolation, all components between the e-type ports on an e-type System Control Unit and the patient must meet or exceed the certifications and approvals of the Optotrak Certus System. Serious personal injury could result if the appropriate type of isolation is not maintained.

Cautions

Caution! In all NDI documentation, cautions are marked with the word "Caution!". Follow the information in the accompanying paragraph to avoid damage to equipment.

Do not plug telephone or other telecommunications devices into the marker port connectors. Telecommunications devices could be damaged by the marker strober.

Contact Information

If you have any questions regarding the content of this guide or the operation of this product, please contact us:



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Updates

NDI is committed to continuous improvements in the quality and versatility of its software and hardware. To obtain the best results with your NDI system, check the NDI Partner Site regularly for update information:

<http://support.ndigital.com>

1 Introduction

This guide contains information for both the e-type and s-type versions of the marker strober. To use this strober, you must be familiar with the Optotrak Certus System. Please see the *“Optotrak Certus User Guide”* for additional information about the Optotrak Certus System, including instructions on how to clean markers. Information on designing rigid bodies is included in the *“Optotrak Certus Rigid Body and Tool Design Guide”*.

E-type marker strobers will only connect to e-type Optotrak Certus System Control Units. S-type marker strobers can connect to s-type Optotrak Certus System Control Units and the s-type port on e-type Optotrak Certus System Control Units.

This strober can be used with switches and markers that you wire yourself. Wiring the switches requires you to have a basic knowledge of electronics and good wiring practices.

1.1 Related Accessories

Other accessories that are available for the Optotrak Certus System include:

- axon strober, which has a DB25 connector that can be used for either markers, rigid bodies or tools
- tool strober, which has four, 10 pin, tool ports that accommodate tools with SROM files
- 3020 strober adapter, which allows Optotrak 3020 strobers to be used with the Optotrak Certus System
- markers with twisted pair cable and RJH connectors
- markers with twisted pair cable
- marker connector kit, which includes RJH plugs and a crimping tool

2 Strober Capabilities

The marker strober is designed to allow up to 24 markers to be wired in groups of two, each group of two markers connecting into 1 of 12 RJH connectors.

Three strobers (marker, tool and axon), the strober extension cable, and the System Control Unit are available in both s-type and e-type configurations. The e-type components are intended for applications that require type BF isolation. The e-type System Control Unit includes two e-type strober ports and a single s-type strober port. All of the strober ports on the s-type System Control Unit are s-type.

2.1 LED and Switch Support

The marker strober has a visible strober status LED and supports two optional, external switches connected directly to the strober through a headphone jack connection. The external switches are intended for feedback from the user to the application software. The signal returned from these switches is not fast enough to be considered real time, and cannot be used to synchronize the Optotrak Certus System with external devices.

2.2 Communications

The strober receives marker activation information from the Optotrak Certus System and sends status information back to the system. The strober powers the markers in the order specified by software running on the host computer.

2.3 Compatibility

Marker strobers can be used simultaneously with other strobers, as well as the 3020 strober adapter. 3020 strober adapters, marker strobers and axon strobers can be mixed within a daisy chain; 3020 strober adapters must always be located at the end of the chain.

2.4 Convenience

The RJH connectors provide maximum flexibility for changing marker configurations.

A swivel clip, which allows the strober to be attached to objects and rotate, is included with the strober. This facilitates fastening the strober to the subject.

2.5 Software Configuration

Using either NDI application software or the routines described in the device handle section of the Application Programmer's Interface, you can set the:

- number of markers to be activated
- name of the strober
- order in which markers will be activated
- behaviour of the system in response to a change in the status of the switches
- information about a rigid body that includes the marker(s) being controlled by the strober
- marker voltage and frequency

3 Connecting the Strober to the System Control Unit

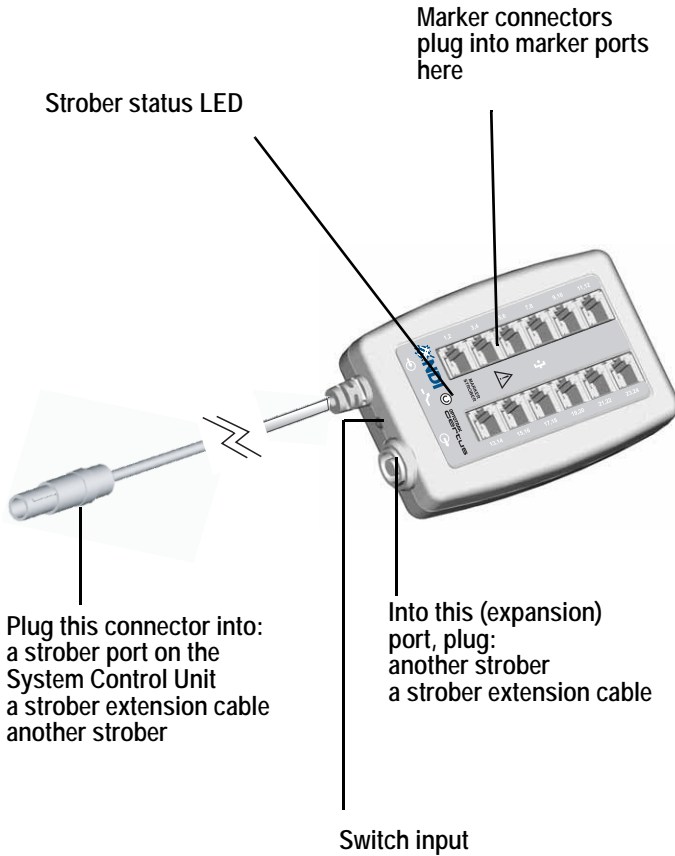


Figure 3-1: s-type Marker Strober - Top View

3.1 Strober Port Connections

Strobers designed for s-type applications have connectors equipped with a blue nut on both the strober port connector and the expansion port. They will connect to a port that is also equipped with a blue nut.

E-type strobers are designed for applications requiring type BF isolation and have connectors equipped with a black nut on both the strober port connector and the expansion port. They will connect to a port that is also equipped with a black nut. A strober designed for type BF isolation is also labelled with the Type BF symbol:



Figure 3-2: Type BF Symbol



Warning!

1. An e-type strober must be connected to an e-type port on the e-type System Control Unit to maintain Type BF isolation. Check that the colours of both connectors match. The keying for the different types of connectors is unique to prevent using an s-type strober in an e-type port.

2. The s-type marker strober is not suitable for patient applied parts.

3.2 Strober Status LED

The strober status LED will flash in one of three default patterns.

The three default patterns are:

- A slow flash indicates the strober is connected to, and has communicated with, the System Control Unit.
- A fast flash usually means the markers are being activated. If the strober powers on with a fast flash, it may, in rare cases, mean there is a communication problem.
- A solid light means there is a communication problem.

Note: More detailed technical descriptions of the Optotrak Certus System components are included in the "*Optotrak Certus User Guide*".

3.3 Marker Port Connectors

Caution! Do not plug telephone or other telecommunications devices into the marker port connectors. Telecommunications devices could be damaged by the marker strober.

3.4 Strober Activation Order

The order in which strobers and tools are activated is determined by the strober port to which they are connected. All the strobers which are connected to strober port 1 are activated before the strobers on port 2, which are activated before the strobers on port 3.

Tools and tool strobers are activated so that the tools connected to a tool strober are activated directly after the tool strober itself, and before the next strober in the chain. The tools are also activated in order ie a tool plugged into port [1] of a tool strober is activated before a tool plugged into port [2]. See [Figure 3-3 on page 7](#), where the strobers and tools are numbered I to VIII.

While the strober activation order is fixed, the activation order of markers on each strober can be set in either the NDI application software or in the Application Programmer's Interface.

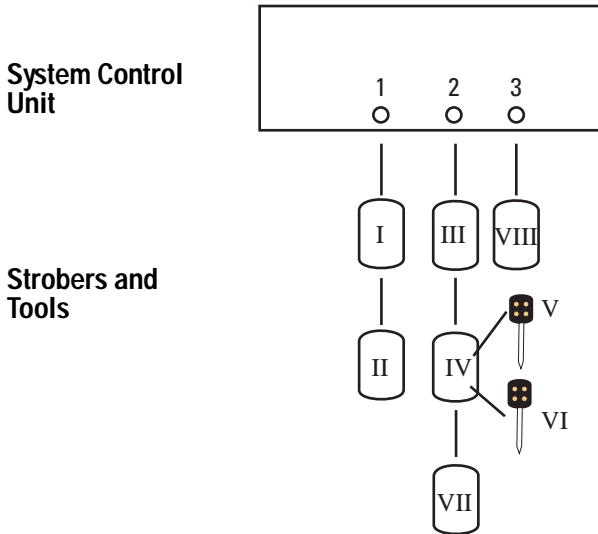


Figure 3-3: Strober and Tool Activation Order

3.5 Strober Extension Cable

The strober extension cable can be used to increase the distance between:

- the strober and the System Control Unit
- two strobers

The distance from the strober to the System Control Unit should be as short as possible as the amount of power available to the markers decreases with both the length of the cable and the number of connectors.

Both s-type and e-type strober extension cables are available. Check that the colours of all connectors match each other. The keying for the different types of connectors is also unique to prevent using an s-type strober extension cable in an e-type port.



To maintain type BF isolation, all components between the e-type ports on an e-type System Control Unit and the patient must meet or exceed the certifications and approvals of the Optotrak Certus System. Serious personal injury could result if the appropriate type of isolation is not maintained.

3.6 Connecting Markers to the Strober

The markers are connected to an RJH connector through a twisted pair cable, of up to 3 m:

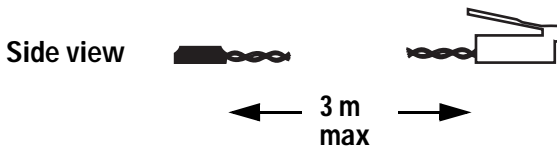


Figure 3-4: Markers with RJH Connector

Each marker connector can accommodate either one or two markers.

Marker and connector lifetimes will be maximized if you hold the connector when connecting and disconnecting the markers - not the wires.

The marker port number is shown beside each marker port.

Marker connectors do not have to be plugged into the marker ports sequentially. For example, marker connectors could be plugged into marker ports 1-2, 7-8, 15-16, and 21-22. In the application software, the marker activation order can be set, in any order, to activate either all markers or a subset of markers. This includes activating one marker only, when two markers are wired into a single connector.

4 Using the Swivel Clip

The swivel clip consists of:

- a clip, which attaches to items such as a belt, collar or shoe.
- a tab, which is permanently fastened to the strober and can be quickly disconnected from the clip.

The supplied clip is designed to provide rotation in two dimensions. The default orientation of the strober will depend on the location of the circular tab:

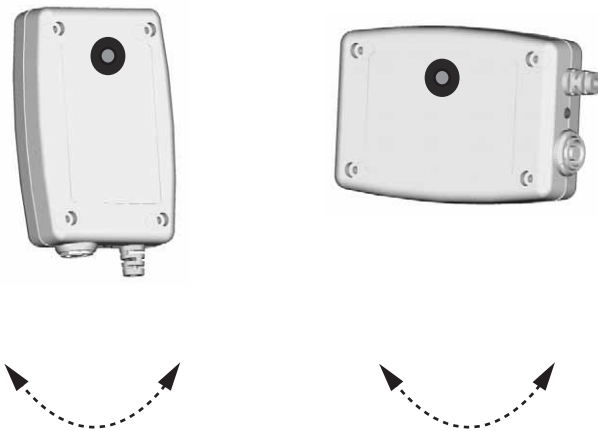


Figure 4-1: Possible Positions for Swivel Clip Tab

The orientation will also affect the amount of strain on both the marker and strober cables. It is a good practice to minimize the strain that might cause cable breakage as much as possible.

4.1 Fastening the Tab to the Strober

1. Clean both the back of the strober and the back of the tab with a small amount of isopropyl alcohol (rubbing alcohol).
2. Remove the backing from one side of the adhesive strip and apply it to the tab.

3. Remove the backing from the other side of the adhesive strip and press the tab firmly onto the back of the strober in the preferred location.
4. If possible, do not use the tab for 24 hours to allow the adhesive to set firmly.

4.2 Clip Orientation

1. Slide the tab into the slot on the clip.
2. Position the clip as shown below:

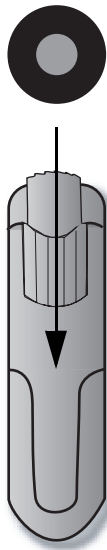


Figure 4-2: Preferred Orientation of the Clip

4.3 Removing the Strober from the Swivel Clip

To release the locking mechanism, press the release button and slide the tab towards the release button:

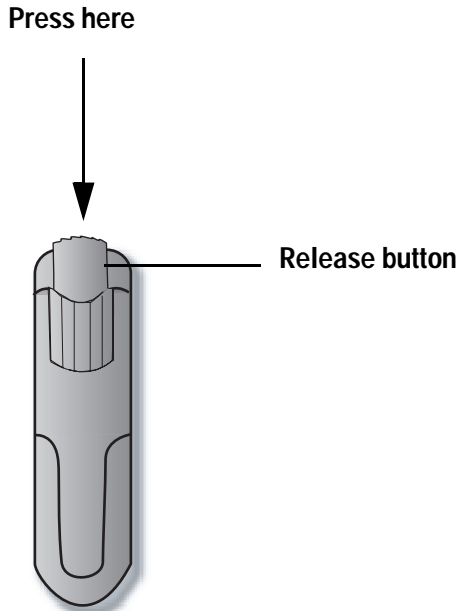


Figure 4-3: Releasing the Tab From the Clip

5 Wiring Markers and Switches

Markers purchased with twisted pair cables, but no connectors, will need to be connected to an RJH connector before they can be used with the marker strober.

Optional switches are provided by the user. These are wired to a 2.5 mm headphone jack, also supplied by the user. You must have a basic knowledge of electronics and good wiring practices to wire the headphone jack.

5.1 Wiring Markers Into an RJH Connector

Markers can be wired into a connector either singly or as a pair. You will need:

- markers, each connected to a twisted pair cable, available from NDI
 - RJH connectors, available from NDI or an electronics shop
 - crimping tool for RJH connectors, available from NDI or an electronics shop
 - the connectors and crimping tool are available from NDI as a connector kit
1. Untwist about 50 mm of the twisted pair cable attached to a marker.
 2. When connecting a pair of markers to the RJH connector, arrange the individual wires so that the copper and tinned wires are arranged as:

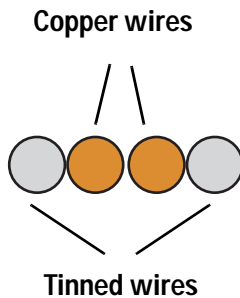


Figure 5-1: Marker Wire Arrangement

If only one marker (two wires) is being attached to the RJH connector, the copper wire should be on the inside. See [“Inserting Wire into an RJH Connector” on page 14](#).

3. Smooth the wires so they lie flat and straight.
4. Holding the wires about 10 mm from the end, trim the wires even with either scissors or wire cutters.

Note Do not strip the wires or the connection will not work.

5. Insert the end of the wires into the RJH connector until the end of the wire reaches the far end of the connector:
6. Insert the strain relief tab into the back of the connector (where the wires were entered) so that it rests underneath the wires. This holds the wires up so they lie flat.

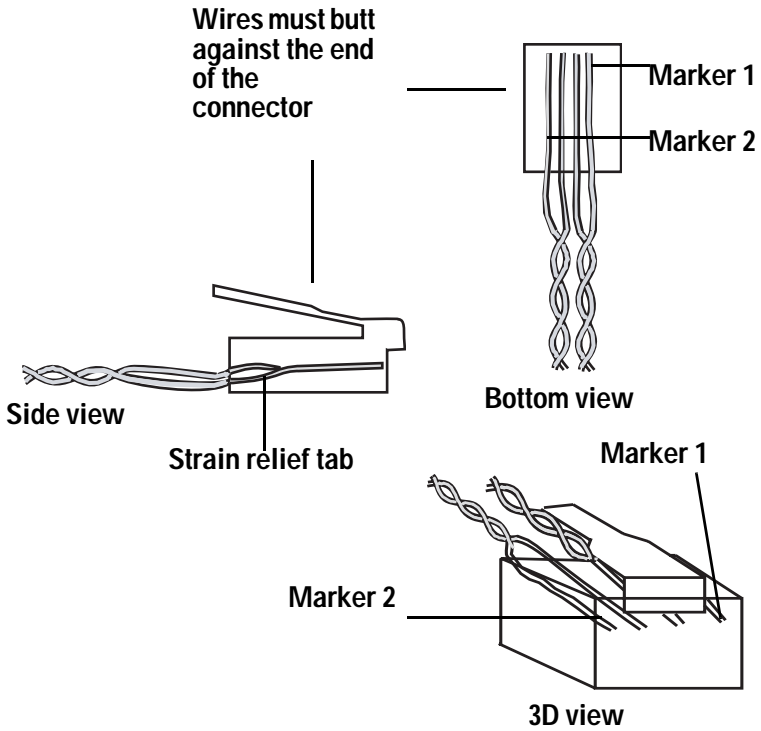


Figure 5-2: Inserting Wire into an RJH Connector

7. Refer to [Figure 5-3 on page 15](#). Take the adapter from its storage place in the handle and insert it into the anvil:

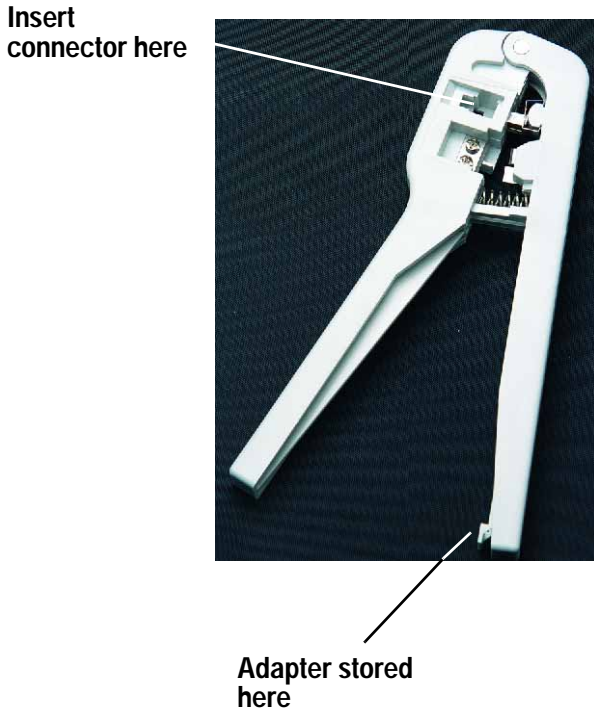


Figure 5-3: Wire Crimper

8. Insert the RJH connector into the matching opening in the crimping tool.
9. Squeeze the handle arms together until they stop.
10. Remove the connector from the crimper.
11. Check the connection:
 - gently tug on the cables to check the wires are firmly attached
 - look down at the wires from the top of the connector to check that the wires butt against the end of the connector (see [Figure 5-2 on page 14](#), top view)

- if the wires do not butt against the end of the connector, cut off the connector and repeat, using a new connector

5.2 Wiring Switches

Note If the marker strober will be used with NDI application software, it is important that the external switches have a “normally open” contact configuration.

Externally, a 2.5 mm headphone jack generally appears as:

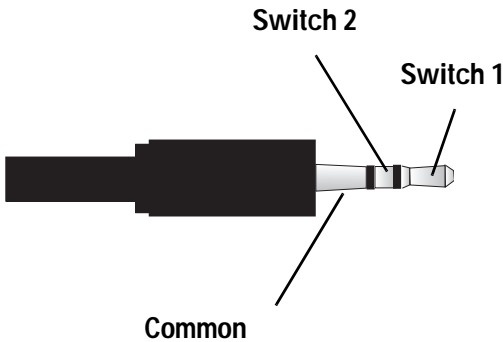


Figure 5-4: External Appearance of 2.5 mm Headphone Jack

The black covering can be unscrewed or removed:

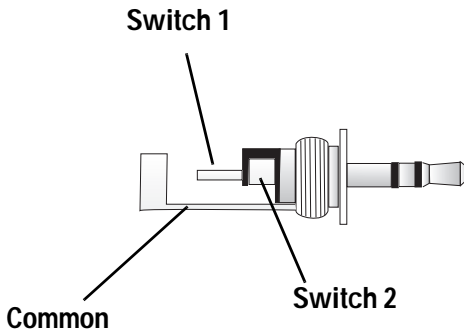


Figure 5-5: Internal Appearance of Headphone Jack

1. For each switch, solder one wire to the ground and one to the relevant part of the headphone jack shown in [Figure 5-5 on page 17](#).
 - Use solder designed for electronics.
 - Multi-stranded wire is preferable to solid core wire as it is less susceptible to fatigue and wire breakage.

6 Abbreviations and Acronyms

Abbreviation/ Acronym	Meaning
BF	Patient Isolation (non cardiac)
LED	Light Emitting Diode
NDI	Northern Digital Inc.
SROM	Serial Read Only Memory

7 Equipment Symbols

The following symbols may be found on the marker strober.



Signal in

Marker strober



Signal out

Marker strober



Switch input

Marker strober



Type BF equipment

E-type marker strober



WARNING:
Please consult accompanying documentation

Marker strober

Equipment Symbols



Static sensitive: Take electrostatic discharge precautions

Marker strober



Marker port

Marker strober



Strober status

Marker strober

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