1-800-323-4548

Expert's Guide to Wave Solder Operation with ECD's WaveRIDER™

Problem (1) / Potential Cause (2) ▶	Conveyor speed too fast....Reduces dwell time in wave and forces preheat to be too high	Pre heat temp low.....Solder pads not within 100°F of solder wave temp	Conveyor speed too slow.....Increases dwell time in solder wave	Carrier bent or damaged.....Board must run parallel (flat) over wave	Conveyor fingers bent.....Board may not be parallel over solder wave	Vibrator, 2nd wave OFF.....Solder is not evenly distributed	Flux applied is insufficient.....Spotty application or weak activity flux	Rails not parallel (flat) over nozzles.....One side of board deeper in solder wave than the other	Wave or nozzles not level.....Must be parallel to conveyor	Wave temperature too high.....Solder and components are getting cooked	Conveyor width too tight.....May warp board up or down while in wave	Pre heat too high....Heating slope is too steep	Assembly too heavy.....Weight of components bending board	Board too wide.....Wide boards lack strength to support their weight	Conveyor jerky or vibrating.....Disturbs solder joints while cooling	Flux not uniform across bottom of board.....Spotty application of flux	Pre heat slope too steep.....Heats components faster than recommended	Chip wave OFF.....Solder is not evenly distributed	Chip wave activity too low.....Solder is not evenly distributed	Wave height/exit incorrectly set.....Exit speed of solder should match conveyor speed	Wave solder splash.....Too active wave splashes solder on exit	Assembly removed too early.....Solder not hardened before disturbed	Carrier too tight.....May warp board up or down while in wave	Conveyor too low.....Boards below wave	Chip nozzle clogged.....Solder is not evenly distributed	Vibrator, 2nd wave too low	Wave height too high.....Wave height greater then thickness of board	Flux air knife too strong.....Blows flux off board	Board not run in best direction.....Component shadowing	Flux activator low.....Low flux density	Flux activity too low.....Flux not aggressive enough	Cooling rate too slow.....Solder not hardened before disturbed	Dross recirculating from pot to wave.....Excessive dross build up	Pallet center support missing or poor	Vibrator, 2nd wave too high.....Causes splashing of liquid solder	Chip wave lower in spots.....Solder is not evenly distributed	Air knife after wave set incorrectly.....Air knife not effectively blowing off excess solder	Flux liquid in holes.....Flux density too high or too much flux applied to board	
Solder Skips	1			3	2	3		2	2		1							3	3							3			1							1			1 = Low impact
Solder Bridges	3	3	3	3	2		2	2	1												3								1					1			1		
Unfilled Via Holes	3	3		2	2	3	1	1	1							3											3											2 = Moderate Impact
Solder Wave Over Flooding Board			2								3	2	3	3											3	3		3							1				
Grainy or Disturbed Joints										2					3								3										1						1	3 = High Impact
Cold Solder Joints	3	3																													2								
Solder Balls on Assembly			3				3															3						2		2						1			
Cracked Components	3									3		2					3																						

WaveRIDER™ Parameter (3)																																							Typical Values
Maximum Preheat Temp		3										3					3																						225 °F
Minimum Preheat Temp																																							Room Temp
Maximum Preheat Slope		2										2					3																			3				5 °F/Sec
Conveyor Speed	3		3												3								3													2				4 ft/Min
Delta Temp at Chip Wave		1								1		1					1																							N/A
Chip Wave Temp										3																														495 °F
Chip Wave Dwell Times (A,B,C)	2		2												3			3	3						3	2														1 sec
Chip Wave Contact Lengths (A,B,C)	1		1												1			3	3						3															0.5 inches
Chip Wave Immersion Depth																		3	3						3															.062 inches
Chip Wave Parallelism					2			3										3	3							2														< 0.3 sec
Delta Temp at Solder Wave										1		1					1																							100 °F
Solder Wave Temp										3																														495 °F
Solder Wave Dwell Times (A,B,C)	2		2						2						3						3				3	3											3			3 sec
Solder Wave Contact Lengths (A,B,C)	1		1						1						1						3				3	3											3			2.0 inches
Solder Wave Immersion Depth																					3				3	3		3									2			0.062
Solder Wave Parallelism					2			3	3																															< 0.3 sec

Based on information form IPC-S-816 and Industry expert opinion 8/29/96

Interpreting the Expert Guide

Example problem: Use the troubleshooting Expert's Guide shown below.

PROBLEM (1)

In the example, Solder Bridges is the problem that has been detected.

➲ The next step is, follow the row to the right. Now determine the potential cause that best fits the problem. In the columns, there are impact numbers rated 1,2 or 3. These impact numbers help the user to decide which potential cause is most important to the problem. There is a legend on the Expert Guide, 3 = High Impact, 2 = Moderate Impact, and 1 = Low Impact. Now read and sort out the potential causes that best fit the problem. In the example, the solder bridges row has several columns with impact numbers. All the probable causes should be read and the highest potential cause that was selected is in the next step.

POTENTIAL CAUSE (2)

Conveyor speed to slow…….Increases dwell time in solder wave.

➲ Once the potential cause has been determined, continue following the column down to the rows with impact numbers.

If there are no impact numbers in the WaveRIDER parameter rows, the WaveRIDER cannot assist the user in this area.

➲ Now read all the WaveRIDER parameters that have impact numbers. Once the problem WaveRIDER parameter has been determined, correct adjustments can be made. In the example, there are several impact numbers and the one that has been selected is in the next step.

WaveRIDERâ„¢ PARAMETER (3)

It is determined that the Conveyor Speed best indicates the likely cause and the proper adjustments should be made.

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Potential Cause (2) ➲													
Solder Bridges ➔ ➔	3	3	3	3	2	2	2	1	3	1	1	1	1 = Low impact
			↓										2 = Moderate Impact
													3 = High Impact
WaveRIDER™ Parameter (3)			↓										**Typical Values**
													225 °F
													Room Temp
			↓										5 °F/Sec
Conveyor Speed ➔ ➔		➔	3										4 ft/Min
													N/A
													495 °F
Chip Wave Dwell Times (A,B,C)			2										1 sec
Chip Wave Contact Lengths (A,B,C)			1										0.5 inches
													.062 inches
													< 0.3 sec
													100 °F
													.495 °F
Solder Wave Dwell Times (A,B,C)			2										3 sec
Solder Wave Contact Lengths (A,B,C)			1										2.0 inches
													0.062
													< 0.3 sec

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