MODRATEC®

Wire-in-tube (WIT) Control Techniques and Hints (v1 Dec 2013)

Overview

Wire-in-tube (WIT) is not a new way of controlling turnout points and semaphore signals on a model railway. The method has been used for many decades.

WIT can still be an attractive option in terms of its affordability, its simplicity, and its intuitive nature that allows you to see exactly what is happening.

While, in the past, WIT has presented the user with some headaches, MODRATEC has developed a system that overcomes these, making setting up wire-in-tube control relatively simple and forgiving.

At the heart of the MODRATEC WIT system is the use of adjustable slipping-clutch mechanisms at points and semaphores. This means that the exact travel of a control wire is not critical. As long as there is sufficient travel, any excess can be accommodated by means of the control wire slipping through the clutch. Points are not overdriven, and semaphores can be easily set for repeatable stop and go positions. This also means that seasonal changes of temperature do not affect WIT operation.

Data sheets are readily available for the various MODRATEC WIT devices:

- Point-wit – turnout points driver.
- Sig-wit – semaphore signal driver.
- Link-wit – to enable linking of control wires across baseboard joins.
- Slot-wit – mechanical logic gates for semaphore slotting.
- Crank-wit – a seven-ratio right-angle crank for abruptly changing control wire direction. These may be used in conjunction with Sig-wit as a means of connecting the vertical operating wire.

Wire-in-tube works much like the brake cable on a bicycle. The wire is typically 1mm diameter stainless steel wire. There are two options for the tube. The more expensive option is copper tube. This suits both indoor and outdoor use. The more affordable option is what we call Flex-wit – a tube formed of tightly coiled plated steel wire with a protective plastic covering – and is suitable only for indoor use.

MODRATEC markets copper tube and stainless steel wire packs as Out-wit (outside/outdoor use), while flexible tube and stainless steel wire packs are marketed as Inter-wit (indoor/internal use).

Basic Principles

Wire-in-tube is effectively a push-pull cable. Because a solid wire is used, it works well for both pulling and pushing actions.

For satisfactory operation,

1. both ends of the tube must be anchored solidly;
2. the inner surface of the tube should be lubricated with grease*; and
3. the length of unsupported wire at each end of a run should be minimal.

[**Greasing is most easily achieved by smearing grease on the wire as it is fed into the tube. Any general-purpose grease is suitable.*]

A header should be used near the Lever Frame so that multiple tube ends may be easily held. A suitable header is an electrical terminal block having a pitch of about 10mm between terminals, and a clearance through each terminal of 3.2mm (1/8 inch). MODRATEC supplies suitable terminal blocks. These can accommodate copper (Out-wit) tube directly, and Flex-wit (Inter-wit) tube once the outer sheath has been stripped at the end.

Terminal blocks are best used in groups of six corresponding to each group of six levers. These should be secured at each available securing hole in order to minimize tube movement.

Wire Sizes

MODRATEC supplies two sizes of stainless steel wire.

1mm diameter wire (Control Wire) is intended for long runs of control wire.

1.2mm diameter wire (Link Wire) is intended for linking levers to control wires where support within the tube is not possible. It is also suitable for short tubed runs.

Cutting Tube

Copper tube may be cut using a special tube-cutting tool. Alternatively, a very fine-bladed saw may be used. It is important to ensure that the entry to the cut tube is clean. This may be achieved by using a hand-held drill bit of suitable size to “taper” and smooth the entry.

Flex-wit tube may be cut with standard wire-cutters or combination pliers. No additional smoothing is generally required.

Cutting Wire

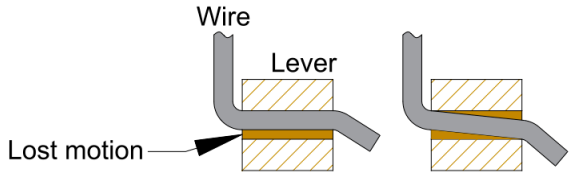
Stainless steel wire may be cut with engineering-type side cutters or shearing cutters. DO NOT USE electrical cutters – they are designed for much softer wire. File smooth any sharp edges.

Connecting Wire to Lever

If Auxiliary Switch Units are fitted, these should be temporarily removed while wires are being connected to levers.

Connection is made to a lever by making a nearly* right-angle bend at the end of the control wire. The bent section should be about 9mm in length. Insert this into the required hole of the lever and then use

long-nosed pliers to slightly bend the protruding wire end in order to capture it in place.

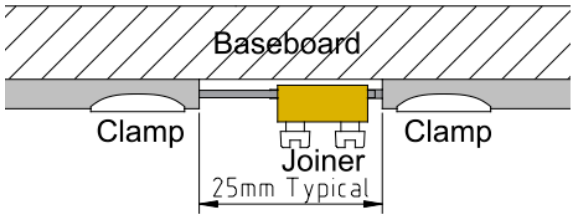


[*If the angle were exactly 90-degrees, then there would be lost motion of the difference between the hole diameter and the wire diameter. The hole is 1.5mm, so for 1mm wire, the loss is 0.5mm, while for 1.2mm wire, the loss is 0.3mm. With an angle a little less that 90-degrees, the wire sits diagonally through the hole touching opposite sides at opposite edges.*]

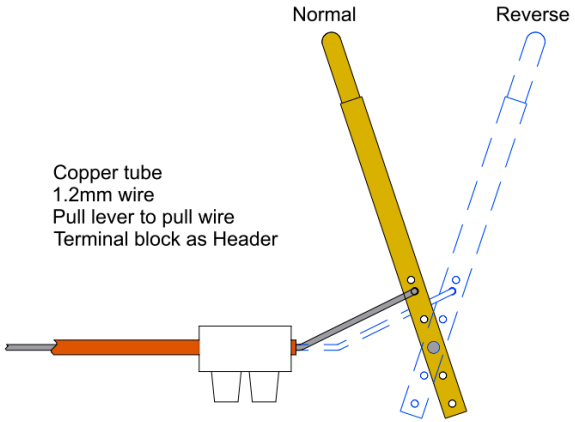
Starting a WIT Run

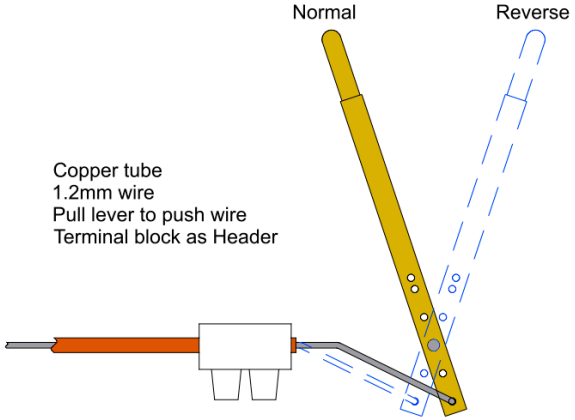
The diagrams opposite show some options.

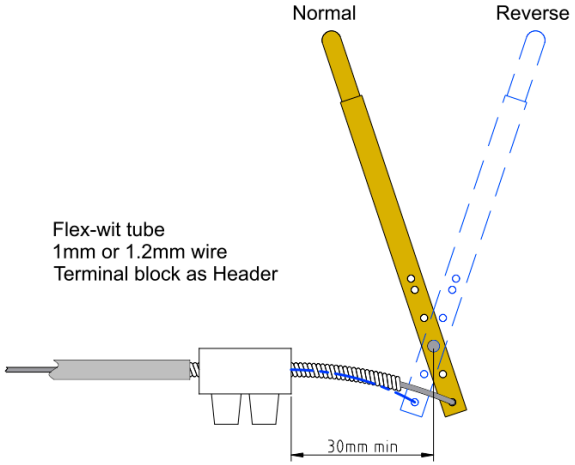
If using copper tube, it is recommended that 1.2mm wire be used for the beginning of the run. If the run is short, then 1.2mm wire may be used throughout. For longer runs, it will be best to change to 1mm wire after a short distance. This is a simple matter of creating a gap in the tube where the two wires may be slightly overlapped and joined using an insert cut from a terminal block.



- A wire may be connected to a lever using holes above or below the spindle.
- The method shown for copper tube may also be applied to flexible tube.
- Ensure that the bend is placed such that the link does not foul the header when the lever operates.







- When using the method shown for flexible tube, it is important that the header is reasonably in line with the connecting holes. Hence this method is not ideal if connecting both above and below the spindle within a header group. Also ensure that when the lever operates, it does not foul the tube.
- With copper tube, it is essential to pre-thread the wire through the tube before bending the tube.

Completing a WIT Run

WIT runs should avoid as far as possible sharp bends (75mm – 3" min radius) – consider cranks if necessary. Points may be approached from either side but at right-angles to the track. Semaphores may be approached from any convenient direction.

Checking Operation

When a run is complete, check that the lever operates correctly, and that the device being driven operates satisfactorily.

If the lever bounces back after an operation, look at the following:

1. A clutch may be adjusted too tight. Clutches should be set just-tight-enough for reliable operation, otherwise the device and control wire will be under stress and cause bounce-back. Ensure that points operate freely before connection.
2. A wire run may be generating too much friction. This may be because the run is too bendy, bends are too tight, or, in the case of copper tube, the tube has collapsed or kinked.

Once set up, only very occasional clutch adjustment is required.

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