

Digital Temperature Recorder Buyer's Guide

Digital temperature recorders were introduced around 1990, and have evolved to eliminate many of the problems associated with previous generation mechanical strip chart recorders.

As the technology has advanced, so too has the marketing of temperature recorders. Twenty years ago, producers/shippers typically placed the least expensive strip chart recorder they could find on their shipments. Now, many perishable product buyers specify to their suppliers which brand temperature recorder to place on their orders. This exclusivity allows Receivers to improve efficiency (and reduce costs) by designing their Receiving and QA protocols around the features and benefits of a single temperature recorder manufacturer's technology.

Many digital recorders currently on the market utilize thermistor technology. Unlike the bi-metallic coil technology in mechanical strip chart recorders, a thermistor is a solid state electronic component that is sensitive to temperature. As ambient temperature drops, electrical current through the thermistor is slowed due to increased resistance. Warmer temps reduce the electrical resistance and allow more current through the thermistor. A simple integrated circuit measures resistance against a constant, and makes the temperature calculation based on that difference. Thermistor technology does not require any recalibration during its lifecycle and is accurate to 1/10th of 1 degree Fahrenheit in most applications. Thermistor technology is vastly more accurate and does not require calibration.

Due to the wide range of temperature recorder applications, manufacturers have customized their recorders, product standards, interfaces, and desktop software packages for specific applications. While such customization is often essential, it has created a market environment in which cross-platform compatibility does not exist. Think Microsoft vs. Apple. A recorder from manufacturer "A" is NOT compatible with the desktop software from manufacturer "B" and visa-versa. Additionally, some units require use of proprietary cords, adapters, or other custom peripherals to download data from the recorders.

Some of the features available on digital recorders include LED "out of range" indicators, built-in LCDs which display data summaries, range programming selectors, audible beepers to help locate the recorder within a shipment, and even Radio Frequency (RF) transceivers which can transmit temperature data wirelessly from the loaded trailer/container to handheld or permanently mounted receivers within a warehouse facility.

Manufacturers have developed desktop applications which allow users to download and process the data from the recorders. Once the data has been downloaded, some of the software packages can variously archive the data, create reports in graphical and tabular formats, and even share data in proprietary or common file formats via email. Systems to transmit data from the PC to cloud based data storage has also become available. When evaluating which temperature monitoring system best fits the requirements of your operation, there are a number of factors to consider. The following is a partial list of key features to consider:



How long is your transit cycle? Digital recorders are typically available in recording periods ranging from 10 days to 80 days. Generally, it is best to use a recorder with a recording period closest to your needs. Since digital temperature recorders have only limited memory, longer recording period units take less frequent temperature samples to accommodate limited data storage capacity.

Single-Use or Reusable? The vast majority of temperature recorders are placed in vehicles/vessels that are one-way only (from supplier to purchaser). In this case, a single use (least expensive) recorder makes the most sense, since there is no cost effective means to return the recorder to the shipping point for re-use. In some closed-loop applications, such as intercompany transfers, a reusable recorder (more expensive than single use) can be a cost saving option. An internal procedure would need to be developed to download data and reset the recorder for its next use.

Do you require a recorder with a LCD? Some Receivers make their reject/accept decisions simply based on out-of-range LED indicators and/or summary data displayed on built-in LCDs. Recorder manufacturers have different type LED alerts and reporting available on the LCD. Make sure the recorder you are considering provides the data points you require.

Does your application include a wet environment? Some manufactures provide a waterproof pouch or other measure which can protect the recorder from harmful water fouling in transit. This is important when monitoring iced product like broccoli or corn. If an unprotected recorder falls off a pallet of iced product, it may be rendered inoperative by melting ice.

Would your Receiving/QA operations benefit from a handheld data retrieval device? Some recorders connect to a handheld device designed to capture trip data immediately upon arrival. Some handheld devices include LCD monitors large enough to display a graph (chart) for the recording period. Other handhelds simply display a numerical report. Time saved by such added efficiencies can do nothing but improve overall Receiving department efficiency and reduce overtime during busy periods.

Can your operations benefit from cloud-based online data access? In most cases, when a shipment arrives showing out of range conditions, the Receiver/QA inspector typically notifies the product's buyer. The buyer then contacts the supplier, who subsequently notifies the transportation broker/provider, who then calls the carrier/driver. Each party to the transaction wants a copy of the temperature chart to protect his/her interest in the transaction. The most common method to distribute this information is for the Receiver to manually email or fax temperature recorder data to each of the interested parties. Frequently, this process is delayed while the Receiver attends to other high priority arrivals on the dock.

The inefficiency of this process can be easily addressed with a cloud-based data archive which allows all interested parties access to non-editable temperature data online. The days of faxing/emailing temperature charts can be over with the adoption of this technology. Cloud based storage also eliminates the need to file hard copy temperature charts for each arrival.

Can your operation benefit from automation? Many larger scale perishables receivers have determined that perishables receiving operations can be streamlined with the implementation of automated temperature data collection and archiving systems. Radio Frequency (RF) wireless data transmission technologies have been developed that allow Receivers to wirelessly receive and view in-transit temperature data from arriving shipments without the need to physically retrieve the recorders. Similarly, some recorder manufacturers have developed fully automated data archiving systems that don't require any staff inputs. With some manufacturer's systems, the data can then be automatically uploaded to a cloud based data storage facility as described above.

Would a digital temperature recorder with audible locating beeper bring efficiency to the Receiving process? Some recorders are available with an audible locating beeper. A beeper can immediately alert Receiving staff to the location of the recorder and subsequently expedite the Receiving process. This feature is generally NOT desired when shipments are sent overseas or via domestic package handlers like UPS and FedEx. Security protocols often require shipments with audible beepers to be opened and inspected. Recorders equipped with locating beepers are best suited to domestic over-the-road truckload and intermodal shipments.

What are your data archiving and reporting requirements? Digital temperature recorders are optimized to interface with PC based software packages. Some of the software is free with no registration required, while some manufacturers restrict access through fee structures or registration requirements. Some manufacturers offer software packages that include only limited report generating capabilities, while others offer more robust reporting. Some apps can provide data in .pdf or in .csv (which is compatible with MS Excel) or proprietary formats. Some manufacturers offer summary printed reports from a central data center for additional costs. Determine what reports you need (for internal and third party audit purposes), and confirm that the software and/or print services offered for your temperature monitoring system can support that specific reporting requirement. Obviously, avoid additional cost software and printed reports whenever possible.

Rebates for Used Recorder Recycling: Some recorder manufacturers have embraced and encouraged recorder recycling programs to help eliminate hazardous electronic component waste (most recorders contain lead, cadmium, mercury, and other pollutants). Some manufacturers have implemented rebate programs for Receivers who return used recorders.

Costs: Temperature recorder unit prices vary according to manufacturer and feature sets. Like many other infrastructure related decisions, a "Big Picture" approach must be adopted when determining what temperature monitoring system best fits your operational structure and

budget. Rebate programs for returned recorders can substantially reduce the total cost of your temperature monitoring program.

A handheld data retrieval device may add tremendous efficiency to your Receiving/QA process and result in significant cost savings. Transitioning from a fee-based reporting regime to free desktop software or a free cloud-based data archive may also bring significant administrative savings. Since the goals are shrink reduction, product safety, and freshness maximization, the value proposition is determined by comparing the effectiveness of each manufacturer's system, its ease of integration to existing internal processes, and its total overall costs.

Sources: Cargo Data Corporation (www.cargodatacorp.com) of Ventura, CA offers the Automated Temperature Monitoring System designed to simplify cold chain monitoring at every level. Cargo Data provides **Select Radio Frequency** enabled transit digital temperature recorders, **Express** handheld data retrieval device, **UpLink** cloud-based data archiving, **iMAT** real-time temperature monitoring systems, **Boomerang Reusable** recorders, **KoldLink App** free full-featured desktop software, and much, much more.

As product quality, safety, and traceability programs become more sophisticated and more important, perishables logistics and quality assurance professionals will be increasingly responsible for monitoring cold chain integrity. Many such professionals are seeking an integrated and automated temperature monitoring system that provides added efficiency, full data archiving, and easy data sharing. You should too.

For more information, contact Cargo Data Corporation:
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