



SmartScan



*The Next Generation
Hot Box Detector*

Proven components and an innovative approach to total system design make the Smart Scan Hot Box Detector a true next generation product.



Surge Protection

The Next Generation HBD incorporates state of the art surge protection components in an enclosure designed to minimize the exposure of clean wiring to the damaging effects of rail transients. The surge compartment is designed to create a Faraday cage. Track wiring enters the cage through bottom openings and is routed via the shortest possible path to the appropriate surge protector. Each surge component is grounded directly to a common ground bus. Clean wiring exits the cage via the shortest path, and is thoroughly shielded from the surge components thereafter. The entire cage is covered and bonded to the system chassis.

Presence Detection

The Next Generation HBD can accept a Series Overlay Track Circuit installed as a plug in component in the base of the system chassis. The SOTC plugs into an interface board with secondary surge protection and conditioning circuits appropriate for the application. The SOTC approach range can be adjusted with the system controller removed. Use of the SOTC is optional. The system can be turned on by the gating transducers or by advance transducers.

Internal Radio

The standard radio for the Next Generation HBD is an 8-channel, 5-watt transceiver. The radio is equipped with a feature that allows the user to select one of eight preprogrammed channels, or the radio can be set in R-NET mode to select one of two channels under firmware control. The system controller contains DTMF decoding circuitry that supports rebroadcast of the last message from the system talker. All radio connections are brought out to a connector on the side of the chassis in the event an external radio is required. The system antenna connection is made via a chassis mounted surge protector.

Scanner Control Relays

Power for the scanner shutters, integrity check heaters and snow melt heaters is controlled by two solid state relays mounted in the surge compartment. No switched AC or DC circuits enter the system controller. The relays are sized to support four scanners each. Status LEDs on the chassis give positive indication of relay operation. All switched power is protected from over voltage and over current conditions by circuit breakers with trip indicators.

Scanner Connections

The system is equipped with two military circular connectors as standard equipment. If the system is ordered with optional wheel scanners, two additional circular connectors are installed. The connectors are compatible with all previous models of inboard scanner cables from Southern Technologies Corporation.

Smart Scan — the Next Logical Step in the Evolution of Hot Box Detector Systems.

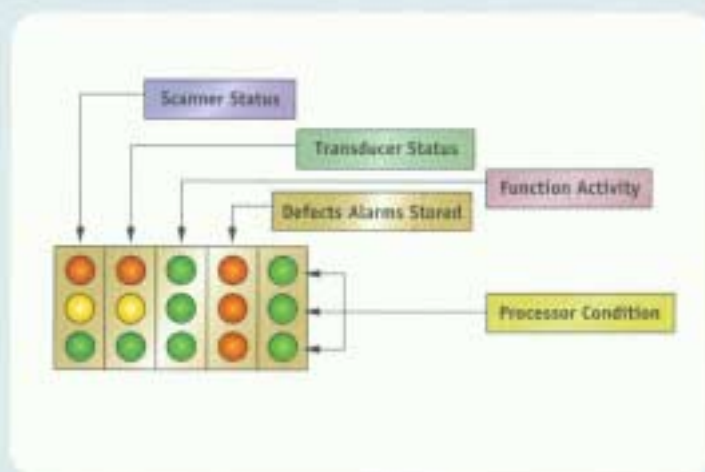
Today, Southern Technologies Corporation has more than 1800 Sentry System Hot Box Detectors in service worldwide. Smart Scan builds on the proven concepts of the Sentry System, while expanding data processing capability, reducing board count, simplifying packaging, improving diagnostic capabilities, and providing economical AEI integration.

Smart: Smart Scan HBD systems use continuous performance monitoring to optimize system performance and minimize system maintenance. The system firmware maintains an internal database of key performance parameters. As each train is processed, the key parameters are compared to data from a number of trains in the database. If the key parameters vary from established limits, the

system can make automatic adjustments prior to processing the next train. Cross checking logic prevents over correction of the system adjustments.

Very Smart: As the system detects variances in expected performance and makes compensating adjustments, it also builds diagnostic reports that will save maintenance personnel valuable time. The reports, accessible through the Graphical User Interface, can pinpoint system problems that may not be readily apparent.

Parameters monitored by the system include microprocessor health, non-volatile battery health, gating transducer health, scanner health, and presence detector health. To further simplify the process, banks of LED's on the side of the controller module give immediate indications that the system is or is not performing within expected limits.



Brilliant! Advanced digital signal processing algorithms identify abnormalities in the heat profile of each bearing as it is processed. This capability provides a level of sophistication not available in "peak store" systems. Smart Scan captures multiple samples from each scanner during each gate period. Based on train speed, the sample rate is automatically adjusted to assure data consistency.

Multiple samples allow the processor to perform extensive analysis of any heat profile. Profile analysis can identify false heat samples that clearly fall outside the normal profile. Once identified, the false signals can be safely filtered by the system. This capability will significantly reduce false stops, and the expense associated with train delays.

The advanced features of the Smart Scan HBD system improve system reliability, simplify maintenance, and reduce train delays. No other system offers value comparable to the Smart Scan — Next Generation HBD.

The Next Generation HBD Controller package follows the design principles of other Smart Scan systems.

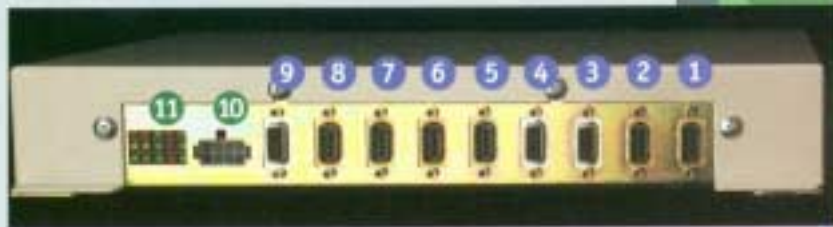
The Controller contains an application specific interface board with all I/O connections for its intended application; nothing more, nothing less. The interface board has provision for plug in modules that can be added and replaced as required.

The Next Generation Controller package utilizes the Smart Scan Embedded Processor/Communications Controller (EPCC), the standard microprocessor for all Smart Scan applications. The EPCC plugs directly into the controller interface board.

Other optional modules for the Smart Scan controller include a 19,200 internal modem, and a 16 x 32 liquid crystal display with sealed membrane keypad.

The Embedded Processor Communications Controller (EPCC) board is the work-horse of virtually all Smart Scan systems.

- It has twice the speed and communications capability plus four times the memory of its predecessor.
- It is a proprietary board, designed and manufactured by STC.
- It allows most of the already proven firmware for the Sentry and Smart Scan products to be ported to the new design.



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|-----------------------------|--|
| 1. RS 232 - Local | 7. Transducer I/O |
| 2. RS 232 - Pass Through | 8. Auxillary I/O |
| 3. RS 232 - External Modem | 9. SmartPass AEI |
| 4. RS 485 - Weather Station | 10. 12 VDC power input, Temperature probe, Telco |
| 5. Internal Radio | 11. LED Array |
| 6. Scanner I/O | |

Smart Scan	
EPCC-Embedded Processor Communications Controller	Firmware
<p>Controllers</p> <ul style="list-style-type: none"> 2-Motorola 68HC11 Microprocessors 2-Watchdog Timers 512 Byte EEPROM - Each processor Battery Backed Calendar/Clock <p>Memory</p> <ul style="list-style-type: none"> 4-Megabit Flash Memories 4-Megabyte Non-Volatile Data Space Scratchpad Memory - 128KB <p>Output</p> <ul style="list-style-type: none"> Analog Input Lines - 16 Opto-Isolated Digital IO Lines - 16 Serial Communications Ports - 6 	<p>Applications</p> <ul style="list-style-type: none"> Automatic Equipment Identification Defect Detection Integration AEI - Defect Detection <p>GUI - Graphical User Interface</p> <ul style="list-style-type: none"> Automatic Calibration Automatic System Setup Remote Data Downloads Remote Firmware Uploads Windows Based



The track hardware for Smart Scan wayside reporting systems is proven in more than 1800 installations from Northern Canada to the desert outback of Australia.



Bearing Scanner

The Type II bearing scanner provides a very compact and rugged system for recording the heat from rail car bearings as they move through a wayside location. The scanner clamps directly to the base of the rail, is shock mount isolated from the rail, is small enough to fit between two ties and low enough to avoid damage from Hi-Rail equipment. The scanners have 10 degrees of lateral scan adjustment built into the patented alignment system. Type II scanners can reliably scan inboard bearings at speeds to 100 MPH.



Wheel Scanner

The Type II wheel scanner mounts in the same manner as the bearing scanner, but the field of view is turned 90 degrees in order to scan a point approximately 3 inches above the rail. Bearing and wheel scanner modules are interchangeable, only the rail mounting hardware is different. Both scanners use the same calibration and alignment systems.



Calibration System

The Smart Scan calibration system is fully automatic. It adjusts itself to compensate for changes in ambient temperature, always presenting a delta black body temperature of 180° F. The calibration system is self-locating, aligning itself on the scanner-housing aperture and sides. Power input is 120 VAC at 1 amp. Warm up time is approximately 20 minutes. Algorithms in the Smart-Scan microprocessor automatically adjust calibration levels, based on the output of the calibration system.



Magnetic Transducers

Two magnetic transducers provide all of the timing signals required for calculation of train presence, speed, length and direction. The magnetic transducers synchronize bearing and wheel scan timing algorithms that capture the heat signals from the bearing and wheel scanners. The transducers also provide timing information used to break out cars and locomotives into individual vehicles within the consist.

The magnetic transducers mount directly to the web of the rail with three bolts. The mounting plate provides 1-inch of vertical adjustment to facilitate proper height adjustment of the transducers. The transducer cable is shielded from EMI / RFI and physical abuse by steel jacketed flexible conduit. The magnetic transducers have been tested for reliable operation over a speed range of 7-100 MPH.

SPECIFICATIONS	
Input Voltage	10 to 16 VDC @ 6 amps — with 2 scanners - < 500 mA at Idle 120 VAC @ 5 amps — with 2 scanners
Operating Temperature	-40° C to +70° C (-40° F to +160° F)
Dimensions	15.5 x 22 x 3.75 inches
Available I/O	7 — Opto Isolated digital inputs — user defined either NO or NC 4 — 0-5 Volt Analog-Scanners 1 — Precision Temperature Probe 1 — Battery Monitor 2 — Spare 0-5 Volt Analog
Communications	3 — External — RS 232 ports — Local, Pass Through, Modem 1 — External — RS 485 port for R.M. Young Weather Station 2 — Internal — RS 232 ports for AEI interface 1 — Internal — 8 channel transceiver with rebroadcast capability
Microprocessor	Dual 68HC11 microprocessor architecture 16 MHz clock Non-volatile — 4 megabyte data storage Non-volatile — time and date Dual — Watchdog Timers Flash program memories
User Interface	Graphical User Interface (GUI) for laptop computer
Circuit Protection	DC input — 15 amp circuit breaker with trip indication AC input — 15 amp circuit breaker with trip indication Controller — Self restoring fuses
Surge Protection	Primary — Critec UTB — (Universal Transient Barrier) Secondary — Ferrite core Tertiary — MOV & Ceramic capacitor
Scanning & Reporting Applications	Hot Box and Hot Wheel, Dragging Equipment, High-Wide Load, AEI Integrated Defect Reporting
Options	Internal modem — 19,200 baud MNP 5 with error correcting User Interface — Liquid Crystal Display — 16 lines x 32 characters with membrane keypad Dual rail mounted wheel scanners SmartPass AEI readers



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