Terminology

**DACT**
- Digital Alarm Communicator Transmitter

**DACR**
- Digital Alarm Communicator Receiver

**RJ31X**
- Phone jack
- Required by FCC

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**CID**
- Contact Identification – Reporting format developed by Ademco Manufacturing

**SIA**
- Security Industrial Association – Reporting format developed as a standard for reporting to central stations

**POTS Line**
- Plain Old Telephone System
- Copper line

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**IP**
- Internet Protocol
- Language used by computers to communicate via the internet

**GSM**
- Global System for Mobile communications
- The most popular standard for mobile phones in the world
### DACT

A system using a DACT shall employ 1 telephone line.

In addition, one of the following transmission means shall be employed:
- Second telephone line
- Cellular telephone connection
- 1-way radio system
- 1-way private alarm system
- Private microwave radio system
- 2-way RF multiplex system

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### DACT Sequence Of Operation

- DACT activates / phone line seized
- Dials DACR / DACR answers
- Obtains verification
  - Handshake tone
- Transmits the data
- Obtains verification
  - Kiss-off
- Hangs up

**Must be completed in 90 seconds**

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### DACT Requirements

- Monitor the phone lines
- Obtain verification / receive ACK
- 10 reporting attempts
- Attempt completed in 90 seconds
- Test communication every 24-hours
- 24 hour standby / 5 min. alarm
- Alternate phone lines when doing a test
Phone Line Requirements

- 2 loop-start phone lines (POTS)
  - Constant voltage
  - Should see min 5 VDC
    - If not get phone line trouble
  - 48 – 52 VDC on hook
  - 5 - 7 VDC off hook
- Upstream of any phones
  - For line seizure
- No PBX extensions
- No T1 or VOIP lines

NFPA 72 8.6.3.2.1.1

DACT Wiring

- Digital Alarm Communicator Transmitter

Telephone Connections

- The model 7860 phone cord is available from Silent Knight for this purpose, or use a standard RJ31X cord.
The History of Alarm Reporting

In the past, night watches walked the streets while the city slept in order to spot fires and raise the alarm.

Call-Box Systems

Direct copper connection to the fire department.

Direct Wire Systems

Multiple direct wire connections:
- To Fire Department
- Or Central Station
Tape Dialers

- Alarm prone and unreliable
- Not able to verify signal transmission with the central station
- No way to supervise their operation from the central station
- Still have wide usage in residential applications
- NEVER has met NFPA72

Improvements to Public Telephone: NFPA, UL, FM

- Two separate phone lines
- Two separate phone numbers
- Telephone “cut line” line monitor
- Automatic call retry
- Automatic 24-hour test call
- Receiver message acknowledge
- Communication failure indication
- Line Seizure

Digital Communicators

- Essentially a “high-speed” call box using public switched telephone lines
- In the event of an emergency it will:
  - Dial up the central station
  - Establish connection
  - Transmit the message
  - Verify the message
Digital Message Formats

The first phone formats used coder-wheel logic via the pulse of rotary phones.

A rotary phone pulse count was used to communicate the information.

3-Plus-1 Format

The first format used

XXX - X

Subscriber Identification Event

3-Plus-1 Format

(@ ¼ speed)

9 2 9 F
4-Plus-1 Format

XXXX  X

Subscriber Identification  Event

4-Plus-2 Format

XXXX  XX

Subscriber Identification  Event

4-Plus-2 Format

(Full speed !)

9  2  0  0  F  3
How Are You Sure The Message Got Through?

The first tone establishes the communication link

* Handshake

The communicator sends the message twice

* Newer formats use a parity or check-sum

The last tone confirms that there were no differences in the first and second messages and the message was received

* Kiss Off
As the ability to transfer large amounts of information became easier, it became obvious that:

- Specific information about a specific building might be transmitted
- Address
- Emergency condition
- Exact room

In the late 1980s: ADEMCO Contact ID format

It had 2 great advantages:

- Dual Tone Multi-Frequency (DTMF) Signaling
  - Touch tone dialing
  - Robust format

9 2 0 0 - E 3 0 0 - C 0 0 0 0 0 0
**How Much Faster?**

- About 18 seconds per message!
- Full 4-Plus-2 message followed by full ADEMCO Contact ID message

**Contact ID**

Events are sent to the central station as a fixed string of 16 digits:

<table>
<thead>
<tr>
<th>Event Format</th>
<th>AAAAIIQEEEMMMZZZK</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAA</td>
<td>Account number</td>
</tr>
<tr>
<td>II</td>
<td>Message type always 18</td>
</tr>
<tr>
<td>Q</td>
<td>Event qualifier 1 = New, 3 = Restore, 6 = old</td>
</tr>
<tr>
<td>EEE</td>
<td>Event code - 3 digits (See manual)</td>
</tr>
<tr>
<td>MM</td>
<td>Used to report the module number the point is linked to. Zone reporting does not send module number but will 0 fill. Used to report partition # for Ademco Security.</td>
</tr>
<tr>
<td>ZZZ</td>
<td>Zone number reporting the Alarm (001-999) or Point ID (Zero filled)</td>
</tr>
<tr>
<td>K</td>
<td>Message sum</td>
</tr>
</tbody>
</table>

- Example 1:
  - Zone Reporting
  - Manual pull alarm on zone 15
  - Account number 1234
  - 123418111500015C

- Example 2:
  - Point Reporting
  - Heat detector alarm on point 8 module 2
  - Account number 1234
  - 123418111002008C

**SIA Rev 9 FACPs**

- Two / Three times faster than CID
  - Reports and sounds like a Computer modem

Events are sent to the central station as a variable length string:

- The account number is sent using an account block that is separate from the event block (larger account number)
- Multiple events (many more than older formats) can be sent within a single event block
  - Events are separated by a "/" character
- Event parameter can be either a zone, point or module number
- Dialer uses a "pi" event when reporting by point
  - Supersedes the actual point event to report the module the point is linked to
**SIA Rev 9 FACPs**

<table>
<thead>
<tr>
<th>Event Format = EEPPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
</tr>
<tr>
<td>PPP</td>
</tr>
</tbody>
</table>

**Example 1:**
- One event
- Fire Alarm on zone 15
  - FA15

**Example 2:**
- Two events
- Module 10 / Fire Alarm on point 5
  - pi10/FA5

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**DACR**

**Digital Alarm Communicator Receiver**
- Receives incoming calls from FACPs
- Silent Knight models
  - 9500 (pictured)
  - 9800

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**Central Station**

**Central stations use automation packages**
- Customizes the reporting
- Take data and make it specific to the receiver’s needs
**Troubles**

- **Phone line 1 trouble**
  - Less than approximately 3VDC across Telco 1, Tip & Ring

- **Phone line 2 trouble**
  - Less than approximately 3VDC across Telco 2, Tip & Ring

- **Comm 1 trouble**
  - Failure to communicate to the receiver using phone line 1
  - 10 attempts before trouble

- **Comm 2 trouble**
  - Failure to communicate to the receiver using phone line 2
  - 10 attempts before trouble

- **Account 1 trouble**
  - Not able to report to primary account

- **Account 2 trouble**
  - Not able to report to secondary account

- **AutoTest Off Normal**
  - FACP in some other condition than “Normal” when it does it’s daily test

- **Other Transmission Technologies**

  - **Communication Integrity:**
    - Provision shall be made to monitor the integrity of the transmission technology and its communications path.
    - (1) Any failure shall be annunciated at the supervising station within 5 minutes of the failure
    - (2) If communications cannot be established with the supervisory station, an indication of this failure shall be annunciated at the protected premise
    - (3) If a portion of the communication path cannot be monitored for integrity, a redundant communications path shall be provided

  - NFPA 72 8.6.4.4
IP Communicator

- Connects to primary dialer output on panel
- Connects via Internet or Intranet with 512 bit AES encryption
- Communicates with compatible Teldat Corporation receiver
- Can be supervised every 90 seconds!

Current Network Architecture

NFPA References

8.5.4.4 (7) The transmission technology shall be designed so that upon failure of a transmission channel serving a system unit at the supervising station, the loss of the ability to monitor shall not affect more than 3000 transmitters

- The Central Station receiver will only monitor up to 3,000 units
Long Range Radio

Use a wireless mesh network
There is a remote transceiver used to monitor or control a device such as an alarm panel
Each transceiver relays its data to the central receiver via radio transmission

• If the transceiver is too far to reach the central receiver directly, it simply hops the data to the next closest transceiver

The Central Receiver relays the data to alarm automation software for processing

If data cannot be relayed via one route, the mesh network automatically selects the next best route from a choice of up to 8 available routes at any given time
Long Range Radio

The network dynamically and automatically adapts to changes in the network caused by:

- Weather changes
- Obstruction changes
- Addition or subtraction of other transceivers in the network

Highly redundant & reliable

Advantages of Long Range Radio

- Plug and play addition of transceivers
- Can do remote self-diagnosis from Central Station
  - Reduce tech calls
- Save money on phone lines
- Proven technology that will not become obsolete
- Fastest current technology available

Installing Silent Knight with other Transmission Technologies

Rev 10 panel
- Use phone line 1
- Use Contact ID for reporting

Program options to:
- Disable phone line monitor on second line
- Disable phone line two
- Disable dial tone detection on line 1
Installing Silent Knight with other Transmission Technologies

Older than Rev 10
- Tie phone line 1 & 2 together
- Tip to tip
- Ring to ring

Use Contact ID for reporting

CANNOT use a phone line for backup
- Can’t mix technologies
- Phone line not required by code with new technology
- Either use DACT or use new technology