

### “Best Practices” for Successfully Integrating PAT4.0 Family Tool Systems With A Robot

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- Panduit recommends using the PAT/Robotic Kit (PATM4.0-RK) when integrating a PAT1M4.0 or PAT1.5M4.0 with a robot. This kit includes an aluminum housing that replaces the standard ergonomic PAT plastic housing. This aluminum housing includes a pneumatic trigger actuator for remote cable tie installation and has a bolt pattern to facilitate easy mounting of the tool to the robot end effector. Additional alignment holes in the housing allow the tool to be installed repeatedly in the same position to ensure accuracy. Two dowel pins are included in this kit for use with the alignment holes. It is critical that both dowel pins are actually installed and used.
- PAT tool approach angle and wire bundle placement within the PAT tool jaws:
  - a. The following drawing explains a suggested three step process for PAT tool approach onto wire bundles when using a robot. This approach method ensures cable ties are tensioned properly onto the bundle and tie tips are cut off flush to the tie head.
  - b. Do not force the wire bundle into the PAT tool jaws. Doing so could hinder the travel of the cable tie around the jaw path, and could increase the possibility of a misfeed. Misfeeds can occur if the cable tie tip gets blocked while the tool attempts to feed it through the cable tie head.
  - c. The top of the bundle should be approximately 5 mm away from the nook of the jaw (see Figure 1 illustrating the use of the PAT Test Tool P/N: PATM-TT)
  - d. It is recommended that bundles are formed round using harness board accessories to ensure tight tie installation.
  - e. The bundle should be flexible enough such that the cable tie can pull the bundle into the nook of the jaw during installation.



**NOTE:** *In the interest of higher quality and value, Panduit products are continually being improved and updated. Consequently, pictures may vary from the enclosed product.*

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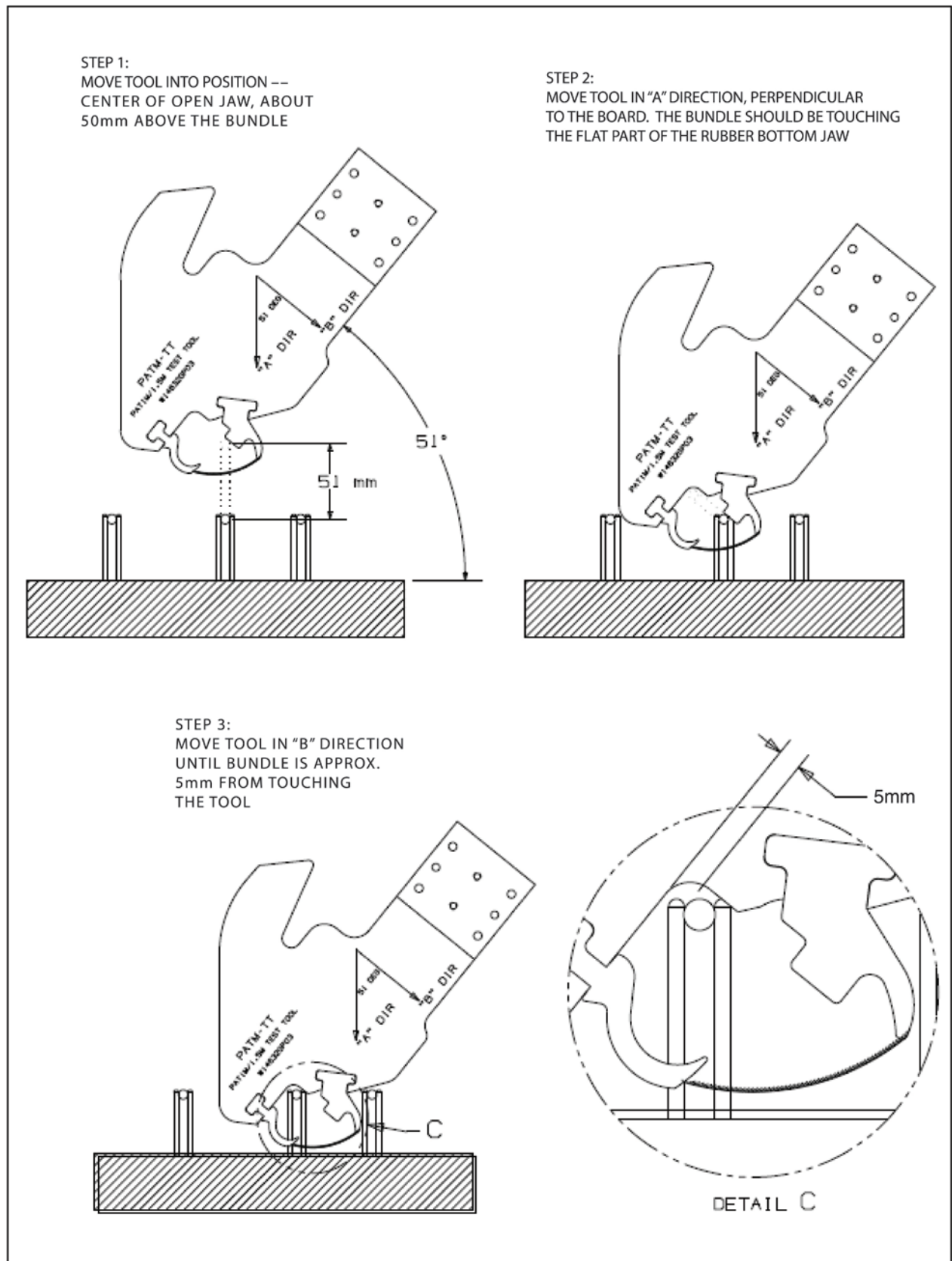
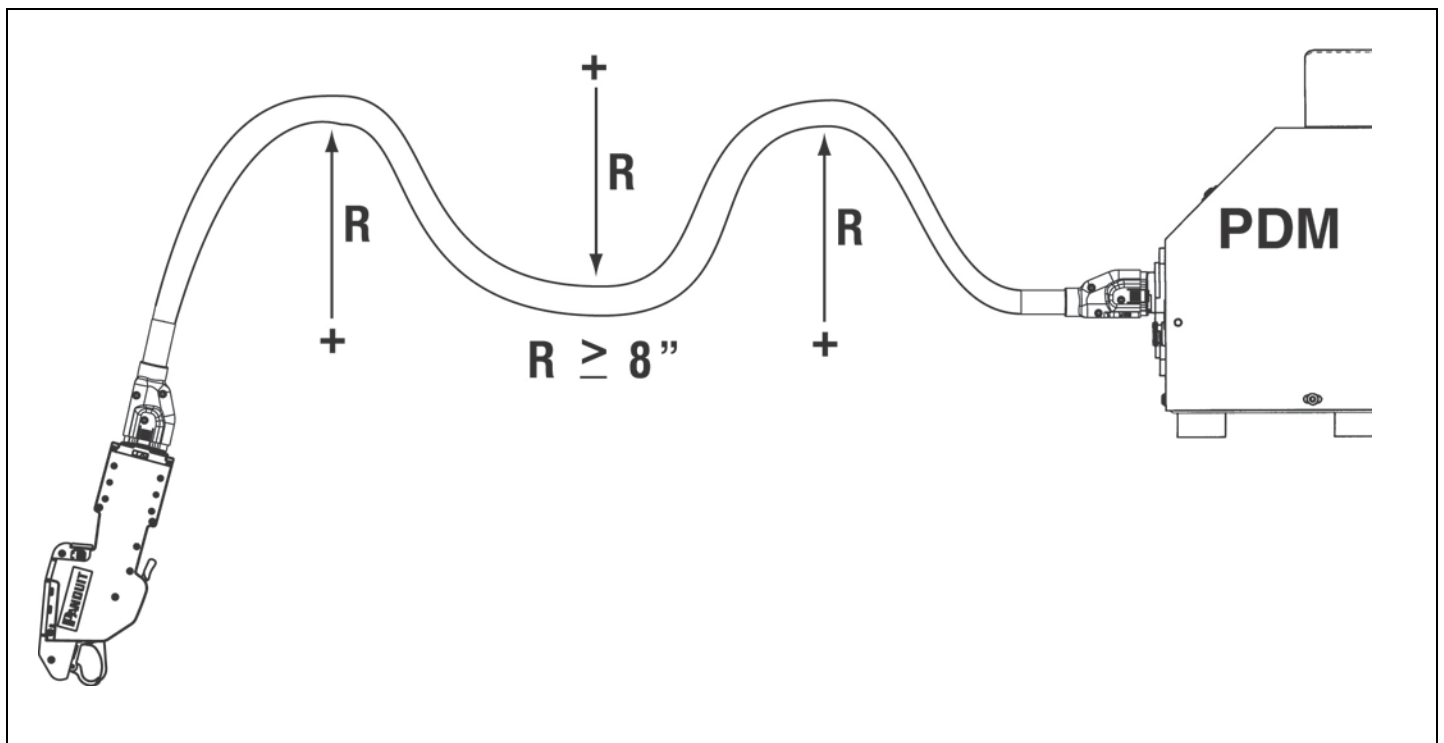


Figure 1: Details for Tool Approach to Bundle (Test Tool PATM-TT is used for the above illustration)

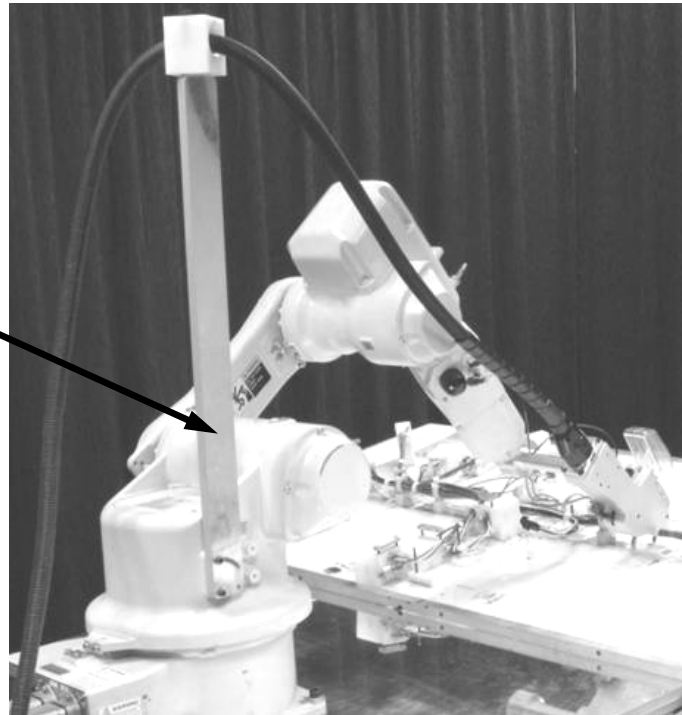
- Use of the PAT test tool (PATM-TT): This tool can be used during robot programming to provide a safe method to debug robot software and finalize PAT positioning without damaging actual PAT tools. This test tool has removable rubber jaws that represent the actual steel jaws. It is recommended to use this test tool during programming while attached to the PAT system transfer hose to account for hose bend radius control during robot movement.
- To electronically cycle the cable tie properly, use both the pneumatic trigger actuator to close the jaws and the PDM-EI (electronic interface) option. Either one of these alone will not cycle the tie properly.
- Dispenser transfer hose bend radius control is critical during robot motion:
  - a. The transfer hose must not have sharp bend radii or twists during robot motion which cause slower cable tie movement in the transfer hose and tie misfeeds.



- b. Panduit provides two transfer hose strain relief tubes (1ft each) for both ends of the transfer hose. These strain relief tubes are included in the PAT/Robot integration Kit (PATM4.0-RK) and can be purchased separately under part number (PATM-RKS).

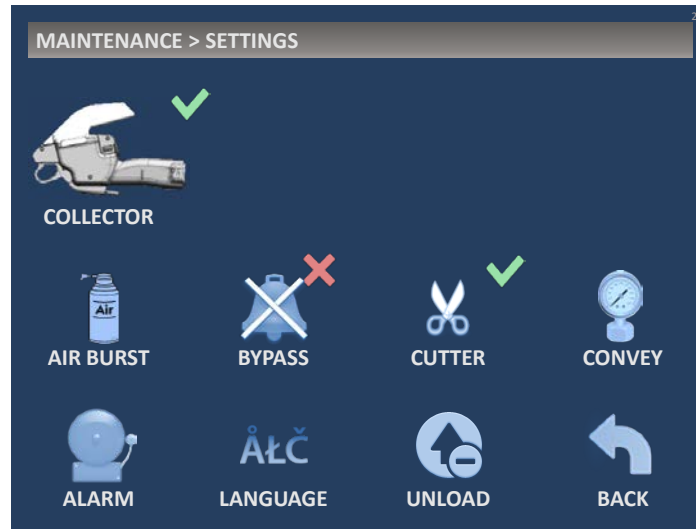
Both strain relief tubes should be installed onto the transfer hose by cinching the cable ties included so the strain relief tubes do not slip during robot motion. Make sure both strain relief tubes are installed at the very ends of the transfer hose behind the quick connect couplings.

- c. Panduit suggests using a support bracket (supplied by integrator) to hold the transfer hose during robot movement to better control tube bend radii.



- The PAT PDM4.0 dispenser must be located such that the transfer hose is not damaged and bend radii can be controlled during the entire reach of the robot. This will ensure optimal cable tie installation as well as increase the life of the transfer hose.
- Suggested deployment of wires and accessories to avoid mechanical shock to tool:
  - a. To optimize the cable tie installation process increasing production rates:
    - 1. For PAT1M4.0 tools: The top of the wire bundles should always be at least 45mm (1.75") off the harness board.
    - 2. For PAT1.5M4.0 tools: The top of the wire bundles should always be at least 64mm (2.5") off the harness board.
  - b. To avoid loose ties and long cutoffs, do not install cable ties closer than 7mm (0.3") to previously installed cable ties. The jaw of the PAT tool must be a minimum of 15mm (0.6") away from the harness board accessories to avoid interference.
  - c. If the Z-axis is not a variable on the robot, then all wires must be in same plane parallel to the harness board to eliminate cable tie placement issues. It is recommended that the Z-axis be servo-motor driven to provide the tool with a multi-directional approach as needed to achieve the steps in Figure 1.
- Recommended air pressure to the PAT4.0 system is 65-85 PSIG with a maximum 10PSI drop during operation. Setting the air pressure at any other level may result in unsatisfactory results. Do not use lubricated air, as this may damage the tool. If the pressure drop is more than 10 psi, it may be necessary to add a booster to the line.
- Once the tool has fully completed the cycle, the cable tie waste is dispensed in the PAT tool tip collector:
  - a. The tip collector can hold a maximum of 300 ties, and should be emptied when prompted. Not doing so may cause jams in the tool.
  - b. It is not recommended that tie tips be ejected over the harness board since these can affect harness board and wire accessory positioning, affecting accurate tie placement.

- c. Some integrators successfully installed “trap doors” on the back of the PAT tool tip collector to make it easy to release the tips when the tool is turned upside down.
- d. If the tip collector is modified to empty tie waste by turning the tool upside down, no programming changes are necessary to the dispenser. If the tip collector is used unmodified, then programming changes to the dispenser are necessary to ensure the tip collector does not over fill and jam.
- e. The dispenser is configured to stop after 300 cycles with an alarm to notify the operator to empty the tip collector. To deactivate this feature, use the touch screen LCD. Press Maintenance> Settings> Collector



The “Collector” icon toggles the automatic tip collector counter off. The user will not need to acknowledge the tip collector full after 300 successful cycles.

- The carrier strip scrap bin also needs to be emptied to ensure a smooth operation. The bin holds up to one half of a reel or 360 carrier strip pieces:
  - a. Empty out the carrier strip scrap bin after every 2,500 ties have been dispensed.
  - b. If emptying the bin by hand twice per reel is unacceptable, it is recommended that a larger collection bin be positioned in place of the scrap bin.
- There is a feature in the dispenser that will allow the operator to manually create a burst of air down the hose transfer tube to clear a tie that has not reached the tool head and could possible cause a hose jam. The "Air Burst" button can be pressed if the cable tie does not advance to the jaw area. NOTE: Care should be taken to not activate the air burst when the hose and or tool is not attached to avoid injury. Pressing the "Back" will return to the previous menu level. To activate this feature, use the touch screen LCD. Press Maintenance> Settings> AirBurst.