Solar solutions - Market

Concentrator type assemblies:

34% Market growth 2008 - 2009

Market revenue ~ 3.7 Billion Q4 2009

Income from revenue positive in the same period ~ 125M

Universal capabilities:

• System Integration
• Final assembly machines
• PCB assembly
• Process support

Major process concern is heat dissipation as efficiency is dramatically affected
### Solar Solutions – Polaris Advantage – Core Platforms

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**Polaris Platform**
- Multiple processes on a single cell
- Capable for screw driving, dispensing, pick and place, label placement, etc
- Used for odd form components and assembly

**Polaris Junior**
- Single process cell
- Used when simple non-vision tasks are required
- Very capable test handling cell, dispenser, potting, pick and place, screwdriver

**Material Handling**
- Standard handling Systems
- Various width adjust options (FWA, H/C, SWA)
- Used in custom solutions with Automation systems
- CE compliant

**System Solutions**
- Process consulting and development
- Design for manufacturing support
- Full deployment globally
- Life cycle support to maintain high efficiency
Redeployment Opportunities

- Investment protection with Polaris extends well beyond the current application
- Most customization only applies to head and transport mechanism

Multiple process types on the same machine

Open Architecture

- Ability to adapt to plant standards for:
  - Dispensing, screw driving, inspection tools, etc.

Construction

- Solid steel platform designed to stand the test of time
- Sealed Lead screws provide low maintenance requirements
Solar Solutions – Polaris Advantage – Head types

- Vision guidance camera
- Quadrus 2-D bar code scanner
- Cognex insight color inspection camera
- Keyence color inspection camera
- Vacuum and gripper pick and place tools (pneumatic and servo)
- Dispensing valves
- Screw drivers
- Height detector
- *Future applications driven by customer requirements*
Solar Solutions – Polaris Advantage – Target Processes

Pick and Place
- Capable of Gripper or Vacuum tip
- Accuracy down to +/- 75µ @ 3 sigma

Dispensing
- Configurations for Gaskets, dots, potting, single part or two part adhesives
- Input from tanks or drums down to 10cc syringes

Screw driving
- Bowl and blow feed or vacuum pick place and screw

Label placement

Odd Form assembly
- Servo Gripper capability for wide range of components
Solar Solutions – Polaris Advantage – Feed Systems

Tube Feed components
- Low Profile
- Expanded
- Wide Body
- Quad tube
- Lead Forming on request

Tray
- High Volume Random Access
- High Volume, High capacity

Bowl Feeders

Coin Stack

Foreign Feeders
- The Polaris Feeder interface is wide open to accept any feeder with a stand alone controller
### Genesis Platform
- Scalable solution in 1, 2 or 4 beam configurations
- Accurate and robust patented linear motor drive system
- Precision and flexibility to deliver semiconductor & odd-form capability beyond standard SM components

### Head Technology
- Three Head Technologies delivering 01005 to 150mm long connectors and up to 25mm tall
- Up to 5kg placement force for odd-form placement
- Over 2000 special vacuum and gripper nozzles to automate odd-form parts

### Feeding Solutions
- Intelligent, spiceable tape feeders to assure high utilization and traceability
- Scalable tray feed solutions to satisfy all environments
- Vibratory track and bowl feeding to automate odd-form capability
- Bank change for efficient changeovers

### Software Solutions
- Intelligent feeders, feeder interface and barcode validation to assure proper loading and replenishment
- Paperless changeover tools offline and online to minimize downtime
- Circuit level traceability for safety circuit applications
- Feeder Low tools to assure max up-time
Solar Solutions – Core Platforms – Genesis SC Platform

Genesis SC
- Flexible solution with a unique range of feeder options
- Extremely accurate and robust patented linear motor drive system
- Precision and flexibility to deliver semiconductor assembly capability at surface mount speeds

Head Technology
- Multiple Head Technologies delivering bare die, 01005 to 150mm long connectors and up to 25mm tall
- 35 gm to 5kg placement force for thin preforms to bulky die
- Over 2000 special vacuum and gripper nozzles to automate odd-form parts

Feeding Solutions
- Matrix tray, Tape and reel and other feeding solutions for die, connectors and other essential components and fixtures
- Wafer feeders for direct delivery of PV elements from wafers up to 300 mm

Connectivity Solutions
- Intelligent feeders, feeder interface and barcode validation to assure proper loading and replenishment
- ALPS server for wafer map download
- Feeder Low and alternate feeder tools to assure max up-time
Solar Solutions – Genesis Core machine – Feature Rich!

High Speed Passive Placement

High Accuracy active and Die Placement

Semiconductor options:

- Linear Thin Film Applicator
- Low Placement force capable
- High placement force and dwell
- High Accuracy (10µ @ Cp=1)

Software features

- Line manager for programming and data collection
- DPO for optimization and line balance
- Line chart for performance monitoring
- NPI tools for setup and short run capability

NPI tools

- Strip feeder
- Adjustable tracks
- Adjustable grippers
Solar Application Example
Solar Solutions – PCB Assembly Solution

- **Magazine Unloader**: Loads PCB into Assembly pallet and places top pallet.
- **Polaris**: Loads Solder preform, Photovoltaic and weights.
- **Genesis**: Manual inspection work-station.
- **Magazine Loader**: Custom Vacuum oven with traffic control conveyors (Batch Process).
- **Polaris Junior**: Unloading weights, and top cover (Places them tray).
- **Magazine loader**: Moves the Pallet bases with complete PCB.
Solar Solutions – Concentrator type assembly – PCB Process

Processes Included

- Pallet Loading pick and place
- Pallet assembly pick and place
- High accuracy assembly for:
  - Solder preform
  - Photo voltaic
  - Custom weight
- Custom batch vacuum chamber
- Pallet disassembly pick and place
Solar Solutions – **Concentrator PCB Assemblies**

**Polaris Multi-process**

- **Two Heads included**
  - Small vacuum Pick and place
  - Large form factor pallet cover handling

**Genesis Semiconductor**

- Custom clamping registration
- High accuracy placement (10µm Cp)
- Wafer handling capability
- Preform handling with custom nozzle
- Precision lifter
Solar Solutions – Final Assembly Solution

- Manual Work-Station for loading Heat sink
- U/V or Plasma cleaning
- Polaris for dispensing adhesive and placing the PCB, PCB delivered from Front end line
- Custom oven with traffic control conveyors (Batch Process)
- Prism adhesive dispense and placement
- Prism critical alignment and secure
- Custom oven with traffic control conveyors (Batch Process)
Processes Included

- Heat sink manual loading with option to automate
- Cleaning process (Heat sink and PCB)
- PCB pick and place
- Two part adhesive dispense
- Screw driving PCB
- Custom batch oven for extended cure
- Prism two part adhesive dispense
- Prism pick and place
- Fine alignment of prism
- Custom batch oven for extended cure
Cleaning Process

- U/V or Plasma cleaning required to prepare the Aluminum surface for the adhesive

Polaris Multi-Process

- Custom heat sink alignment
- Head configuration
  - Two-part adhesive dispense (mixing valve)
  - PCB Pick and place (Custom nozzle)
  - Screw driving system with bowl and blow feed
- Assemblies delivered from front-end line with standard magazine handling

Customized batch curing with magazine traffic control
Solar Solutions – Concentrator Final assembly process

Polaris Multi-Process

- Custom heat sink alignment
- Head configuration
  - Two-part adhesive dispense (mixing valve)
  - Prism Pick and place (Custom nozzle)
  - Custom algorithm and lighting
- Prism delivered from large form factor tray

Polaris Junior

- Configured with two micro stages for high accuracy alignment of the Prism
- Special algorithm to look through the prism after placement

Customized batch curing with magazine traffic control
Universal value to our customer

- Process definition
- Material Selection and Application
- Prototype runs / feasibility test
- Prototype tooling development
- Design for manufacturing
- Material factory flow
  - DFMEA
  - Data collection for Quality
  - Staffing and Expertise
- Deployment and support
- Application of Cycles of learning
Solar Solutions – Inverters - Market

2.4B market size

Support all sizes of installations ranging from small home based power ranges to megawatt farms

Construction

- Similar to Power supplies
- Mixture of SM, IM and Odd Form assembly
- Many fences and heat sinks
- Board stacking require standoff assemblies
- Estimates of the component breakdown on following slide