

P350 flexitrax™ sytem

CRAWLER CABLE RE-TERMINATION GUIDE

90/P350-RETERM/05

ISSUE 5

12/2011

READ AND UNDERSTAND THIS GUIDE IN FULL BEFORE PROCEEDING

Overview

This document describes how to re-terminate the P350 crawler cable, and encompasses the original standard termination and the swivel termination. This procedure should only be performed by a skilled and adequately trained technician.

You must re-terminate the cable if you suspect that video, power or communication signals are in anyway degraded.

This may be indicated by poor video quality, intermittent power shortages or an unresponsive crawler or camera.

WARNING! Power down the system and disconnect the power cable from the drum before attempting any part of this procedure.

Damaged cables

Physical damage to the cable, such as scoring or cuts, will degrade video, power and communication signals between the tractor and the command module.

If any part of the cable is damaged, you must remove the section completely and discard it before you re-terminate the cable. Do not use damaged cables under any circumstances.

NOTE: If you remove more than 25m of cable, you must reduce the cable length setting in the command module as described in the User Guide or Operation Manual.

Material Requirements

To re-termination a cable with the Original Standard, Option 1: (Go to Step 1)

Replace cable interface PCB only. Kit part number 93/VT2920Z2 P350 Cable Reterm Kit (Spare)

Swivel Re-termination Option 2: (Go to Step 7)

Replace cable interface PCB only. Kit part number 93/VT2920-10 Swivel Term PCB Replacement Kit.

Swivel Re-termination Option 3: (Go to Step 8)

Cable Re-termination. Kit part number 93/VT2920-11 Swivel Cable Retermination Kit.

Upgrade from Original Standard to Swivel Option 4: (Go to Step 11)

Full Upgrade. Kit part number - 10/P350-Swivel, P350 Swivel Termination Assy

Tools and other parts

Large side cutters

Allen key set

Heat gun

Wire strippers

10ml Syringe / flexible plastic needle

Heatshrink 4mm

Emery cloth or emery board

Loctite 222

Copper slip

Bull-nosed pliers

15mm open-ended spanner

Scalpel or craft knife

Soldering iron / solder

Multi-meter

Heatshrink 2mm

Silicon grease

Loctite 243

Two-part quick-set epoxy adhesive (e.g. 3M Scotchweld DP100)

Re-termination procedure

Note: Prior to undertaking any re-termination procedure, power down the system and remove the mains cable.

To re-terminate a cable fitted with the original standard termination, continue with Step 1.

To replace a damaged cable interface PCB on the swivel termination, go to step 7.

To re-terminate a damaged cable on the swivel termination, go to step 8.

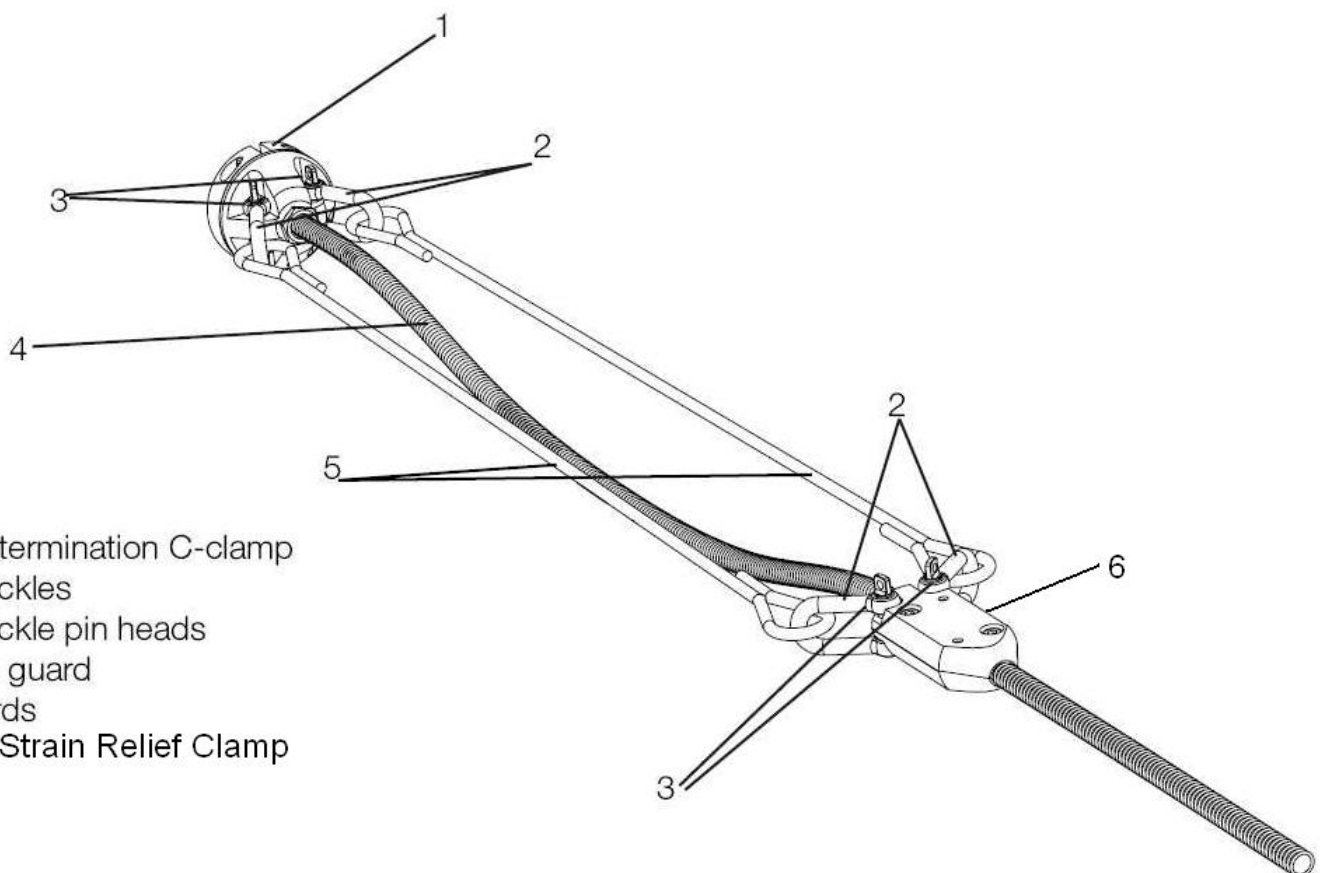
To upgrade from the original standard termination to the swivel termination go to Step 11.

Step 1

The following sections describe the replacement of the Interface PCB only for the original standard option.

1. Start by removing the D-shackles and lanyards and the cable strain relief clamp: do not remove the spring guards.
2. Push the spring guards further up the cable away from the end to allow you room to work.

This section describes the replacement of the Interface PCB only for the original standard option. Original Standard Re-termination Option 1, kit part number (93/VT2920Z2 P350 Cable Reterm Kit (Spare))



- 1 Cable termination C-clamp
- 2 D-Shackles
- 3 D-Shackle pin heads
- 4 Spring guard
- 5 Lanyards
- 6 Cable Strain Relief Clamp

1. You must remove the damaged cable or faulty connector assembly. To do so, remove the heat-shrink sleeve if fitted by cutting it lengthways with a sharp blade; then use a large pair of side cutters to sever the cable as close to the back of the assembly as possible.



2. Unscrew the two screws that hold the cable Interface board (VT2992) in place.



3. Undo the four clamp screws at the rear of the termination. (If you have an old style termination without the clamp, skip this section.)



4. Using a 15mm open ended spanner, remove the gland nut and the rubber o-ring from the front of the connector.



Step 2

1. Use a heat gun to heat the connector; this will loosen the internal potting, and remove the potted board from the connector assembly
2. Use a suitable drift or other blunt tool to push the cable stub down into the connector until the board begins to protrude from the front of the connector.
3. Allow the assembly to cool, then pull out the board and wire stub.



4. Clean the old shell and before re-assembly, ensure that the new board fits the old shell, if necessary trim the edges of the board with the emery cloth or emery board to optimize the fit.
5. Re-assemble the shell and gland as shown below.



Or if you have the old style termination:-

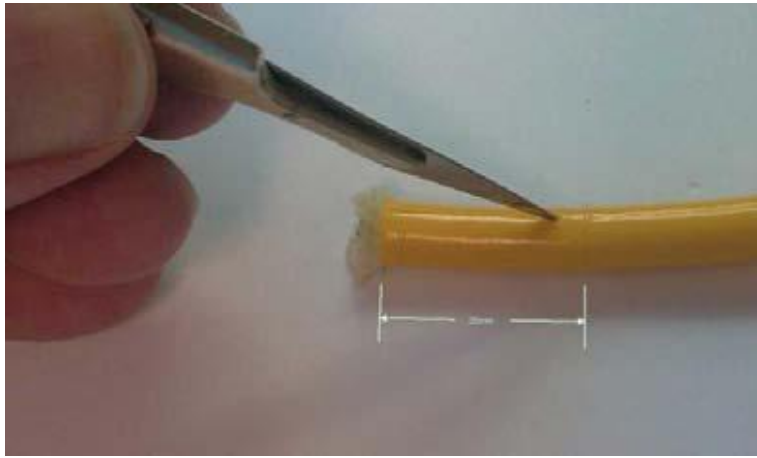


Step 3

1. Use a craft knife or scalpel to score around the cable at 25mm (1 inch) from the end.



2. Score the outer sheath to a length of 25mm (1 inch) from the end.



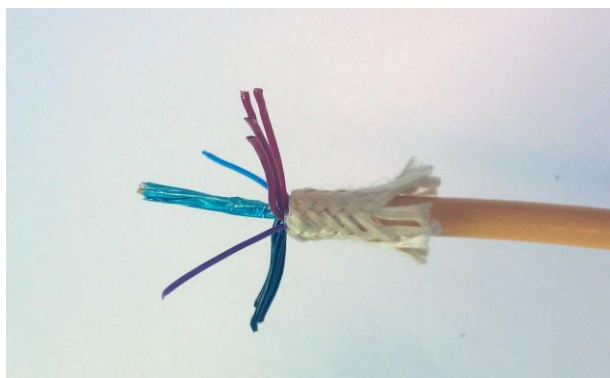
3. Peel back the outer sheath to reveal the Kevlar weave below.



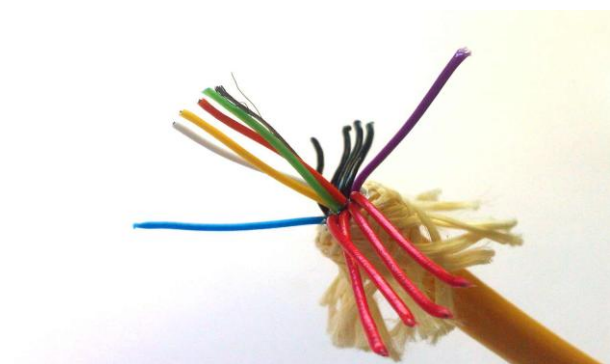
4. Pull back the Kevlar weave along the length of the cable.



5. Peel back and remove the clear covering on the wires
6. Pull back the red, black, purple and blue wires to expose the inner core.



7. Peel off and remove the inner foil sheath to expose four wires and an uninsulated (drain) wire.

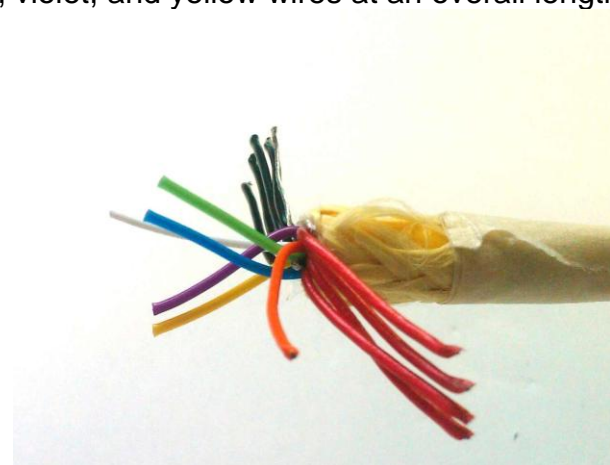


Step 4

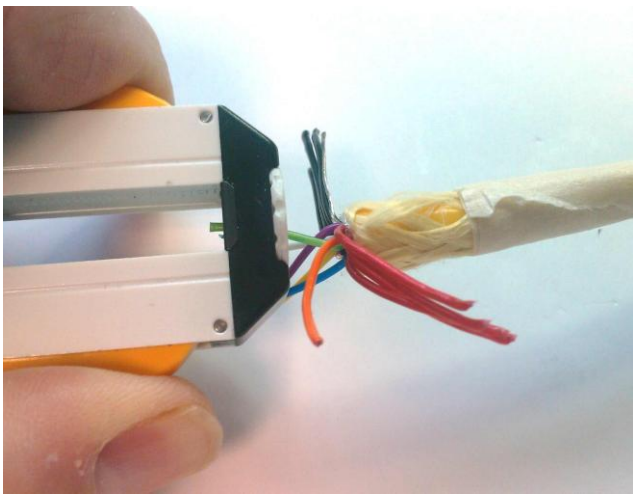
1. Locate the Drain wire and solder the end to stop the strands unwinding. Use masking tape to hold back the Kevlar weave.



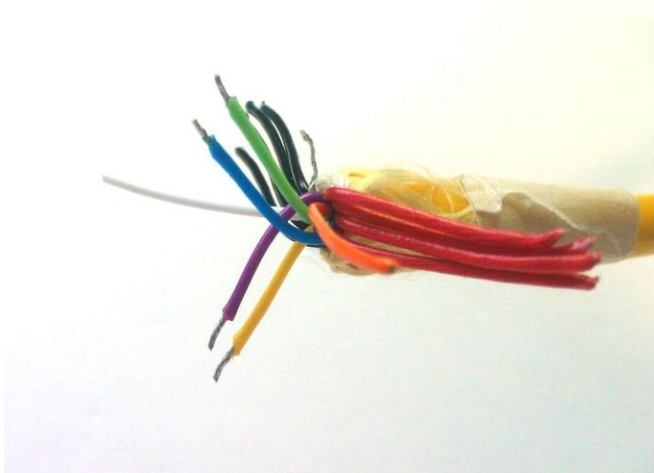
2. Leave the green, blue, violet, and yellow wires at an overall length of 18mm



3. Strip the ends of the green,blue, violet and yellow wires to a length of 3mm. then pre-tin.

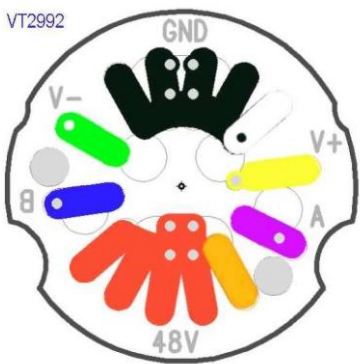


4. Leave the remaining wires at a length of 15mm. Strip these to a length of 3mm.



Step 5

- 1. Secure the board to a solid base with Blu-Tack or a similar reusable adhesive.
- 2. Pre-tin the pads on the PCB.

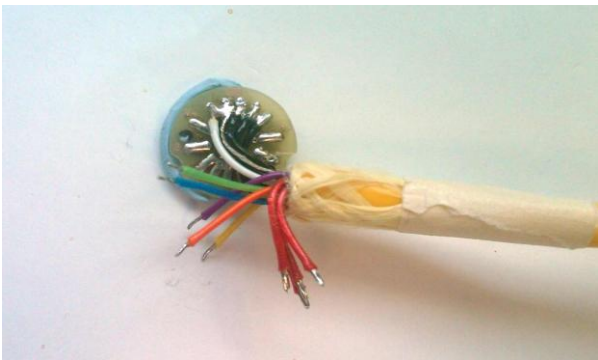


The figure above is a view of the back of the board and has been coloured to assist in the placement of the wires.

3. Start with the black wires: heat each pad in turn and ensure the solder wets around the wire, forming a good joint.



4. Add the drain, white and black wires.



5. Add the rest of the wires, finishing with the red and orange wires.



6. Release the Kevlar sleeve and trim to just behind the PCB.



Step 6

1. Fit the PCB into the shell orientated as illustrated below. Fit the 2 x M2.5 screws



- 2. Locate the cable gland and the gland washer in the back of the cable connector and screw the gland nut into the connector, ensuring the gland is compressed to form a watertight seal, using a suitable 15mm spanner.

Original standard connector (no clamp).



Original standard connector (with clamp)



- 3. Screw together the halves of the clamp (4 x M3 x cap screws), taking care not to over-tighten and damage the cable.

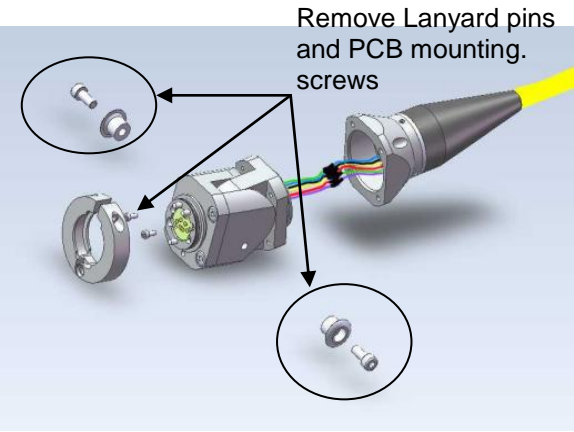
Go to step 12.

Step 7

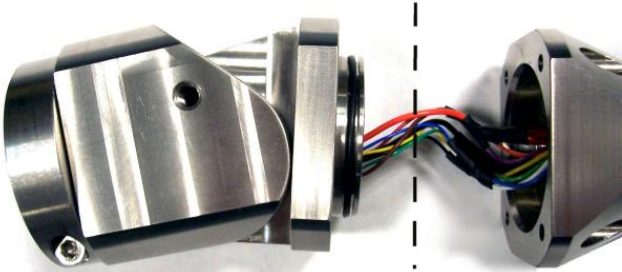
This section describes the replacement of the Interface PCB only for the swivel option.
Use Swivel Re-termination Option 2, kit part number 93/VT2920-10 Swivel Term PCB Replacement Kit



1. Start by removing the front clamp pivot screw and 2 x lanyard pins. Remove 2 x PCB mounting screws

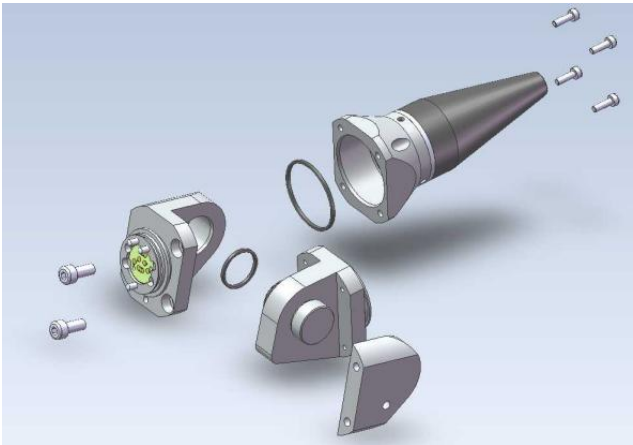
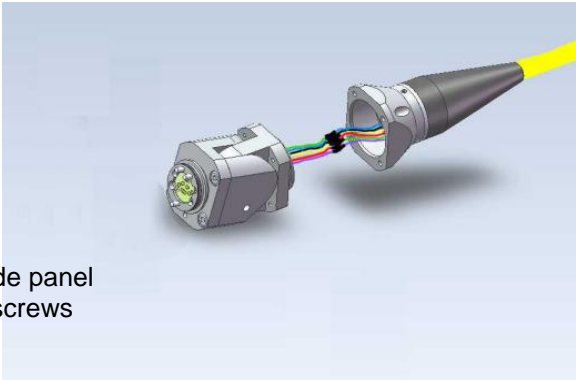


Cut wires at this point

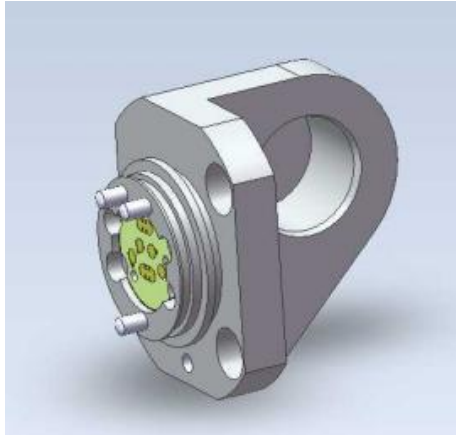


2. Remove the 4 x screws securing the back-shell and cut the cable-form as shown above.

Remove side panel mounting screws



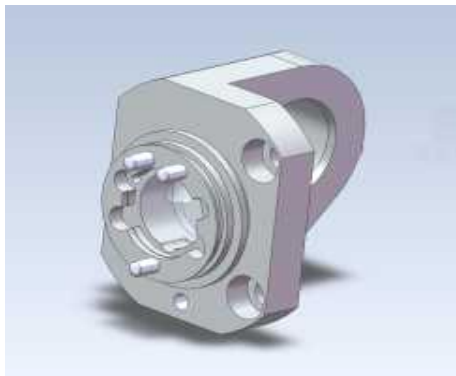
3. Ease off the side panel and pull off the centre swivel boss.



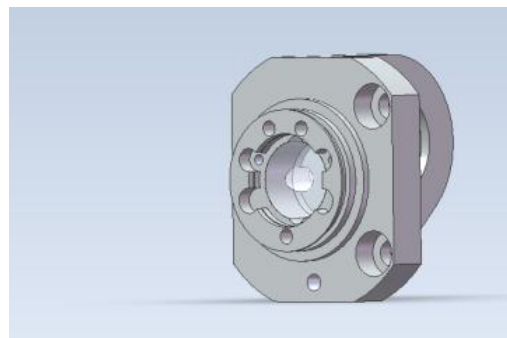
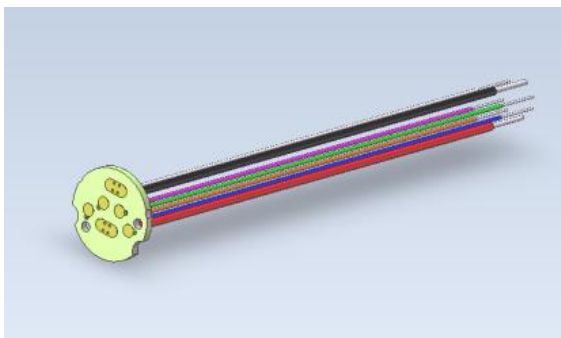
4. Remove any 'O' ring seals from the swivel boss as they will be replaced.

Heat the whole assembly sufficiently to soften the potting of the Interface PCB.

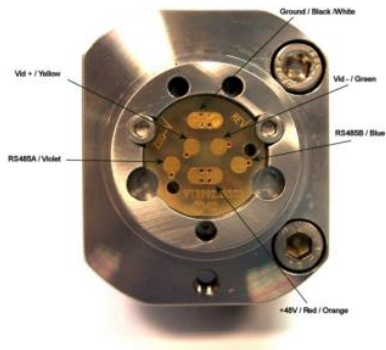
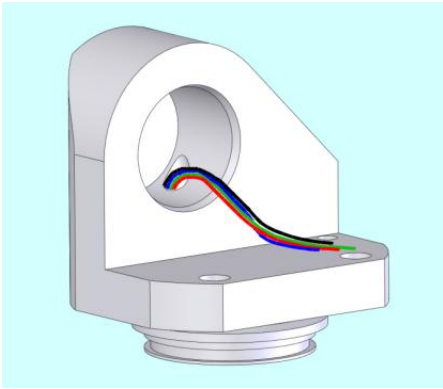
While hot, prise out the PCB and cableform.



5. With the PCB and cableform removed, clean out any potting residue from the cavity. Use a small screwdriver or similar, but be very careful not to score or mark the inner surface of the cavity.



6. Thread the new PCB and cableform into the swivel assembly, through the hole shown above.



7. Orientate the PCB as shown above and fit the two mounting screws.

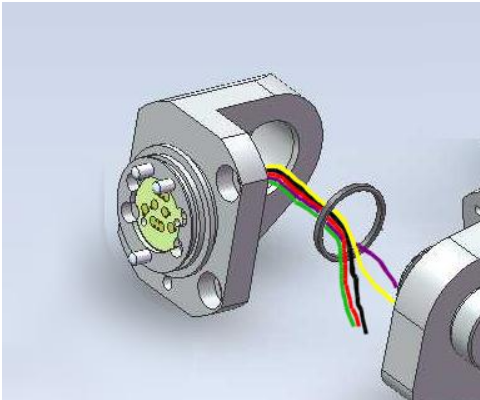
8. The front Interface assembly must now be potted.

Seal the front face of the PCB with blu- tack or similar re-usable adhesive, ensuring that any holes or gaps are sealed.

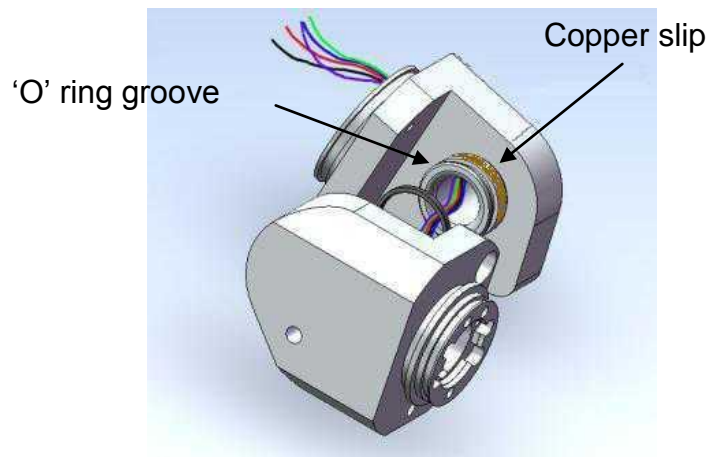


9. Using a 10ml syringe fitted with a flexible plastic needle, fill the syringe to the 1.5ml position, Guide the tip of the needle into the access hole until it stops, the hole is shown in section 10. Completely expel the syringe into the hole, clean away any spillage from the visible wires and the surface of the cavity.

Leave the assembly on a flat surface, orientated as shown in paragraph 6 and allow the potting to set.

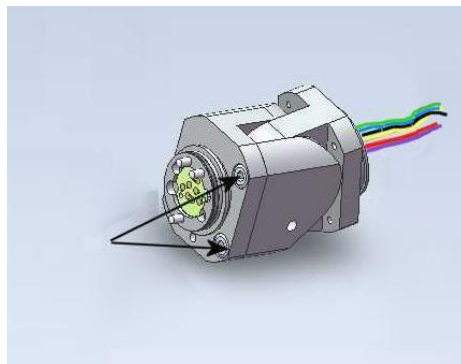


10. Thinly smear silicone grease onto the 'O' Ring before threading it onto the cable-form.



11. Apply a thin smear of copper slip to the side of the boss as shown above.

12. Fit the the 'O' ring, ensuring it is seated into its groove and assemble the two halves together.



13. Re-fit the side panel mounting screws as shown above. Ensure the swivel is free to rotate at this point.

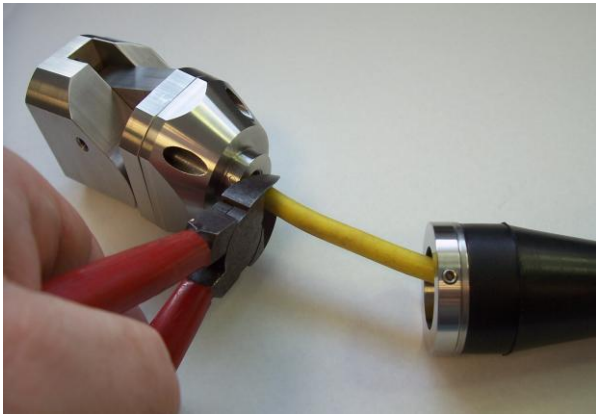
Step 8

The following sections describe the Cable re-termination for the swivel option.
Use cable re-termination Option 3: Kit part number 93/VT2920-11 Swivel Cable Retermination Kit.

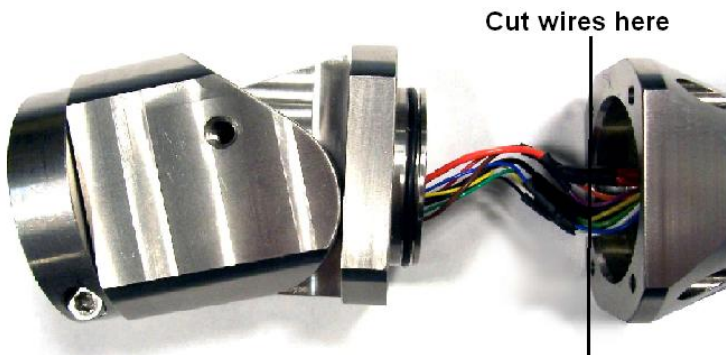
1. This section describes the re-termination of the swivel option.



2. Start by removing the front clamp and lanyards. Then remove the overall boot by unscrewing the 3 x M4 grub screws (2mm Allen key) which hold it in place.
3. With the boot removed, remove the strain relief cable clamp and move the clamp, boot, and spring further up the cable out of the way.
4. Using a large pair of side cutters, cut the cable behind the end of the swivel, including any damaged cable.



5. When upgrading to the swivel termination, the front spring must be removed and shortened to a length of 390mm then replaced.
6. Remove the four screws that hold the swivel back-shell in place.
7. Open the back-shell and expose the wires and splices.



8. Cut the wires on the cable side of the splices. Using a heat gun, remove the heat-shrink off each splice and unsolder the remnant of wire still attached.

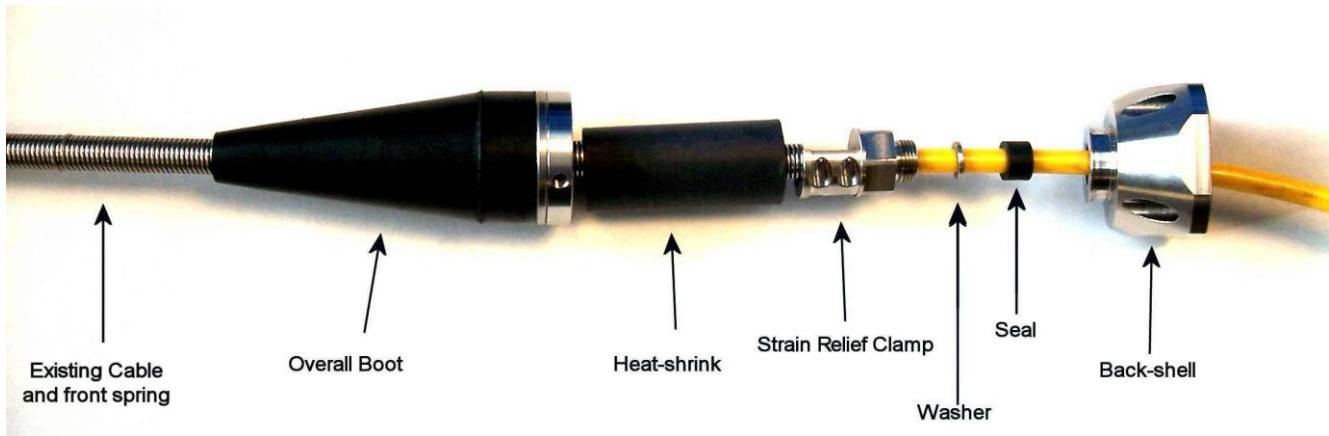
If any of the solder joints break re-strip the wire and pre-tin the wire on the swivel side.

9. With the swivel removed, use a heat-gun to soften the epoxy adhesive holding the short length of cable into the back-shell.

10. Using a drift or similar blunt tool, remove the short length of cable from the back-shell, ensuring you do not damage the thread in the back-shell.

Clean out the remains of the adhesive on the inside of the back-shell and allow to cool.

11. Assemble the parts back onto the cable as shown below.

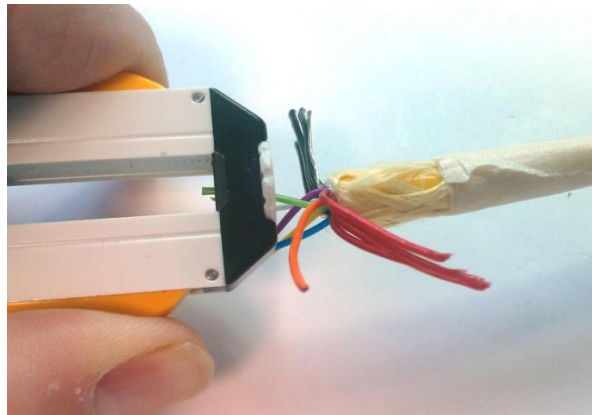


Step 9

1. To prepare the cable follow Step 3 (paragraphs 1 to 7)
2. Locate the drain wire and solder the end to stop the strands unwinding. Use masking tape to hold back the Kevlar weave.



3. Leave the green, blue, violet, and yellow wires at an overall length of 25mm.
4. Strip the ends of the green, blue, violet and yellow wires to a length of 4mm, then pre-tin.



5. Leave the remaining wires at a length of 25mm. Strip the red and black wires to a length of 10mm.
6. Cover the drain wire with a 15mm length of 2mm heat-shrink leaving 10mm of wire exposed at the end. Shrink this down by applying heat with the heat gun.
7. Bundle the four black wires and the drain wire together and twist the stripped lengths tightly together.

Do the same for the four red wires.

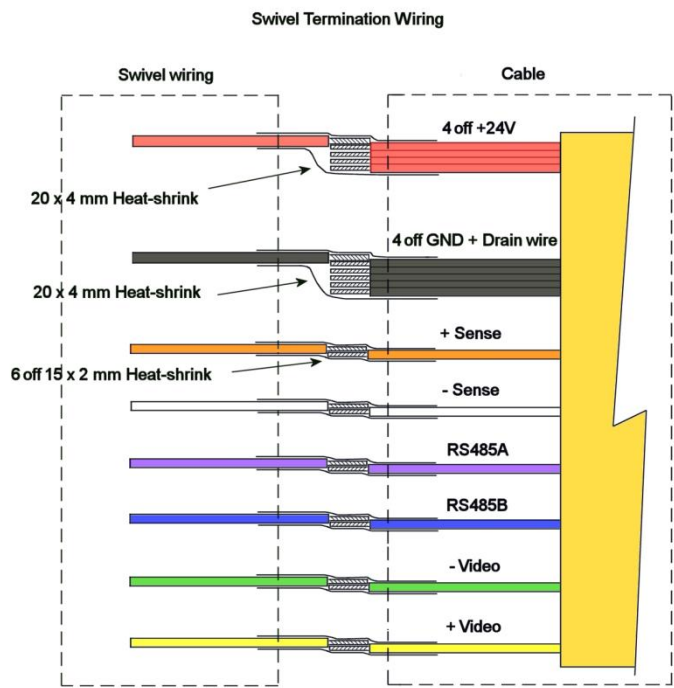
Pre-tin both bundles of wires ensuring that the wires are well wetted with solder.



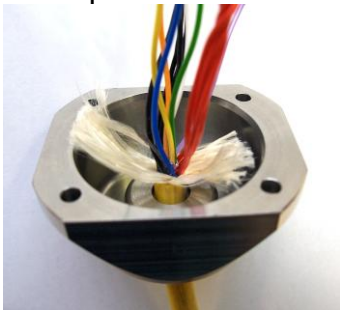
Step 10

1. This part will detail the soldering of the front part of the swivel to the cable. Start by firmly anchoring the cable down, to stop any unwanted movement.
2. The eight wires on the front part of the swivel should already be cut to length, stripped and tinned.
3. Starting with the larger of the two red wires, fit a 20mm length of the 4mm heat-shrink over the red wire. Solder the large red wire to the four red wires from the cable, ensuring that there is good wetting of the solder.

Continue to solder the other wires using the table below.



4. Remove the masking tape holding the Kevlar weave and trim the weave to 20mm length. Slide the back-shell up the cable until you can see about 3mm of the outer cable cover protruding into the back-shell, assemble the strain relief clamp to hold the cable in place.



Step 11

To convert from the original standard termination to the swivel termination, follow steps 8 to 10 and steps 12 to 16.

Use Full Upgrade Kit part number - 10/P350-Swivel, P350 Swivel Termination Assy.

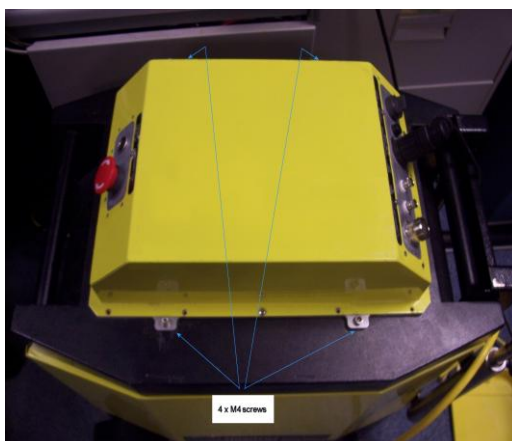
Step 12

1. This step is common to all termination types.

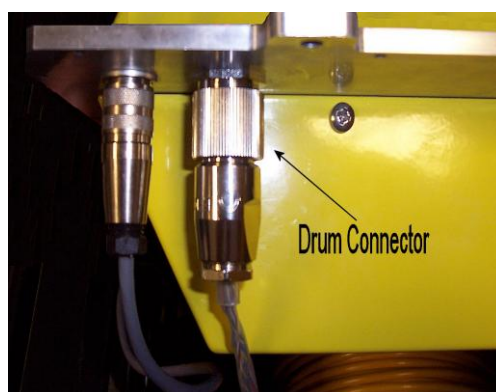
For all options, the connections must be tested.

2. Powered drum:

Undo the 4 x M6 screws that secure the PSU to the top of the drum and carefully lift the PSU to expose the cable connections.



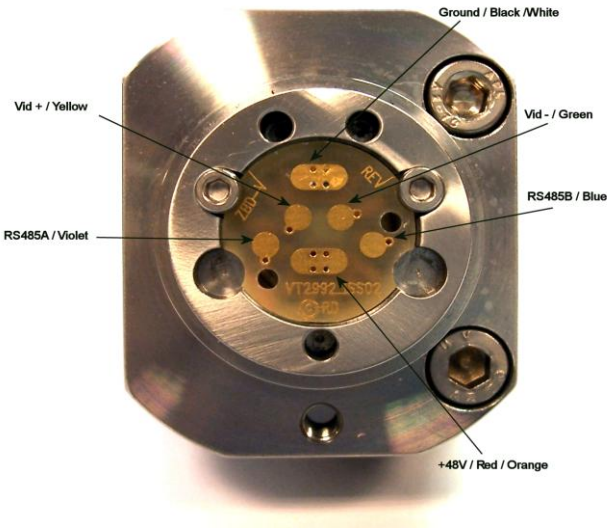
3. Undo the drum connector to expose the 16 pins.



4. Manual drum.

Remove the drum to PSU link lead.

5. Using a multi-meter, carry out a pin to pin continuity test from the termination assembly to the drum end of the cable.. Check the isolation of all leads from ground.



Use the Table below to check continuity

1	+48V	Red
2	+48V	Red
3	+48V	Red
4	+48V	Red
5	+48V	Orange
6	Ground	Black
7	Ground	Black
8	Ground	Black
9	Ground	Black
10	Ground	White
11	RS485A	Violet
12	RS485B	Blue
13	(NU)	
14	Video +	Yellow
15	Video -	Green
16	-----	Drain Wire

Step 13

1. If the re-termination is the swivel type; once the continuity has been checked, the swivel back-shell can be temporarily connected to the front part of the swivel.

The cable can be connected to a crawler to perform a static test.

2. Reconnect the 16 pin connector into its socket and replace the powered PSU onto the drum.
3. Power up the unit and check that you have video displayed on the command module and that you can control the camera and crawler.
4. If successful, secure the PSU by inserting the 4 x M6 screws using Loctite 243 on the end of the threads.

Go to Step 15.

Step 14

1. If the re-termination is the original standard option, then the next stage is to pot the connector.

If the re-termination is the swivel option, go to step 15.

2. If the static test is successful, you can pot the connector.
3. Fit the dispensing tip to the 10-ml syringe
4. Fill the syringe approximately 1/3 full with an epoxy structural adhesive (e.g. 3M Scotch Weld DP-100, or similar). It is recommended the plunger is removed and the syringe filled from the rear, with the syringe held horizontally. Insert the plunger and holding the syringe vertically, carefully depress the plunger to expel any air in the syringe.

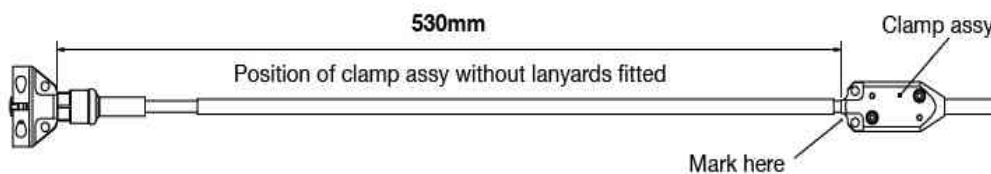


5. Insert the dispensing tip into one of the 2mm holes and gently inject the adhesive into the assembly until a bead of adhesive appears from the other 2mm hole, wait for the level of the adhesive to settle and top up if necessary, ensuring the cavity is completely full. Carefully wipe off any excess adhesive immediately and ensure that the gold pads are thoroughly clean.
6. Most epoxy structural adhesives set within 10-15 minutes and fully cure in 24-48 hours.
7. Let the adhesive set before proceeding to the next step. Do not use the cable until the adhesive has cured.
8. Slide the heat-shrink sleeve up to the back of the connector and apply heat to shrink the sleeve onto the connector gland nut and cable. Ensure the sleeve does not cover the end of the guard spring.

9. Re-assemble the strain relief lanyards to the connector, ensuring the D-shackle pin heads face upwards, i.e. in the same plane as the opening in the C-clamp.
10. Push up the 430mm length of spring until it is just short of the heat-shrink sleeve or the gland nut by about 10mm.



11. Measure a distance of 530mm from the back of the tractor connector and mark the position with a suitable marker.

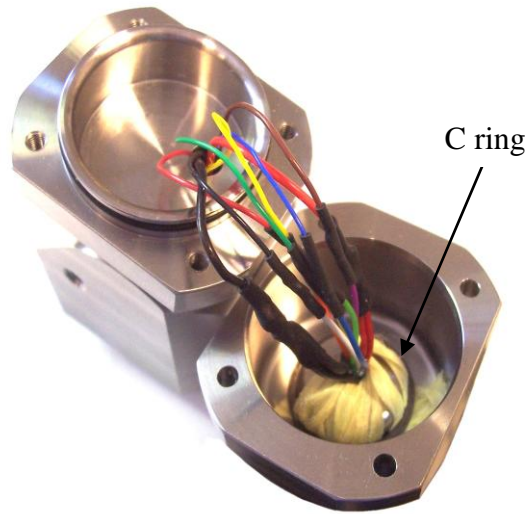


12. Loosely fit the clamp assembly to the cable and adjust it so that its front face is on the marked position, slide up the longer, rear part of the spring into the back of the clamp and tighten the clamp screws so that it clamps the cable and rear spring firmly without crushing them.
13. Secure the lanyards to the cable clamp using the D-shackles ensuring the eyelets of the shackle pins face upward. Check that in all orientations it is the lanyards that take the strain, not the cable. This is especially important in the vertical axis.

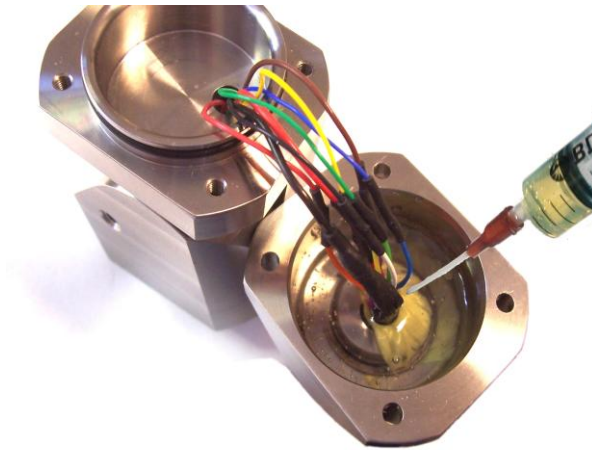
Step 15

This section describes the potting of the swivel termination option.

1. Once the continuity has been checked, the swivel back-shell can be temporarily connected to the front part of the swivel.
2. If the static test is successful, fit the C ring over the Kevlar weave, anchoring it to the central boss as shown below.
3. The inside of the swivel back-shell can now be potted: fit the dispensing tip to the 10ml syringe.
4. 4, Fill the syringe approximately 1/3 full with an epoxy structural adhesive (e.g. 3M Scotch Weld DP-100, or similar). It is recommended the plunger is removed and the syringe filled from the rear, with the syringe held horizontally. Insert the plunger and holding the syringe vertically, carefully depress the plunger to expel any air in the syringe.



5. Fill the back-shell, ensuring that no air is trapped, to a point just above where the cable comes through the back-shell, with the assembly level and anchored down, ensure there is no excess adhesive on the mating face or where the o-ring sits in the back-shell.



6. Leave the potting to set.

Step 16

1. Fit the back-shell to the front of the swivel using 4 x M3 cap-head screws, using Loctite 222 on the ends of the threads, ensuring that the wires are not trapped. Slide the heat-shrink sleeve up to the back of the connector strain relief gland nut and apply heat to shrink the sleeve onto the gland nut and the cable. Ensure the sleeve does **not** cover the end of the guard spring.



2. Now fit the overall boot and tighten the 3 x M4 grub screws with a 2mm Allen key.



3. Attach the lanyards to the body of the connector, using the M5 x 12mm screws and lanyard pins.



4. Loosely assemble the strain relief clamp using the 4 x M4 x 10 cap-head screws, using Loctite 243 on the ends of the threads.

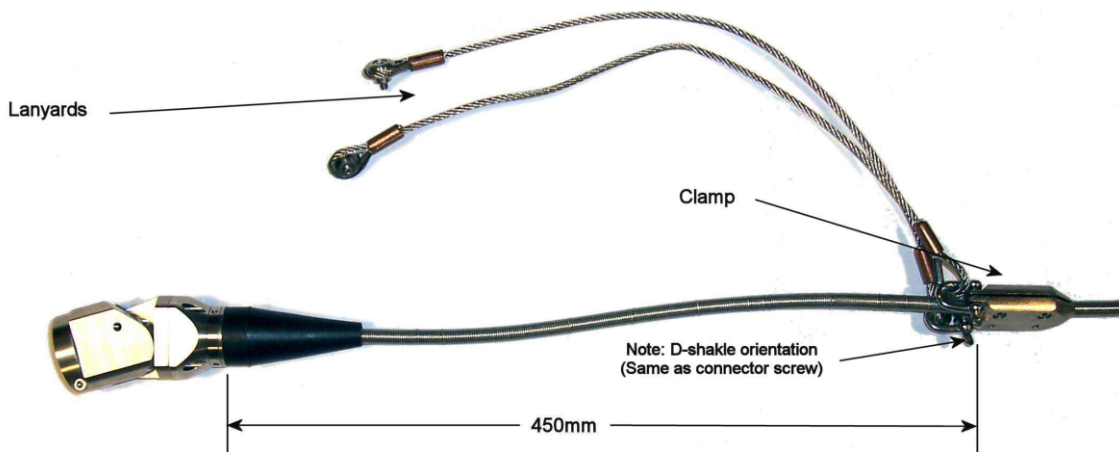
Slide the end of the 2570mm spring into the rear end of the clamp.

Measure a distance of 450mm from the front end of the overall boot to the front end of the clamp and tighten the clamp at this distance.



5. Secure the lanyards to the cable clamp using the D-shackles ensuring the eyelets of the shackle pins face upward. Check that in all orientations it is the lanyards that take the strain, not the cable. This is especially important in the vertical axis.

Caution: Never use the system without the strain relief properly assembled and secure. Failure of the strain relief will damage the termination and may result in the crawler being disconnected from the cable.



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P350 flexitrac system

CRAWLER CABLE RE-TERMINATION GUIDE

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