2011

Apollo Seiko Soldering System

Comet Soldering System

Documentation Package – Table of Contents

Comet Solder Parameter Detail

Date: 2011

Soldering Type, Point Soldering, and Point Soldering No Up

Condition 1-100 Description	Factory Setting	Range
1st amount	7mm	0 – 99.9
1st Feed Speed	15 mm/sec	1 – 99.9
1st Reverse Amount	3 mm	0 – 99.9
1st Reverse Feed Speed	50 mm/sec	1 – 99.9
Preheat Time	0.5 seconds	0 – 9.9
2nd Amount	7.0 mm	0 – 99.9
2nd Feed Speed	10 mm/sec	1 – 99.9
2nd Reverse Amount	3 mm	0 – 99.9
2nd Reverse Feed Speed	50 mm/sec	1 – 99.9
Heating Time	0 sec	0 – 9.9
3rd Amount	0 mm	0 – 99.9
3rd Feed Speed	10 mm/sec	1 – 99.9
3rd Reverse Amount	0 mm	0 – 99.9
3rd Reverse Feed Speed	50 mm/sec	1 – 99.9

Point Solder Profile Notes:

01) The point solder profiles are accessed via BCD (Binary Coded Decimal), 1 ~ 99 via I/O

02) Condition 1 ~ 99 can be used for any **point, line, easy line, point no up** solder joint type

03) There are three potential solder feed cycles (pre-feed, 2nd feed & final feed), normally, the first two are only utilized

04) The point solder profiles are designed to follow the sequence recommended by IPC

05) Process Steps:

Introduce solder to joint area
Retract solder if necessary
Introduce the iron tip to the joint / substrate
Feed additional solder to create the electrical, mechanical connection
Retract solder
Reflow joint area to allow for proper wetting & flow through
Feed more solder to add flux (core) and prevent "icicling"
Retract solder
Remove iron tip

06) Typical solder joint times range between 1.0 & 3.5 seconds

Easy Line Soldering

Condition 1 - 100	Factory Setting	Range
1st Amount	7mm	0 – 99.9
1st Feed Speed	15 mm/sec	1 – 99.9
1st Reverse Amount	3 mm	0 – 99.9
1st Reverse Speed	50 mm/sec	1 – 99.9
Preheat Time	0.5 sec	0 – 9.9
2nd Feed Speed 1	15 mm/sec	0 – 99.9
Start Pool Time	0 sec.	0 – 9.9
End Pool Time	0 sec	0 – 9.9
2nd Reverse Amount	3 mm	0 – 99.9
2nd Reverse Speed	50 mm/sec	1 – 99.9
Heating Time	0 sec	0 – 9.9

Slide Solder Profile Notes:

06) The slide solder profiles are accessed via BCD (Binary Coded Decimal) 1~99
07) Condition 1~99 can be used for any **slide** solder joint type or line soldering
08) There are two potential solder feed cycles (pre-feed, 2nd feed & final feed), easy line soldering
09) The slide solder profiles are designed to follow the sequence recommended by IPC
10) **Process Steps:**

    Introduce solder to joint area
    Retract solder if necessary
    Introduce the iron tip to the joint / substrate
    Pre Heat time
    Second feed speed
    Start pool time – feed additional solder to create the electrical connection – End pool time
    Reflow joint area to allow for proper wetting & flow through (2nd reverse amount)
    Remove iron tip

11) Typical solder joint times depend upon the length of the row of pins / leads to be soldered

Line Soldering

Condition 1 - 100	Factory Setting	Range
1st Amount	7 mm	0 – 99.9
1st FeedSpeed	15 mm/sec	1 – 99.9
1st Reverse Amount	3 mm	0 – 99.9
1st Reverse Speed	50 mm/sec	1 – 99.9
Preheat Time	0.5 Sec	0 – 9.9
2nd Amount 1	10 mm	0 – 99.9
2nd Feed Speed 1	15 mm/sec	1 – 99.9
2nd Amount 2	0 mm	0 – 99.9
2nd Feed Speed 2	15 mm/sec	1 – 99.9
2nd Amount 3	0 mm	0 – 99.9
2nd Feed Speed 3	15 mm/sec	1 – 99.9
2nd Amount 4	0 mm	0 – 99.9
2nd Feed Speed 4	15 mm/sec	1 – 99.9
Start Pool Time	0 sec.	0 – 9.9
2nd Reverse Amount	3 mm	0 – 99.9
2nd Reverse Speed	50 mm/sec	1 – 99.9
Heating Time	0 sec	0 – 9.9

Slide Solder Profile Notes:

01) The slide solder profiles are accessed via BCD (Binary Coded Decimal) 1~99
02) Condition 1~99 can be used for any **slide** solder joint type or easy line soldering
03) There are four potential solder feed cycles (pre-feed, 2nd feed 3rd feed and 4th feed) normally only the first two are utilized.
04) The slide solder profiles are designed to follow the sequence recommended by IPC
05) Process Steps:

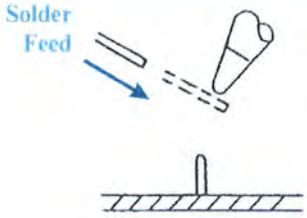
Introduce solder to joint area
Retract solder if necessary
Introduce the iron tip to the joint / substrate
Pre Heat time
Feed additional solder to create the electrical, mechanical connection up to four amounts with 4 feed speeds
Start pool time
Retract solder
Reflow joint area to allow for proper wetting & flow through
Remove iron tip

11) Typical solder joint times depend upon the length of the row of pins / leads to be soldered

Apollo Seiko Comet

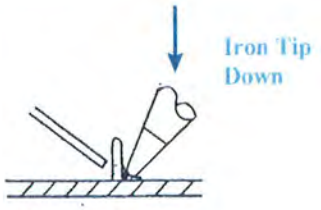
Solder Parameter Description – Standard Solder Cycle

Apollo Seiko Recommended Solder Feeding Procedure



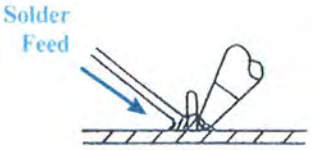
S+ - Initial Solder Feed

- Initial Solder Pre Feed Amount
- Solder Pre Feed Speed (mm/sec.)



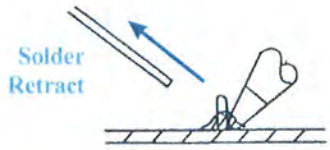
Pre Heat Timer

- Iron Tip Extends Down (10 mm stroke)
- Pre Heat Time (seconds)



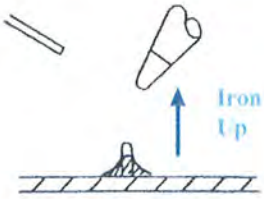
S+ - Secondary Solder Feed

- Secondary Solder Feed Amount
- Solder Feed Speed (mm/sec)



Heating Time & S-

- Heating Time
- Solder Retracts Amount
- Retract Speed



Iron Unit Retracts - Point Soldering

-- System Controlled

-- Once Solder Cycle is Complete

Note:

The above illustration is recommended for most through hole soldering operations, leads through plated or unplated through holes. There are, however, applications where this set-up may need to be modified slightly.

Applications such as very tall pins, large hole to pin ratio, component clearance applications etc. may require slight modification to this set-up.

Please contact Apollo Seiko technical support for optimal settings for your application(s).

Note: Please refer to the Comet solder profile sheet for this application. The above soldering parameter information will explain at what point during each individual soldering cycle that pre-heating is done, solder is being fed, solder is being re-flowed etc.

For example, Pre Heat Timer (above) is the pre-heating portion of the cycle.

Solder Parameter Explanation

Point Solder WORK Profile Description Sheet (1 - 100)

(Work Profiles 1 ~ 100 – Point Solder – Slide Solder)

Comet Solder Parameter	WK _ _ _	WK _ _ _	WK _ _ _
S+ (solder pre-feed amount) (solder prefeed speed)			
S- (solder retract amount) (solder retract speed)			
Preheat Timer			
Start Pool Time End Pool Time			
S+ (secondary solder feed) (secondary solder speed)			
S+ (secondary solder feed 2) (secondary solder speed2)			
S- (solder retract amount) (solder retract speed)			
Heating Time			
End Condition	END	END	END

Notes:

Tip Part #: DCS / DCN _____ Tip Temperature: _____

Process Notes: _____

_____

_____

Work Parameter Settings

Solder Parameters:

S+	Solder Feed Forward (amount)
S-	Solder Feed Reverse (amount)
Preheat	Extend Air Cylinder (timer)
CY1 OFF	Retract Air Cylinder (timer)
Heating	Timer (reflow)
END	End of Work Sequence
ACK	Slide Solder Confirmation

Sample Point Solder Sequence:

S+ 2.5 25.0	Feed 2.5 mm of solder @ 25 mm / sec.
CY 1 ON 0.0	Tip Extend
TIM 0.5	Timer of 0.5 Seconds
S+ 3.0 10.0	Feed 3.0 mm of solder @ 10 mm / sec.
S+ 0.0 0.0	Additional feed amount (if required)
S- 3.0 25.0	Retract solder by 3 mm @ 25 mm/sec.
TIM 0.3	Solder dwell time after feed 0.3 sec.
CY 1 OFF	Retract Iron Tip
END	End of Sequence

Point Iron

Slide Iron

N2 Generator

ZSB Feed Rollers

Clearance Requirements – Keep Out Area (general guidelines)

Clearance requirements are a function of the specific solder iron to be utilized. The specific solder joint configuration and its thermal mass are the primary considerations for choosing the appropriate solder iron tip design. Solder can be delivered to the PCB as flux-cored wire or placed as a preform. Factors to be considered for determining clearance requirements are: direction of solder iron approach, solder delivery method, type and size of neighboring components.

This scope of this document does not cover all of the allowable shapes and sizes of soldering tips for different applications. It is a guideline for considering different options in the development of PCB layout and process flow.

Clearances are measured from the edge of the pad to be soldered to the component body.

Neighboring components LESS than 5mm vertical height.

Includes SMT components and low profile sticklead components. Minimum clearance is 2.0mm from the side of pin array or 1.5mm from the end of the array. As component height increases, the clearance increases. See Figure 1 and Figure 2 below.

Keep out expansion for taller components:

Part Ht.	Keep Out
1mm	2mm
2mm	2.5mm
3mm	3mm
4mm	4mm
5mm	5mm
>5mm	Consult Mfg. Eng.

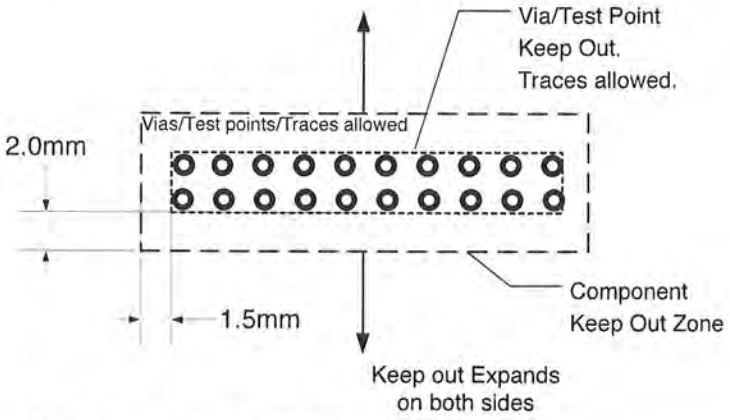


Figure 1 Keep Out Zones for Soldering Iron

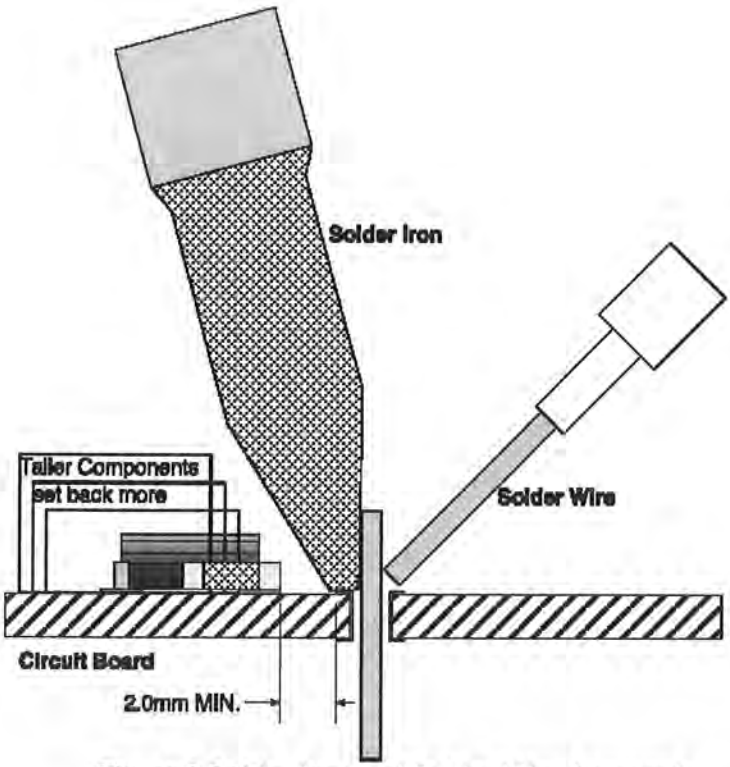


Figure 2 Solder Iron and Solder Wire Approach

Technical Advisory

Jun. 2, 11

Solder Qualtiy Factors

Solder feed & iron position location is very important to achieve consistent solder quality. The solder wire position in relation to tip location and PCB height can be the difference between consistently good solder joints and marginal results.

Point Soldering: (Tip Photo - DCS 60 DV-1)

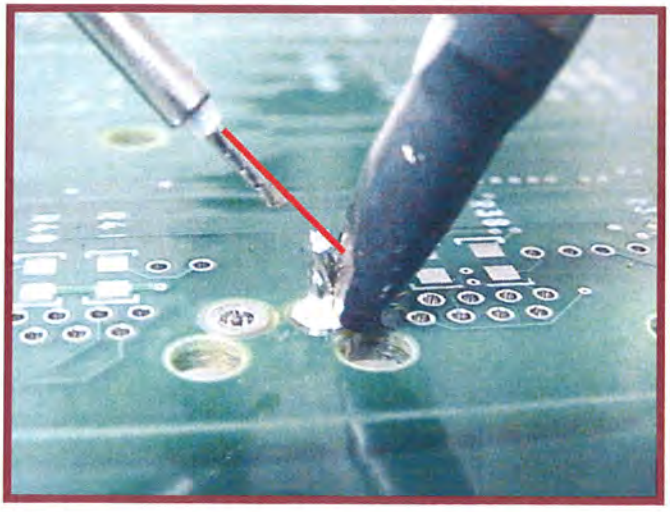
Point soldering is much more forgiving than slide soldering. It is important that the iron tip make contact with both the PCB pad and (if possible) the terminal that you are soldering. Many times the terminals may not be perfectly straight or at the exact same angle. This will cause issues with the iron tip contacting the terminal only and not the pad creating poor heat transfer. For most applications, the terminal / lead position can vary slightly. The tip is programmed to the inside edge of the plated through hole to compensate for the lead variation. The large tip profile allows for excellent thermal transfer even though the tip may not be in direct contact with the terminal.

Solder Feed:

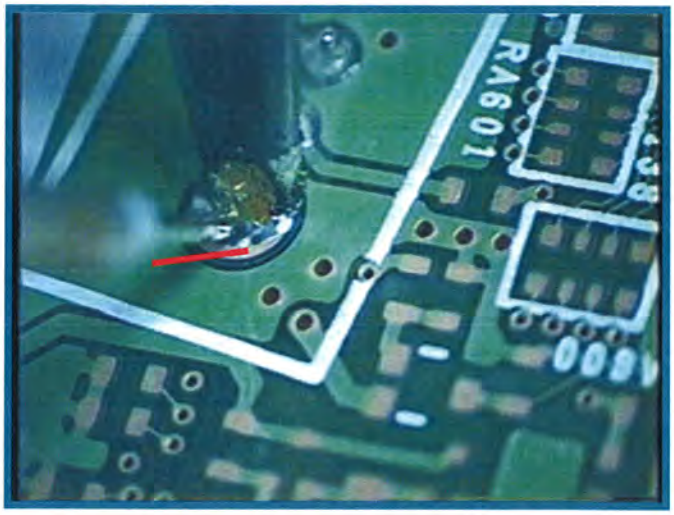
The solder feed height in the photo below is a little higher than recommended. By feeding the wire in this high position there are opportunities for two potential issues:

Solder Jam: The wire may hit the top of the terminal causing a solder clog error condition

Solder Void: The solder may want to stay with the iron tip and not migrate to the joint, this lack of solder can produce a void. Typically, the next joint will have excess solder when this occurs.



Point Solder – Feed too High
Potential Void



Point Solder – Feed into Joint
Correct Position

Slide Soldering: (Tip Photo - DCS 50 R)

Slide soldering requires the iron tip and terminal relationship to be **very consistent**. Optimal results are achieved when the iron tip make contact with both the solder pad and the terminals. Also, the iron tip should have a slight "**OPEN**" angle to minimize the potential for solder bridging (photo next page). During movement, the iron tip should contact all of the leads for the best possible heat transfer.

The sliding speed and feed rate are programmable. Normal sliding speeds range between 3 mm / second & 5 mm / second.

Iron Tip Programmed Location:

The iron tip position is very important at both the start and finish of a connector row. The photos below illustrate the proper location for iron tip position.

Start Position – Tip Location
Iron Tip 50% on past first pin

End Position – Tip Location
Slide past last pin

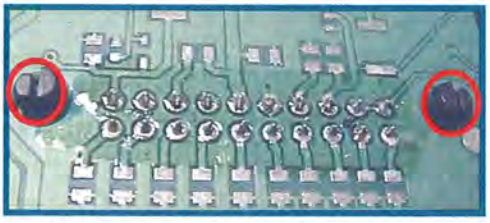
Solder Feed:

The solder feed height in the photos above is correct. The feed height should be located to the center of the iron tip (top to bottom) of the tin electroplate area. This ensures that the solder will melt on contact and wett as evenly as possible. A higher or lower feed height can cause the following issues:

Low Feed Height: The wire may hit the terminals and deflect away from the tip, therefore not melting
High Feed Height: The solder may contact the black plating on the tip causing inconsistent melting and can actually prevent wetting to the Tin electro-plated area

Some applications do not allow for the tip to slide past the last terminal of a connector such as a plastic snap-lock etc. or a component in close proximity. In this case, the tip must be programmed to stop on the last terminal

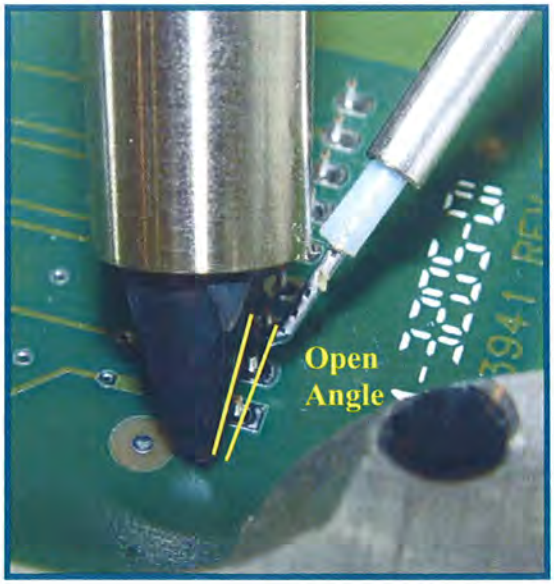
For some applications, there may be components or plastic parts that prevent the iron tip from sliding past the last terminal. In this case, you must stop the tip on the last terminal (photo lower right). This can sometimes cause the solder to "**SPIKE**" upon removal. It is important to determine the correct amount of time to leave the tip down to prevent a solder spike from occurring.



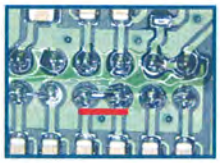
Plastic Snap-Lock Prevents
Iron tip from sliding past the last terminal

Iron tip programmed
to stop on the last terminal

The iron tip is programmed with a slight "**OPEN**" angle. This allows the front of the tip to contact each terminal and the rear edge of the tip to heat each pad as the tip slides. The "**OPEN**" angle minimizes the possibility for bridges to occur as the entire tip surface never contacts two pins simultaneously.



Slide Solder Defects:



Solder "Shorts" or "Bridges":

There are several factors that can contribute to a solder short or bridge. These factors include:

a) Flux void in wire core

b) Wire feed position

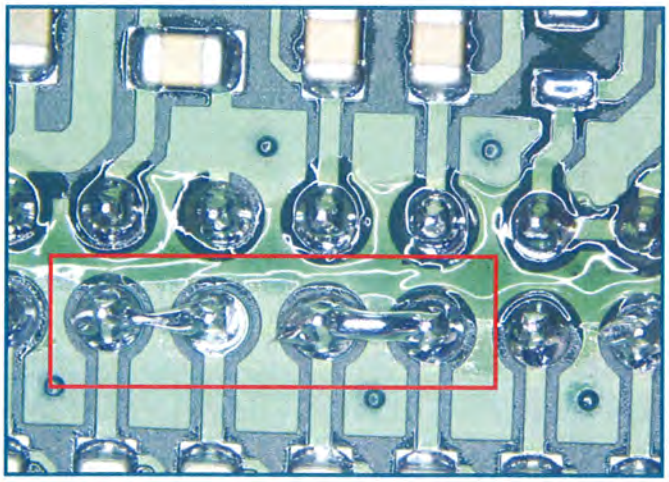
c) Iron tip position

d) Inconsistent lead location

e) Iron tip temperature

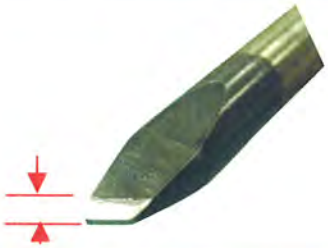
f) Oxides, residual flux on tip (post clean)

If the robot is soldering well and then the quality becomes poor, the main reason is that something has changed in the set-up. Most likely, the solder wire feed position has been accidentally moved or mis-adjusted or was loose and has drifted out of position. Prior to making any programming changes, check the set-up of the tip and feed position to ensure that they are correct.



Poor flux distribution on PCB. This was caused by feeding solder too high on the tip above the Tin electroplate, this caused the flux to burn away and become in-effective. This problem was fixed by lowering the feed position.

The solder feed height in the photo above illustrates the proper height setting for feeding into a slide solder tip.



The solder feed needs to contact the Tin electro-plated area of the iron tip. Solder feed heights above this area can cause major quality issues.

Point Solder Voids:

Insufficient solder, also referred to as a "VOID" can be caused by several factors. These factors include:

a) Flux void in wire core **b) Wire feed position**

c) Iron tip position **d) Burnt flux build-up on tip**

e) Oxidized pad or terminal **f) Poor thermal transfer (iron tip hole or worn plating**

Solder Void
Total missed joint, tip may have hit top of terminal

Incomplete Coverage
poor thermal transfer from tip to terminal
possible worn tip or hole in tip

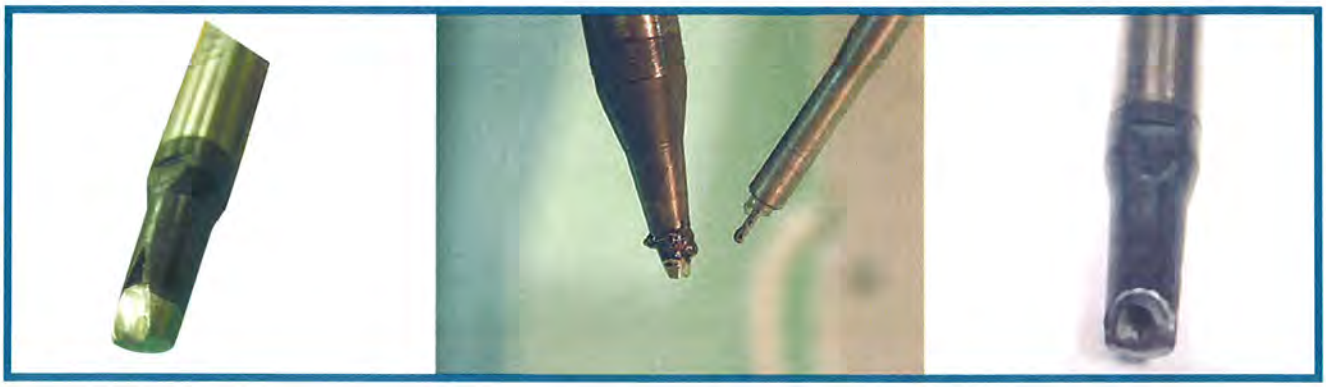
Iron Tip Issues:

The iron tips should be changed on a schedule rather than waiting until there are issues with solder quality. Counter should be installed to determine the amount of cycles that each tip has soldered. Once a pre-determined life has been set, the tip should be changed to prevent soldering issues from occurring.

Iron tips have a Tin electro-plate area on them. Over time, the feeding of the solder wire, the flux in the solder as well as temperature and the terminal that the tip is contacting all have a negative impact on tip life. Below are photos of a new tip and a badly worn tip with a hole worn in it.

Burnt flux residue can also negatively impact solder quality and create potential void situations. The iron tips should be manually cleaned once per hour to remove the burnt flux residue (photo in center below). When the flux builds up on the tip, it can actually prevent the tip making good contact with a terminal due to the flux making contact with the terminal and not the tip surface.

When the plating wears or a hole has built up on the tip, the thermal "mass" of the tip is lost, which in turn causes poor heat transfer. Changing the iron tip on a scheduled basis *will prevent this from happening*.



New BCV-1 Tip
Clean Lines & Plating

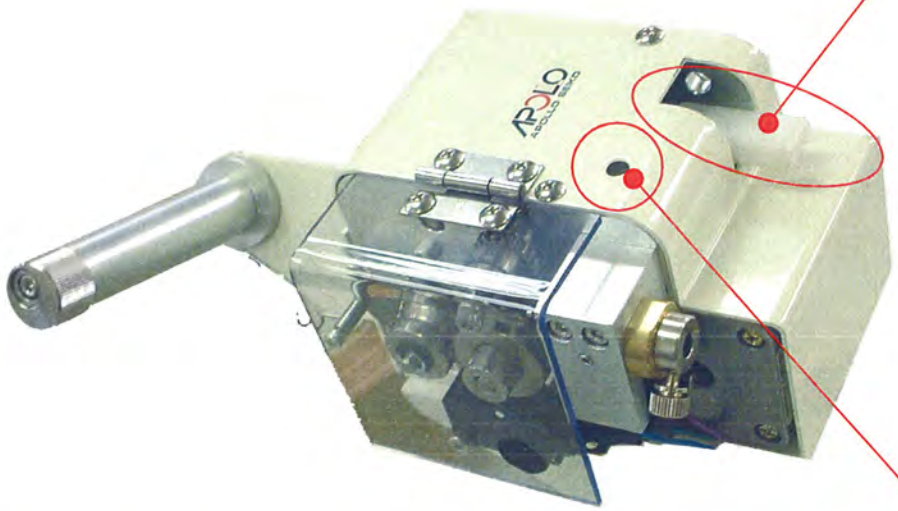
Burnt Flux Residue
Build-Up All Around Tip

Tip with Hole Worn
Loses Thermal "Mass"

Adjusting Solder Feed Tension

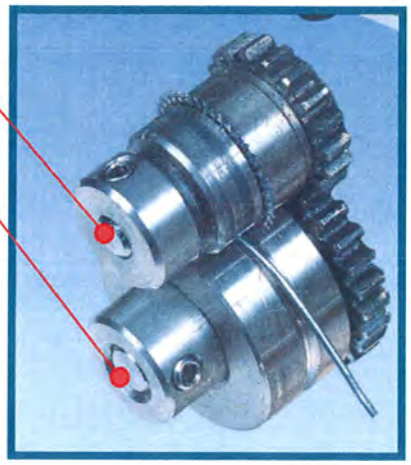
Date: Feb. 07'

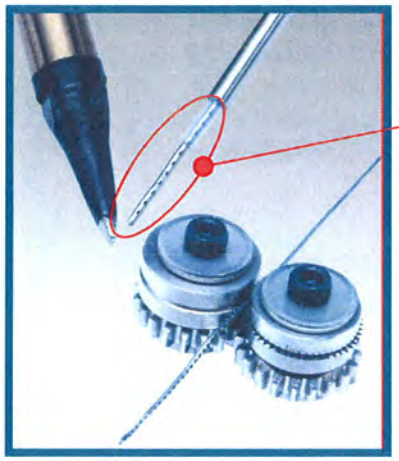
Lower the Solder Feed Engage Lever to Allow Access to Feeder Tension Adjustment



Rotate the set screw inside cover counterclockwise (CCW) to tighten tension and clockwise to loosen feed roller tension

Feed Roller Gear Close-Up (tension adjustment controls tension on these two feeder components)





ZSB Roller Access Holes

ZSB Feeding System

Technical Advisory

Feb. 2011

Comet Iron Tip Cleaning

There are two methods of cleaning the iron tip prior to soldering.

Air Blow Cleaning

Rotary Sponge Cleaner

Air Blow Cleaning – CCU Cleaner Cup:

Step 01: Jog the robot to the location above the air-blow cleaning cup. Press ENTER to enter the location. The screen will allow you to define the point type.

Step 02: Scroll down using the cursor arrow keys and select "Cleaning Point" & press enter

Step 03: Input the time duration for the air blow to turn ON (normally 0.3 ~ 1.0 seconds) & press ENTER

The tip cleaning location has been programmed. Continue programming the soldering locations and save the program when complete.

Rotary Sponge Cleaning – SRC 3000

Step 01: Jog the robot to the location where you would like to begin the tip cleaning. Normally you will start in one set of sponges and then move to the 2nd set to clean the opposite surface of the tip. Press ENTER to enter the location. The screen will allow you to define the point type.

Step 02: Scroll down using the cursor arrow keys and select "Cleaning Start Point" & press ENTER

Step 03: A screen will appear in the LCD for "Line Speed". Enter the speed of travel from the start point to the end point (normally 10~30 mm/sec.)

Step 04: Jog the iron unit to the second (or END) location press ENTER. The cleaning sequence is complete.

Continue programming the soldering locations and save the program when complete.

J-CAT Comet
Teach Pendant LCD

Apollo Seiko
Comet Controller

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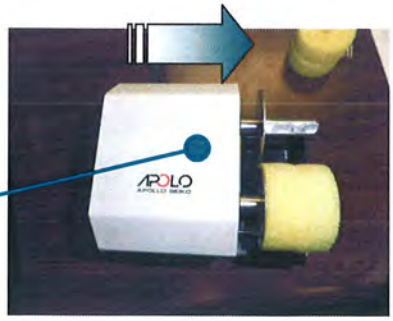
SRC 3000 Sponge Change

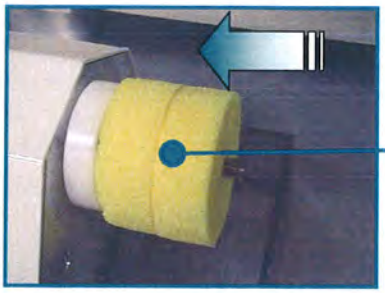
Step 01:

Loosen & remove the metal support on the right hand side of the SRC 3000 by turning it counterclockwise.

Step 02:

Remove sponges by pulling them off of their mounting shaft.





Step 03:

Replace sponges with new ones by installing onto shaft. Reinstall metal support and hand tighten to "stop" position.

Step 04:

Check water level and fill between 2/3 & ¾ full with regular tap water. Replace reservoir

APOLLO SEIKO

Technical Advisory

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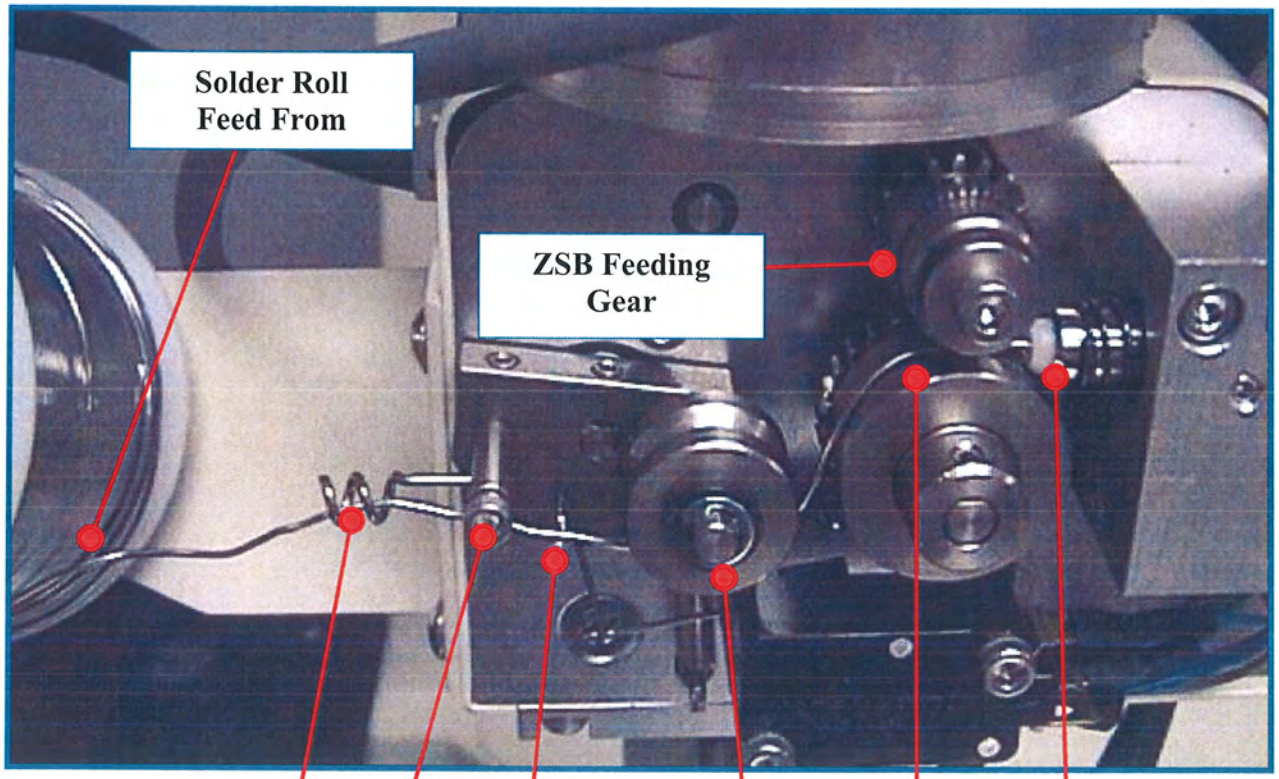
Solder Feed Routing - ZSB



RS-P RS-L Flow Control Adjustment

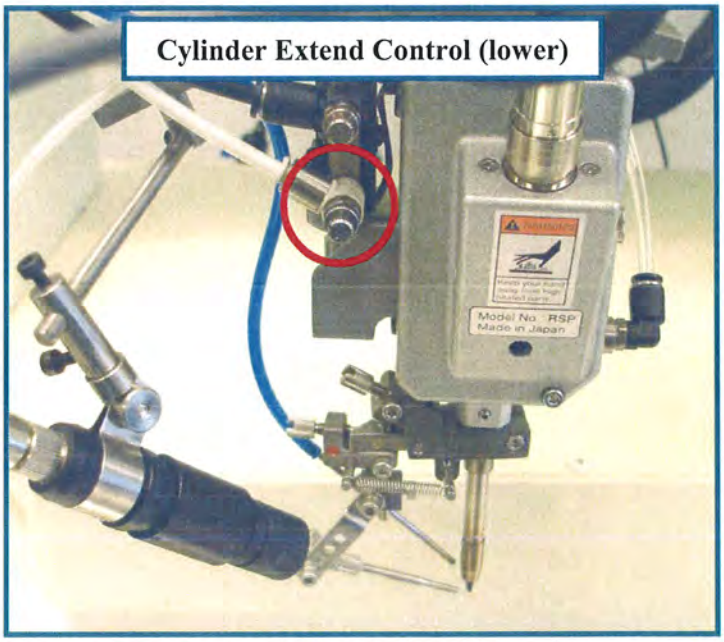
Date: August 09'

The flow control adjustment valve sets the speed of the iron tip extend & retract for each solder cycle. The extend & retract speeds should be set so that the motion is "fluid" and not too fast or too slow. Setting these properly will help prevent the formation of solder balls due to splash of the solder on the cylinder extend or solder dropping from the tip on the retract.

Cylinder Retract Control (upper)

RS-L Iron Unit
Flow Control Adjustments

Cylinder Extend Control (lower)



RS-P Iron Unit
Flow Control Adjustments

Setting the Flow Control on the RS-P or RS-L Iron Units

01) Loosen the outer locking ring by turning it counterclockwise
02) Loosen or tighten the inner thumb screw to increase or decrease the flow rate. Rotate left to increase, right to decrease
03) The upper flow knob controls the retract speed (tip up), the lower flow knob controls the extend speed (tip down)
04) Press the IRON Up/Down button on the Apollo controller or teach pendant to check the speed of travel. Adjust so that the motion is of a "fluid" type (not too fast or too slow)
05) Re-tighten both outer locking rings when complete to ensure the flow controls are locked and secured

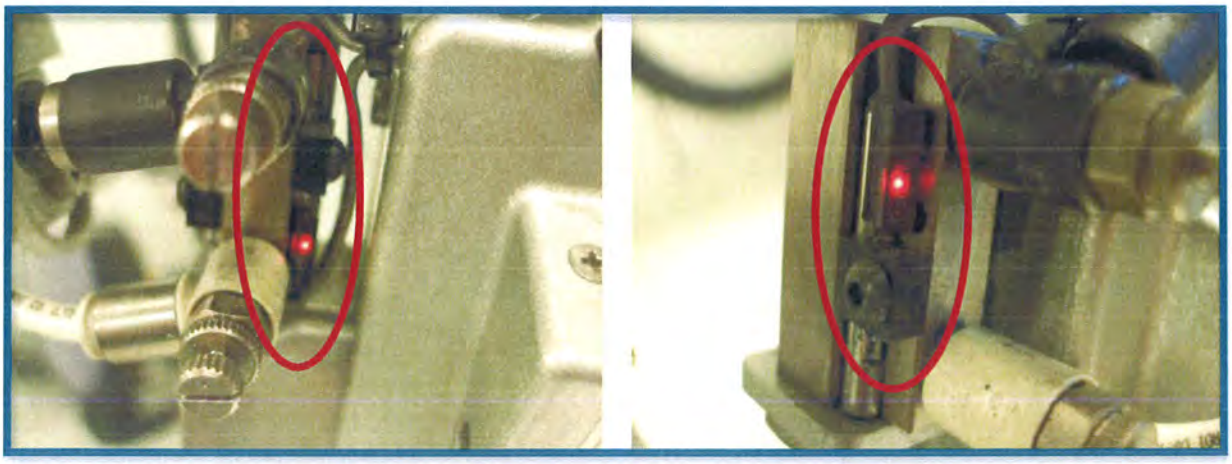
RS-P RS-L Up/Down Sensor Adjustment

Date: August 10'

The RS-P & RS-L iron units have SMC up & down sensors with LED indicator lights. These sensors can be adjusted in order to ensure that they turn on when the tip is either retracted or extended. The sensor position is important as it tells the controller that the iron unit is ready (up position) or "in process" (down position) If the LED's do not illuminate than the Apollo controller is not getting the correct signal and may not complete the cycle as the sensors are not properly adjusted.

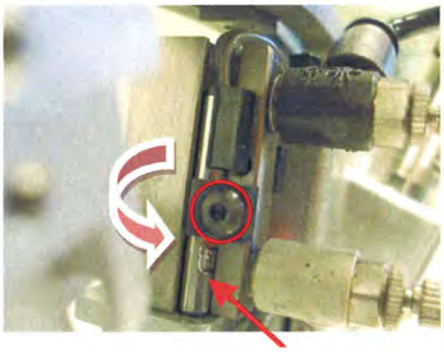
Up Sensor (LED Display)

Down Sensor (LED Display)



RS-P / RS-L Iron Unit Sensor Adjustments

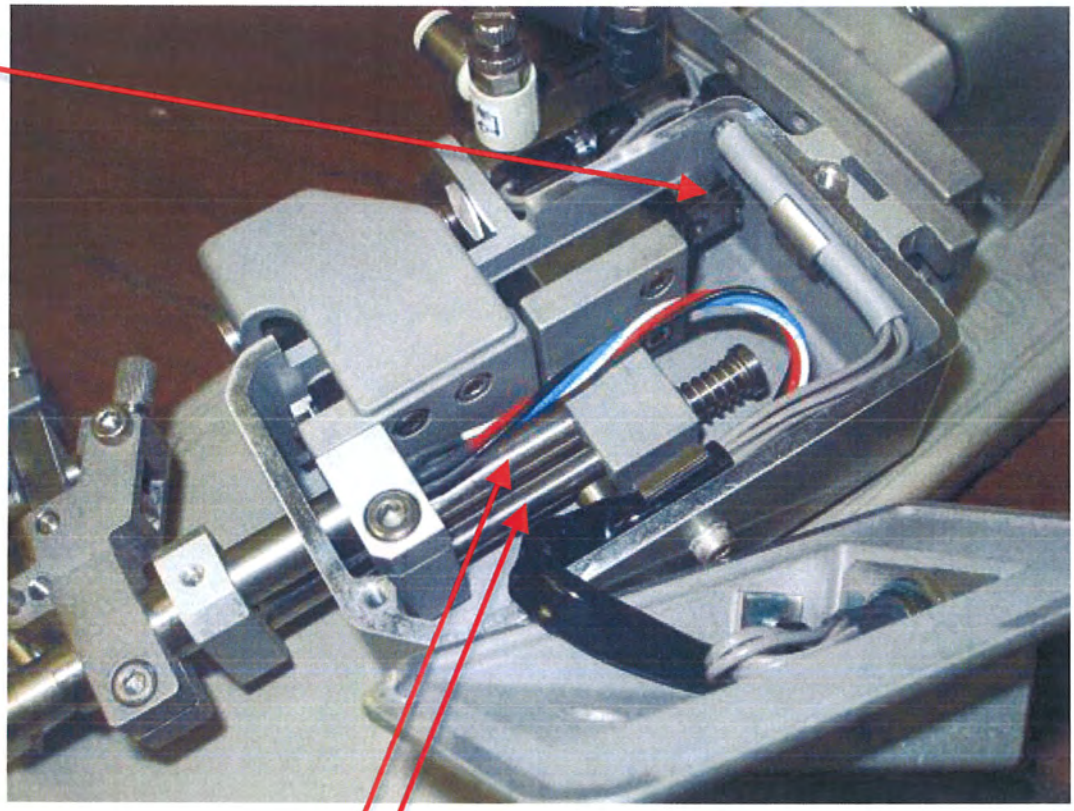
01) Loosen the button head screw to allow the sensor to move freely.
02) Raise or lower the sensor manually until the LED turns on. In order for the down sensor (photo) to be ON, the iron unit/tip must be extended to its lower position.
03) Find the range of the sensor by moving the sensor up & down manually.
04) Locate the sensor approximately in the middle of the stroke and tighten the button screw.

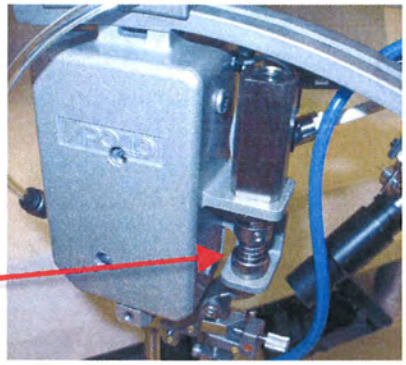


SMC Sensor
Apollo Part #: RB1-RS-P

RS-P Lubrication

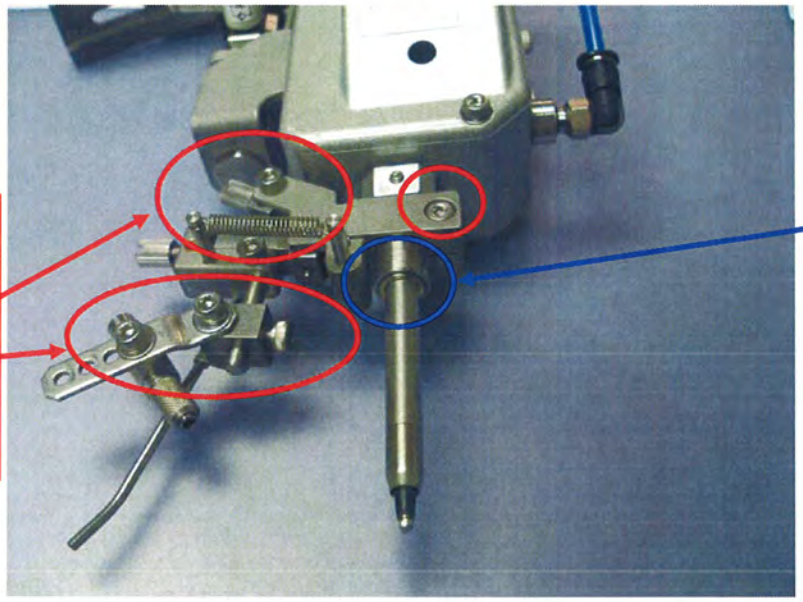
Date: July 17, 2010





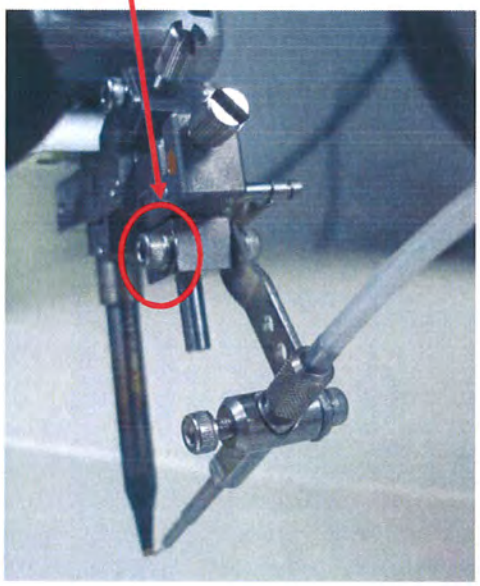
RS-P Iron Maintenance

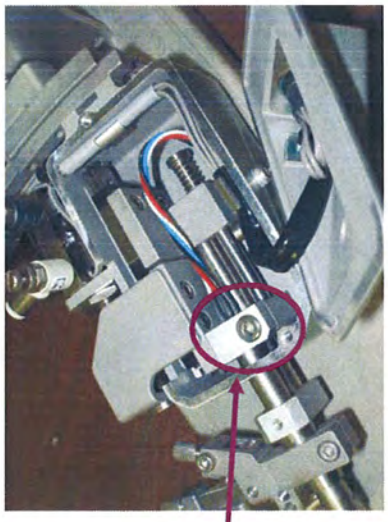
Date: Jan. 08'



Make sure that the area where the tip meets the tip cartridge holder is clean from flux prior to removing (remove N2 sleeve if applicable)

Tighten all set screws, mounting bolts etc. on the RS-P iron unit. This will prevent the unit from moving slightly during tip changing.





Remove the cover plate and tighten the collar bolt inside to ensure that the shaft is not rotating.

RS-P & N2 RS-P Iron Unit for Point Soldering

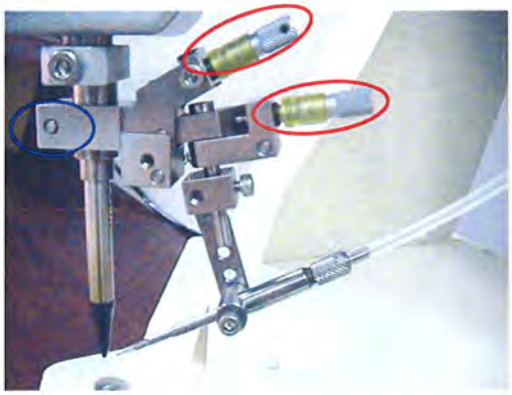
Solder Feed Angle:

The solder feed approach angle should be between 45 & 60 degrees from horizontal. There are also 4 holes on the tube holder. This will set the feed angle per the application requirement.

Solder Feed Height:

Initial solder feed to be positioned just under the iron tip. This will prevent the solder wire from feeding directly into the iron tip plating and wearing the tip prematurely. Once the initial feed is set, you can then set the 2nd feed position. The goal is to feed into the joint area and not to the tip itself.

Solder Feed Up/Down & Left/Right Adjust



Solder Feed Adjust:

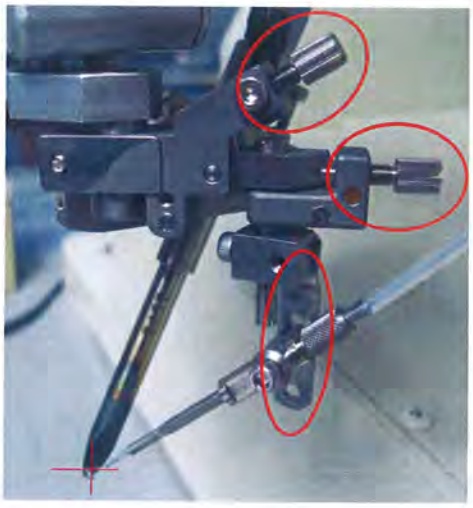
To adjust the height of the solder feed, use the upper micrometer to raise or lower the height.

To adjust the solder feed left to right, use the lower micrometer to direct solder to the desired location.

Feed Assembly Rotation:

On the opposite side of the iron (blue oval) is a set screw. Loosening this screw allows the entire feed assembly to be rotated into the correct position for soldering.

RS-L & N2 RS-L Iron Unit for Slide Soldering



Solder Feed Angle & Location:

For slide soldering, the solder wire should be directed towards the center of the iron tip plated area for both left to right & up / down. The solder feed approach angle should approximately 45 degrees. There are also 4 holes on the tube holder. This will help set the feed angle per the application requirement.

Iron Mounting & Approach Angle:

The iron mounts to the robot with a 10 mm diameter collar. The head can be rotated 360 degrees. Once positioned, this is held in place by tightening the bolt to compress the mounting collar. There is no keyway.

There is a radius "arm" that sets the iron approach angle. There is also a bolt that allows the entire assembly to rotate until the desired angle is achieved. The goal is to keep the tip base parallel to the PCB surface.

Solder Feed Up/Down & Left/Right Adjust

Solder Feed Adjust (photo left):

To adjust the height of the solder feed, use the upper micrometer to raise or lower the height.

To adjust the solder feed left to right, use the lower micrometer to direct solder to the desired location.

Feed Assembly Rotation (Photo below):

Loosening this set screw allows the entire feed assembly to be rotated into the correct position for soldering.

RSP Iron Unit for Point Soldering

Z Axis Pressure:

The pressure can be adjusted by moving the stopper ring position.

When programming the Z axis height, check the spring base collar to ensure that there is a gap of ~ 1~3 mm. This ensures that the tip has contacted the soldering surface and it also allows you to set your 2nd feed height. The blue arrow shows the location of the spring collar (the over travel is not shown).

Initial solder feed to be positioned just under the iron tip. This will prevent the solder wire from feeding directly into the iron tip plating and wearing the tip prematurely. Once the initial feed is set, you can then set the 2nd feed position. The goal is to feed into the joint area and not to the tip itself.

Rear View of Iron

Iron Tip Lowest Position Adjusting Screw

The purpose of the adjustment screw is to set the solder feeding height for the 2nd feed while the tip is in the down position (extended). There is an internal stopper device that allows the tip to retract via a spring which in turn allows the solder feed height to lower when Z axis pressure is exerted.

Raise Set Screw:

Setting the screw position to a higher setting will allow the 2nd solder feed (while the tip is extended down via the air cylinder) to contact the iron even though the pre-feed is set under the tip. However, if you apply Z axis pressure to the iron tip (1~3 mm), the solder wire will lower which provides for feeding directly into the joint area vs. to the tip which facilitates solder flow.

Lower Set Screw:

If you position the set screw at a lower position, the 2nd solder feed (while tip is extended) will be lower. There will not be any over travel via the internal stopper / spring device so the solder feed will always be in the same location.

RSL Iron Unit for Slide Soldering

Spring Pressure:

The spring pressure can be adjusted by changing the screw position.

Angle Adjust:

The iron tip angle can be easily adjusted be setting the position of this set screw. Be sure to tighten the locking nut to prevent the position from moving.

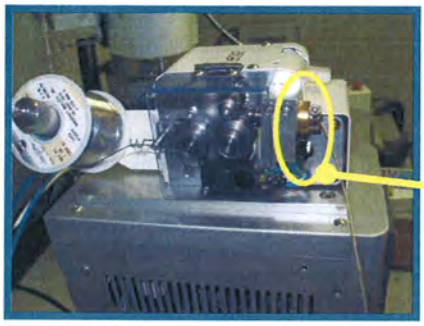
Solder Tube Holder Adjustment

Date: Mar. 23, 09'

Solder Feed Tube Holder:

Loosen the set screw and move the feed tube holder up approx. 1~2 mm away from the iron tip. This will move the solder feed tube end away from the tip and allow the solder wire (after retract) to still be sticking out of the tube. This prevents the flux from building up on the inside of the solder feed tube.

Solder Location:
After the solder retract is complete, there should be some length of solder still protruding from the Teflon solder feed tube end. This will prevent the liquid flux residue from building up on the solder feed tube and causing solder clog errors.

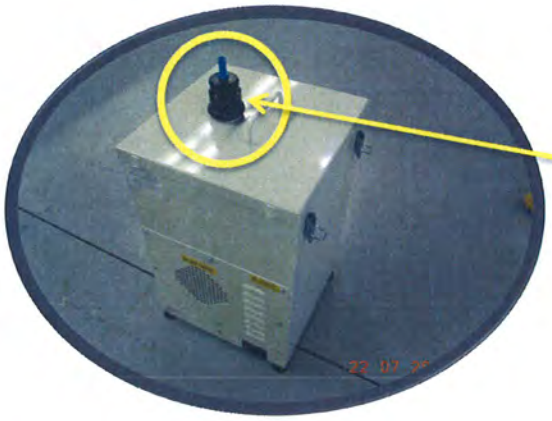


Solder Clog Sensor:

The photo to the left shows the location of the solder clog sensor on the ZSB feeding unit.

Bofa 15 System Set-Up

Date: Feb. 9, 2011

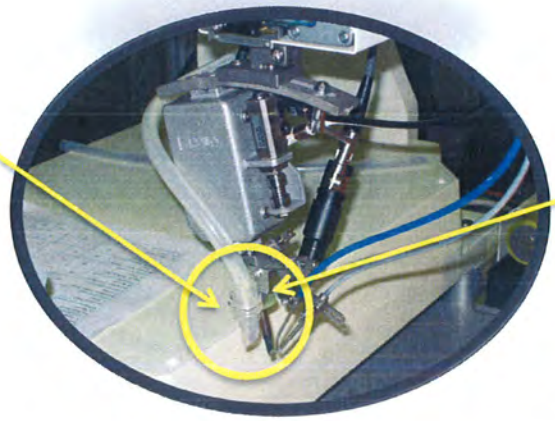


System 15 Adaptor provided by Bofa

Connects larger diameter tubing to **BLUE** connection

RS-P tubing mounting bracket for 11 mm outside diameter tubing

(provided by Apollo)



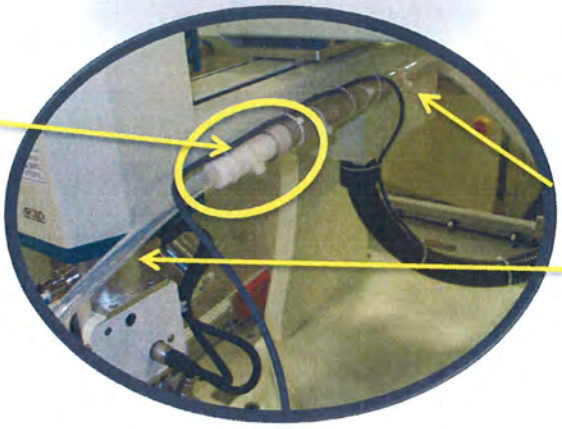
11 mm Tubing Adaptor

M3 x 8 mm Screw & Washer

11 mm to 18 mm nylon tubing adaptor to connect both hose diameters

(provided by Apollo)

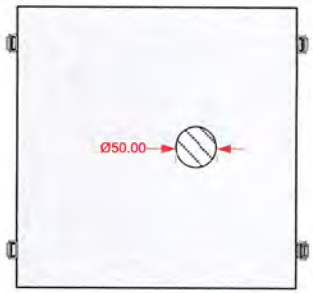
L-CAT EVO Robot Shown

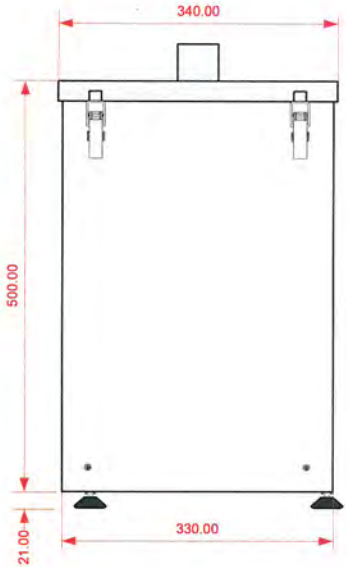


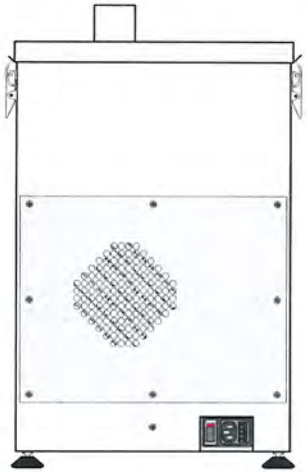
11 mm & 18 mm (OD) silicone tubing provided by Bofa

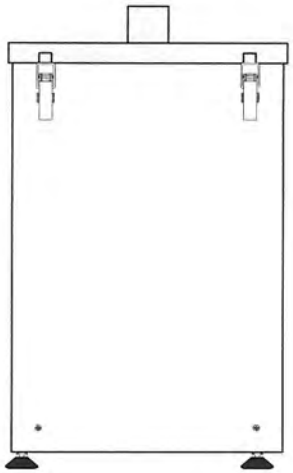
18 mm = 2 meters

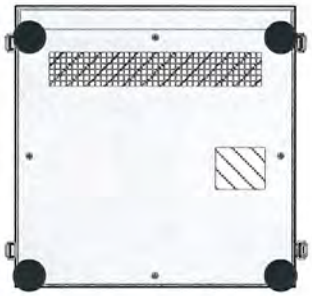
11 mm = 1 meter











Latest Issue	No.	Date	DCR	Initial
	1	17/06/10	000000	MB

Dimensions: 1:8	Drawn: M. Bruzda	Title: T 15 Customer Drawing	
Sht. 1 / Of. 1	Date: 17/06/10	Drawing Number: 020008	

Soldering Principles – Set-Up Description

Apollo Seiko has designed this robotic soldering system (Model L-CAT EVO, Comet, Luna, Terra) around the soldering principles of an efficient hand soldering operation. The soldering steps are as follows:

Step 01:	Introduce flux to remove any oxidation & clean the surface
Step 02:	Feed a small amount of wire to assist in "wetting"
Step 03:	Pre-heat the joint
Step 04:	When the joint is hot enough, feed additional solder to allow for a solid electrical, mechanical connection
Step 05:	Retract the solder wire
Step 06:	Maintain heat to the joint until solder flows as desired
Step 07:	Repeat process

With hand soldering an operator has the dexterity to move the solder wire where it is needed. In a robotic environment, the process is not as flexible but is very consistent. **Solder feed set-up is the most critical process of the entire system.** If the solder feed system is not set up properly, solder joint quality will always be compromised.

Solder Wire: Example wire specification:

Alloy	SAC 305
Diameter	.032" (0.8 mm)
Flux	No-Clean # 245
Flux Percentage	P3 (3.3%)

The Apollo Seiko selective soldering systems can feed a wide variety of solder diameters. The minimum diameter is 0.5 mm (0.020") up to 1.6 mm (0.064"). The solder is fed into one solder feed tube from the reel. The feed tube is a 2-part tube. The outer sleeve is Nylon and the inner sleeve is Teflon. The Teflon inner sleeve is designed to be solder diameter specific. For example, when using 0.031" diameter wire, the inside diameter (ID) is approx. 0.004" wider than the wire. This prevents the solder wire from bending, kinking and mis-feeding.

In order to change solder wire diameter you must change the following items:

a) Solder Feed Tube b) Manually Adjust Feed Roller Distance

ZSB Feeding System:

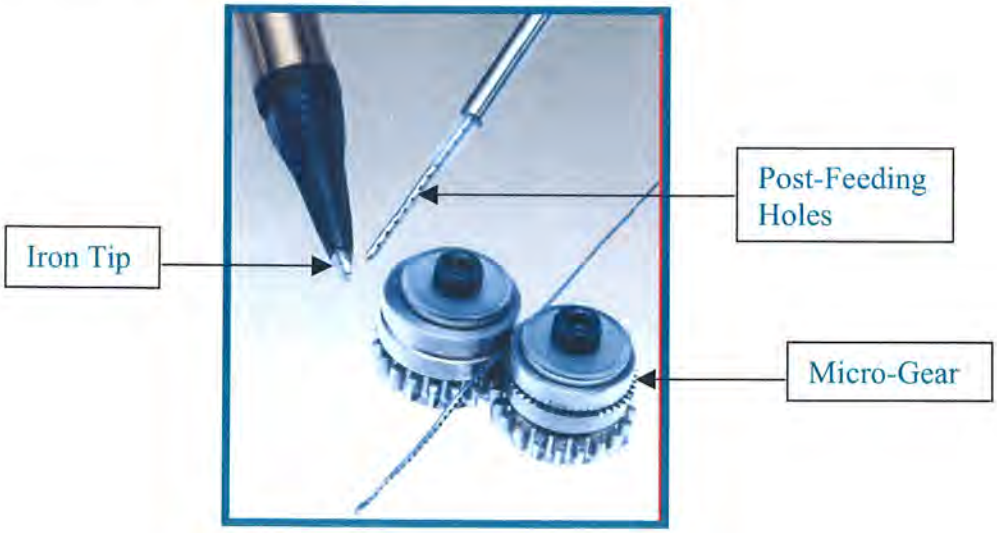
The feeders that have been installed on your soldering robots are known as **ZSB (Zero Solder Ball)** feeders. The concept of the ZSB feeder is to reduce the occurrence of solder balls.

The feed rollers have a micro-gear that penetrates the solder wire to the flux core. The additional benefit of this feeding system is very precise solder wire feeding. **This feeding system is NOT available with solder wires with a diameter larger than 1.6 mm.**

Solder Ball Formation:

Most solder wire has a flux core (paste). This flux has a boiling point of 120 degrees Celsius. Eutectic solder wire has a melting point of 183 degrees Celsius. With a standard "pinch roller" feeding system, the flux inside the solder wire starts to boil as the solder approaches the heat source (iron unit). Once the solder melts, the boiling flux must outgas. This micro-explosion causes the molten solder to create minute solder balls. Solder balls & flux spatter can cause electrical "shorts" between sensitive components. Lead-free solder has a higher melting temperature (normally between 216 ~ 222 degrees Celsius).

The ZSB feeding system (pictured below) allows the flux to disperse evenly through the punctured solder wire. As the wire approaches the iron tip the flux heats up and expands. This liquid flux escapes through these holes and allows for very localized flux dispersion and almost eliminates the solder ball phenomenon.



ZSB Feeding System

The following page illustrates the proper set-up of the solder feeding system. Apollo Seiko utilizes a dual feeding principle for each solder joint. This minimizes cycle time while optimizing solder quality.

Also listed in this illustration are the corresponding solder parameters of the solder block. Each smaller illustration may consist of one or more solder block / profile operations.

Preventative Maintenance Comet RS Iron & ZSB Feeder

The majority of the maintenance of the Comet soldering system will be with the soldering feed, iron tips & the iron units. Flux fumes are the main cause for required daily and semi-annual maintenance.

This system includes the Apollo Seiko recommended fume extraction system. It is strongly recommended that a localized fume extraction system be installed on each robot. **The fumes must be removed at the point of soldering and not vented only from the top.**

Daily

Maintenance Task	Description
Clean Solder Feed Tube (Daily)	Disconnect white solder feed tube(s) from the feeder unit by unscrewing the tube. Using compressed air, blow out any solder debris inside the feed tube. Replace feed tube.
Iron Tip Tinning (Daily)	Prior to turning off the iron unit, it is suggested to tin the iron tip with solder and then turn the unit off. This will help extend the overall life of each tip by preventing oxidation.
Solder Replacement (as needed)	Once a solder reel has been exhausted, you must replace it with a new one. There will be approx. 24" of solder left from each reel.

Feed roller engage lever

Disengage the feed rollers and pull the unused solder from the feed tube. Install a new reel on the holder and feed manually until the solder reaches the feed rollers and into the second tube. Make sure the solder gets fed on top of the sensor arm to ensure the robot will not sense a solder empty condition. Engage the feed rollers and use the solder advance button to feed to the tip (Comet controller front panel*).

Iron Tip Replacement (as needed)

The iron tips need to be replaced as necessary. You need to develop (as needed) a schedule to change the tips as they wear. The average life of the soldering tip is 50,000 - 60,000 points. In a lead free environment, iron tip life can be reduced by as much as 40%. The use of N2 gas can add a portion of the tip life back.

The tip is replaced by first powering off the machine. Once the tip has cooled down (3-5 mins.) gently grasp the tip while supporting the iron unit. Pull down on the tip until you feel it come loose. The tip is keyed and can only fit in the holder one way.

N2 Iron & Tips:

The N2 RS-P & N2 RS-L iron units come equipped with a 4 mm N2 inlet. The tips are designed with integral N2 access holes on the top and an N2 sleeve at the Apex of the tip to provide for localized N2 pre-heat & atmosphere. The opening of the sleeve should be inspected weekly to ensure that the area is clean & unclogged of flux fumes.

WARNING: *Make sure the Comet controller has been powered off prior to removing and / or replacing the solder tip. If the power is on the tip may burn out. Apollo Seiko will not replace tips that have been "blown" in this manner.*

The RSP iron tip heats up in less than three seconds. If the power is not OFF, the operator's fingers will be burned. Use a silicone rubber tube to grasp the tips when removing or inserting them. This will protect your fingers as well as give you a better grip on the tip.

Iron Tip Replacement (cont.)

Replace with a new tip by inserting the tip into the tip holder and sliding it into the tube until you feel it stop. Gently rotate the tip until you feel the key-way lock into position.

Again while supporting the iron unit, apply upward pressure until the tip locks.

> ***Note:*** *You should move the feed tube out of your way by loosening the locking nut and pulling the feed tube out of the way. Once you have inserted the new tip, slide the feed tube back into its lowest position and lock it into place. The feed arm is on a spring and can easily be moved out of the way and will return to the same position.*

Feed Tube Replacement (as needed)

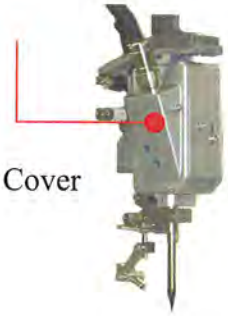
Upper Portion Thumb Screw

Lower Portion Thumb Screw

The solder feed tube will need replacing on an as needed basis. This is accomplished by loosening the thumb screw on the upper portion of the feed tube (feeder end) and pulling the tube out. The lower portion of the feed tube can be removed by turning the thumb screw on the iron end counter clockwise and removing the tube.
Simply replace the new feed tube by doing the reverse steps above.

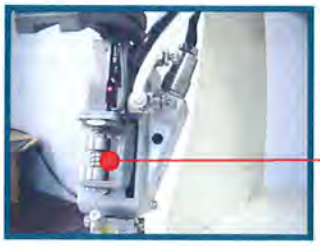
Semi-Annual & Other Scheduled Maintenance

Stepper Motor Slide(s) (approx. 6 months)



Remove Iron Cover

The internal cylinders of the iron need to be greased.
Remove the cover from the iron unit (RS-P / RS-L). There are slides which the tip extends / retracts with. These need to be greased semi-annually. Lubricate as necessary using a thin coating of white Lithium grease.



Lubricate Internal & External

Lubrication: Use AFC or white, Lithium grease on the sides of the rails. Only apply a small amount, approx. 0.2 grams. Replace the cover(s) once grease has been applied.

Caution: a) Power to the system must be disconnected.

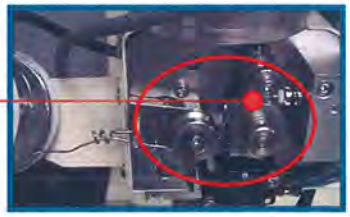
Cleaning Feed Rollers (bi-weekly)

Occasionally the feed rollers will have build-up of solder particles. Simply use compressed air to blow the solder particles from the feed roller housing. Remove the solder from the housing area by lifting the feed disengage lever. Replace solder when complete, following steps above.

Cleaning Geyan/ZSB Micro-Gear (if applicable) (bi-weekly)

The micro-gear of the Geyan feed rollers will tend to build up with flux from the core of the solder wire. You will be able to see the flux residue. Use a light brush and flux cleaner to remove the flux from the gear teeth. Be careful not to bend or break the teeth of the micro-gear.

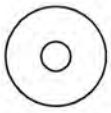
Micro-Gear – One Side Only



RS-P / RS-L Iron Unit (approx. 6 months)

Grease bearings of cartridge holder and internal shaft of the iron unit. Remove the cover of the iron and lubricate moving parts. It may be necessary to clean with alcohol to remove flux residue prior to lubrication. The iron unit must be kept free from flux residue as this is the main cause for pre-mature wear & failure.

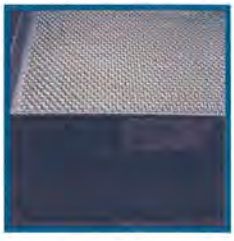
Silicone Ring (weekly – as needed)



Life is approx. 1 week. Replace as necessary. The heat of the iron tip will eventually wear the "grip" of the center of the ring. It will fall from position, replace approx. once per week.

Bofa Fume Extraction

The Bofa fume extraction system has been installed on your system. There are two filters inside the main cabinet. There is a pre-filter and a Heppa filter. The life of the pre-filter will be 1~3 months and the Heppa filter approx. 6~9 months.



Bofa 200 Pre-Filter Heppa Filter

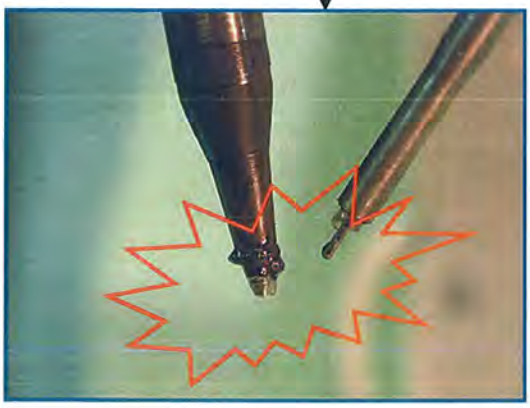
Checking Iron Tip for Wear

The iron tip will tend to corrode & oxidize more quickly if it is not kept clean and free of flux residue build-up on the tip. The molten solder & liquid flux are removed upon air jet cleaning. Burnt flux residue, black in color will build up above the tin / lead plated area of the tip. This needs to be removed with a sponge and / or "Orange" wood stick approximately one time per hour.

While the robot is in the home position, loosen the compression nut that locks the feed tube in place. Pull the feed tube back so it is out of the way. Use a wet sponge or an "Orange" wood stick to scrape the black flux residue from the tip. Make sure the iron tip is clean prior to returning the feed tube to the solder position. Re-tighten the compression nut and return to normal operation.

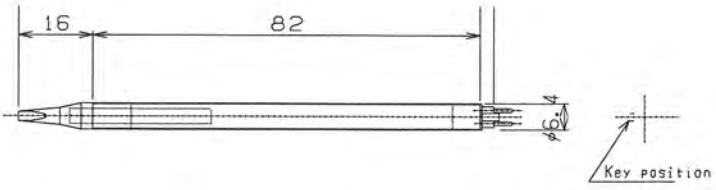
Corroded DC Iron Tip

Has a hole worn into the surface because the tip has been in use too long.



Black Flux Residue – Remove with a wet sponge or an "Orange" wooden stick

Iron Tip Dimensions



Iron Tip Type: DCS/DCN

Apollo Seiko Recommended Spare Parts List

J-CAT 300 COMET w/N2-RSP & ZSB Feeder

June 2, 2011

All estimated quantities support one machine. Quantities will vary for multiple stations.

Soldering Iron Tips

Part Number	Description	Unit Cost	Qty. To Stock
DCN-30BCVI	Iron Tip	98.70	10
Qty.	**% Discount**	**Qty.**	**% Discount**
01 – 10	00%	11 – 50	05%
51 – 75	07%	76 – 100	10%

Note: We encourage blanket orders on soldering tips, delivery 4-6 weeks A.R.O.

Wire Feeding Unit

Part Number	Description	Unit Cost	Qty. To Stock
TAL1.0-650S60	Feed Tube	87.10	03
M76-A32-1.0	Thumb Screws for TM-FTHA	$36.30	01
TM-FTHA	Feed Tube Holder Assembly (1) Nozzle Holder M76-A30 (1) Holder Cap (Thumb Screw)	$205.70	01
MC-1-250	ZSB Feeder Cable	$193.60	01
ZSB-1.0-001B	ZSB Roulette Blade	$266.20	01
ZSB-1.0-002R	ZSB Guide Roller	$193.60	01

Soldering Head Unit

Part Number	Description	Unit Cost	Qty. To Stock
RING	Silicone Ring for TM Iron	$6.25	01
N2-RS-P	Iron Unit RS-P	$3630.00	01
THK RSR 9K/RBI	Cylinder & Sensor w/LED's	$580.80	01
RBI-RSP	Sensor w/LED's	$60.50	01*
CC3F-350	RS-P Iron Cable 350mm long	$193.60	01

*In a multi-machine environment we recommend each customer have one spare iron unit in-house in case of an emergency.

Fume Extraction Unit

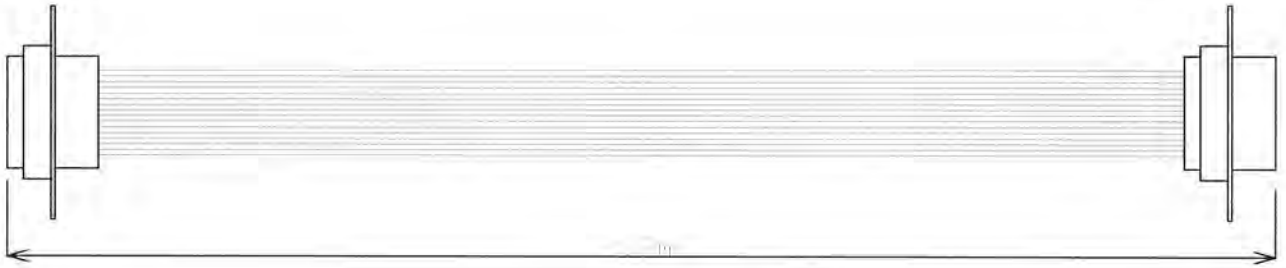
Part Number	Description	Unit Cost	Qty. To Stock
SYS15	Bofa Fume Extraction System	$2337.00	01
XF151	Bofa Pre-Filter (pkg 5)	$154.88	01
XF152	Bofa HEPA Filter	$308.26	01
VAC-2013	Large Vac tubing	$15.00/meter	01

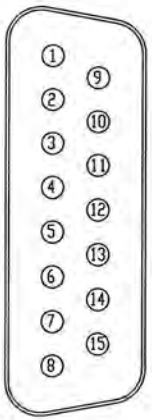
Miscellaneous

Part Number	Description	Unit Cost	Qty. To Stock
TUBING	Blue, White & Black Tubing Set	$48.40	01
SRC-3000	Rotary Tip Cleaner	$1320.00	--
SRC-1006	Sponges for Tip Cleaner (pkg 10)	$38.94	01
ALN-005	0.5 Liter/Minute Type N2 Generator	$2541.00	01

COMET I/O-1へ
D-SUB 15pin オス
DO2-M15PG-N-FO

J-CAT I/O-1へ
D-SUB 25pin メス
DA25SF-N

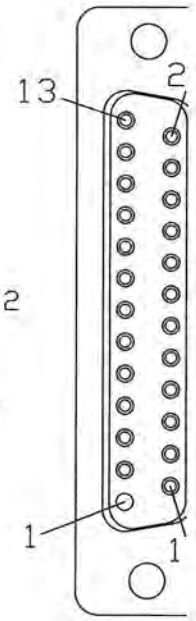




INSIDE VIEW

1	Yellow / Black	COM+24	COM+		21
2	Yellow / Red	IRON DOWN	OUT1	*REV. 1	17
3	White / Black	AIR BLOW	OUT2	*REV. 1	19
4	White / Red	SEND	OUT5	*REV. 1	9
5	Pink / Black	SLIDE	OUT6		18
6	Pink / Red	REV	OUT7	*REV. 1	11
7	Orange / Black	EMR	OUT8		20
8	Orange / Red	COM±	COM±		10
9	Gray / Black	SG	COM-		24
10	Gray / Red	S. SHOTAGE	IN1		1
11	Yellow / Black2	S. CLOGGED	IN2		2
12	Yellow / Red2	TEMP READY	IN3		3
14	White / Black2	IRON DOWN	IN4		4
13	White / Red2	IRON UP	IN5		5

*REV. 2
12
ジャンパー



3	
2	D-sub25Pの23番を抜外し、10番・12番をD-sub15Pの8番と接続
1	OUT1 と OUT5, OUT2 と OUT7を交換

IOケーブル組立(J-CAT用，デモ試験機用)				SPHC-P t1.6	8/SET	**
品名 NAME				材質 MATERIAL	個数 QTY	注 NO'
検図 CHECKED	設計 DESIGNED	製図 DRAWN	尺度 SCALE	製造番号 PRODUCTION No		
2010-11-22 S. NAGAI	2010-11-22 S. NAGAI	2010-11-22 S. NAGAI	NTS	機械名 MACHINE NAME	COMET	
				図番 DRAW No.	J-CAT-COMET_IO R	