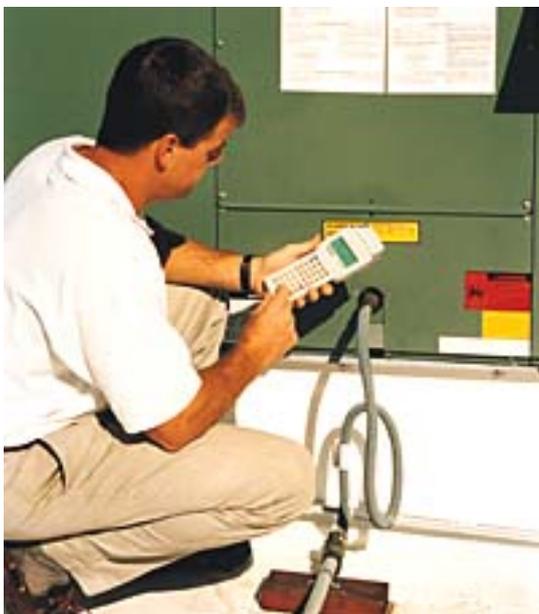


## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

---

### **Automatic data collection technologies are ready to enhance data entry for the information-driven maintenance organization.**



An optical scanner reads a bar code that provides data about the equipment. Bar codes can also support work orders, parts inventory, asset tracking, and labor reporting. (Photograph courtesy Tiscor.) Like any other mission-critical activity, maintenance management is driven by information. Computer systems automate many aspects of a maintenance operation, usually relying on keyboard input and paper output to collect and disseminate information. However, there are situations where the entry and publication of maintenance data can be automated. Given the right situation and proper implementation, automation can significantly enhance the effectiveness of a maintenance operation.

Automatic data collection (ADC) is the process of automating the entry and dissemination of computer-based information. It is an assortment of technologies that provide a machine-based alternative to keyboard entry. It includes bar codes, touch memory, magnetic stripe cards, radio frequency communication, and voice recognition.

Hardware and software vendors have just started to recognize the potential of ADC in maintenance management. At the beginning of the decade only a few computerized maintenance management system (CMMS) vendors provided bar coding modules. Today, most major CMMS vendors support bar coding. Some have introduced products using touch memory and pen-based computers. The number of ADC maintenance management

## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

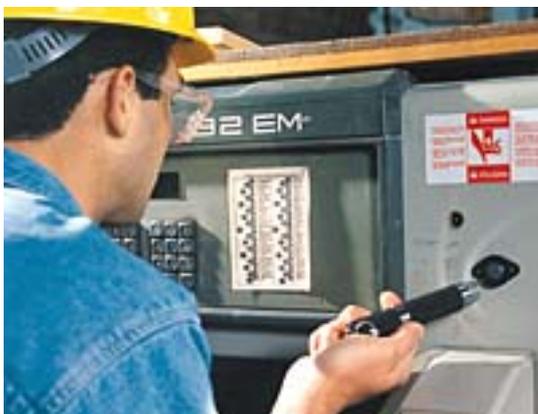
---

solutions will continue to grow with advancing technology and the need to increase productivity.

### Common elements in ADC

ADC maintenance management applications generally have four common elements regardless of the technology used. They are collection medium, reading and writing devices, terminals and data communication, and application software.

The collection medium is the physical vehicle for storing or transmitting information. Bar codes, touch memory buttons, radio frequency identification (RF/ID) tags, and speech are collection mediums.



Technician uses touch memory technology to collect and log data. (Photograph courtesy Diversified Systems Group.) Reading and writing devices are used to retrieve and store information in the collection medium. Bar code scanners, bar code printers, magnetic stripe readers, and microphones are examples of reading and writing devices.

Terminals provide a mechanism for users to interact with the collection process and application software. Fixed terminals communicate with a computer system through cabling and wires. Batch terminals are portable and require users to physically place the terminal in a cradle or docking station in order to upload and download data from the target computer system. Radio frequency (RF) terminals also provide portability, but allow users to send and receive on a real-time basis. Terminals vary in processing power from simple storage devices to portable computers complete with keyboard and display.

The application software is generally a CMMS. However, other software such as predictive maintenance analysis and stand-alone inventory control packages can support ADC. Commercially available software packages do not inherently support ADC; vendors must

## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

---

design and develop a special program code in their products in order to support it. Information technology departments and system integrators can custom build stand-alone ADC solutions or, in certain instances, integrate ADC technology into an existing application package.

### ADC technologies

Bar codes remain the most popular ADC technology used in maintenance management. There are bar coding solutions for just about every maintenance system application that requires the entry of a predetermined set of values such as work order numbers or failure codes. However, other technologies are starting to make an appearance. They include two-dimensional bar codes, touch memory, magnetic stripe and smart cards, radio frequency and wireless communications, portable pen-based computers and personal digital assistants, and voice recognition.

Each technology has its own set of unique capabilities and a cost threshold that can make it appropriate for some applications and not others. Many applications use a combination of the technologies, while others can be addressed by only one particular technology.

ADC maintenance management applications are not restricted to the technologies listed previously. Touch screen computers and optical character recognition are integral components of many electronic document management systems. Biometrics provides the ability to secure access to facilities and financial transactions based on fingerprint or retinal scans. Infrared remains a popular wireless communication mechanism.

Bar codes. Bar coding is an accepted, if not common, practice in maintenance management. Bar codes can support work order processing, inventory control, tool tracking, asset management, and labor reporting. A bar code's pattern of alternating dark stripes and light spaces allows key data elements such as work order numbers, part numbers, and failure codes to be encoded on a piece of paper or label. An optical scanning device reads the bar code by illuminating the pattern and translating the resulting reflection into a data stream. Traditional bar codes store a relatively small amount of information in linear patterns of bars and spaces.

There are several two-dimensional bar code symbologies available, with PDF 417 generally recognized as the standard for maintenance applications. It allows up to 1800 characters to be encoded into a single bar code symbol.

## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

---

**Touch memory.** Touch memory devices store detailed information in a format that can be directly attached to an equipment item. As the name implies, a probe must physically touch the storage device in order to transfer information to or from a data collection terminal. Touch memory buttons come in a variety of models rated according to their storage capacity, ranging from 1000 to 64,000 characters of data. There are two types of touch memory: read-only and read-write. In read-write format, a touch memory device is especially suited for logging predictive maintenance and repair activities. Its electronically accessible serial number makes it an ideal vehicle for confirming that a craftsman was actually at the job site. Its relatively low cost, ruggedness, and ease of use make it attractive for many applications.

**Magnetic stripe.** Magnetic stripe technology employs magnetic material typically applied to a credit-card-size piece of plastic as the data collection medium. Information is encoded by alternating the polarity of small sections of the stripe. Magnetic stripe technology is often used in maintenance for time and attendance, procurement, and security access applications. When an employee identifier is encoded on a magnetic stripe card, it can be used to control and track access to unmanned storerooms and tool dispensing machines.

**Smart cards.** Smart cards employ the same technologies utilized by touch memory and RF/ID to store large amounts of data. Some smart cards require physical contact for read-write operations. Others transmit or receive data in the same manner as RF/ID tags. Their potential uses in maintenance include purchasing control, security, and tool management. Their ability to retain data makes the cards attractive for procurement activities by allowing work order or accounting data to be captured as each purchase is made.

**Radio frequency.** Radio frequency data communication (RF/DC) is a term used by ADC vendors to describe a wireless local area network where radio-enabled, hand-held, or vehicle-mounted terminals communicate with a base station connected to a host computer system or network. RF/DC provides maintenance applications with interactive verification and control. Users can be directed to perform an action on an as-needed basis and data can be verified against a host-system database as soon as it is scanned. These capabilities make it popular for warehouse management systems and for situations where maintenance personnel at job sites require instant access to a centralized database but physical cabling is impractical.

**Wireless technology.** Wireless wide area network (WAN) systems employ radio and cellular packet data communications services to connect mobile users to a central system. CMMS vendors have just begun to introduce WAN-based solutions that support users at remote

## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

---

job sites. These solutions typically feature notebook computers and personal digital assistants equipped with wireless modems that communicate with the CMMS through the WAN service. They allow the remote user to interactively access work order requests, update work orders, view PM procedures, and check part availability in the CMMS.

### Benefits Of ADC

Automatic data collection can benefit a maintenance organization by:

- Reducing the time spent on data entry
- Increasing the accuracy of maintenance information
- Reducing paperwork
- Identifying assets
- Supplying information where it is needed
- Providing an activity audit trail
- Securing valuable resources

### Using the technology

ADC maintenance applications will continue to grow in popularity as technology advances and the benefits become more widely known. However, maintenance organizations should carefully consider what their needs are now and for the future.

ADC technology is not a substitute for good management, competent craftspeople, proper techniques, or appropriate information systems. In order to be successful, ADC or any other information technology cannot be evaluated or implemented in a vacuum. It must be part of an organization-wide effort to achieve maintenance excellence. Before any ADC project can be considered, two key components must be in place—the strategic maintenance master plan and the CMMS needs assessment.

The strategic maintenance master plan establishes the overall maintenance goals and objectives within the organization based on a thorough assessment of current operations and practices. It defines the core elements by functional areas needed to achieve the goals and objectives and it identifies the necessary resources required for implementation. It also establishes the performance measures needed to justify the plan and manage its successful implementation.

The CMMS needs assessment identifies the information systems and resources required to support the strategic maintenance master plan and achieve maintenance excellence. It delineates the informational requirements of each functional area from work order management to cost reporting. It documents the informational flows within the

## ADC for Maintenance Management

Written by Tom Singer, Tompkins Associates, Inc.  
Thursday, 01 October 1998 11:28

---

maintenance department and between the maintenance department and other organizational entities. The needs assessment establishes the selection criteria used in evaluating any prospective solution and identifies the resources required for successful implementation.

The strategic maintenance master plan and CMMS needs assessment are part of an on-going process. Given today's competitive environment and changing technology, no maintenance organization can afford to rest. The performance of the organization must constantly be measured against the benchmarks established by the master plan. The master plan must be periodically reviewed and revised.

Potential application of ADC technology should be part of the CMMS needs assessment process. Once the informational requirements and flows of the organization have been established, the suitability of ADC technology can be evaluated. Functional areas that are prime candidates for ADC technology, based on its potential benefits, can be identified and incorporated into the CMMS selection criteria.

However, the evaluation of ADC technology should not stop with the implementation of a CMMS package. Vendors constantly introduce new modules and enhancements. An ADC module that was not deemed necessary when a package was selected can become a viable solution a few years later. The need for ADC technology is not universal across all maintenance organizations. However, most organizations do need to evaluate its suitability to their operations when developing their CMMS needs assessment. Organizations that are truly interested in pursuing maintenance excellence should constantly look for the right opportunities to apply ADC technology. **MT**

---

*Tom Singer is a project manager at Tompkins Associates, Inc., an engineering-based consulting firm, 2809 Millbrook Rd., Raleigh, NC 27616; telephone (919) 876-3667 Internet [www.tompkinsinc.com](http://www.tompkinsinc.com)*