LAUNCHING A STATEWIDE ANI PASSING IMPULSE PPV SYSTEM

David A. Woodcock

Director of Engineering
Central Cable Television Co.
of Michigan

Larry K. Moreland

Manager CATV/CSE
Zenith Cable Products Division
Zenith Electronics Corp.

ABSTRACT

Pay-Per-View is an important source of revenue for the cable television industry. The challenge is in launching this new service in a customer-friendly manner over a wide variety of system architectures.

The answer can be found by taking advantage of an existing customer accepted technologies: the telephone, 92% of the homes in America have an in-home telephone; this with the cable television industry's use of addressable converters, provides the solution.

Both of these existing technologies, the telephone and the addressable converter, can be merged together on a statewide basis to become a low cost and reliable means of implementing a statewide ANI based IPPV network.

INTRODUCTION

IPPV has gained wide acceptance as a valuable source of revenue for the cable television industry. Of the variety of transaction technologies available, ANI has proven to be one of the most customer friendly and economical approaches to impulse order taking. ANI can be used with either rotary or touch tone telephones and requires no additional in-home hardware. A PPV event is ordered by the subscriber viewing the barker channel, which has a list of events available and the times they are shown. Once a selection has been made, the corresponding telephone number is dialed. After the automated "thank you" response, the subscriber hangs up without having to speak to anyone or enter additional digits. Total off-hook time less than fifteen seconds.

The ANI based IPPV viability has been proven on the system level in the Central Traverse City , Michigan system. The next logical step would be to implement a network that would link multiple systems together. The basics of how an ANI system works and network design considerations will be covered. Among the factors discussed are:

* Telco Switch consideration
* Peak system loading
* Throughput and trunk requirements
* Interfacing with the billing system
* Remote scheduling of controllers
* Network design considerations

Experience gained through the operation of an ANI passing IPPV system since May 1, 1986, will be discussed, along with other non-traditional means of gathering ANI information.

ANI OVERVIEW

Automatic Number Identification (ANI) has been in use in the telephone industry for many years. It's main use has been in the identification of subscribers placing a call for automatic billing purposes in 800 and 900 prefix applications.

The ANI information originates from the local telephone switching center or switch where each telephone subscriber has his own individual pair of wires connected. The switch recognizes when a subscriber picks up his phone and waits for the dialed digits to route the call to the appropriate equipment.

In an ANI passing system, some software modifications called translations, are made to the switch so that the PPV call is routed differently. These modifications allow the call to be placed on a different set of trunks that route the call outside, and thus

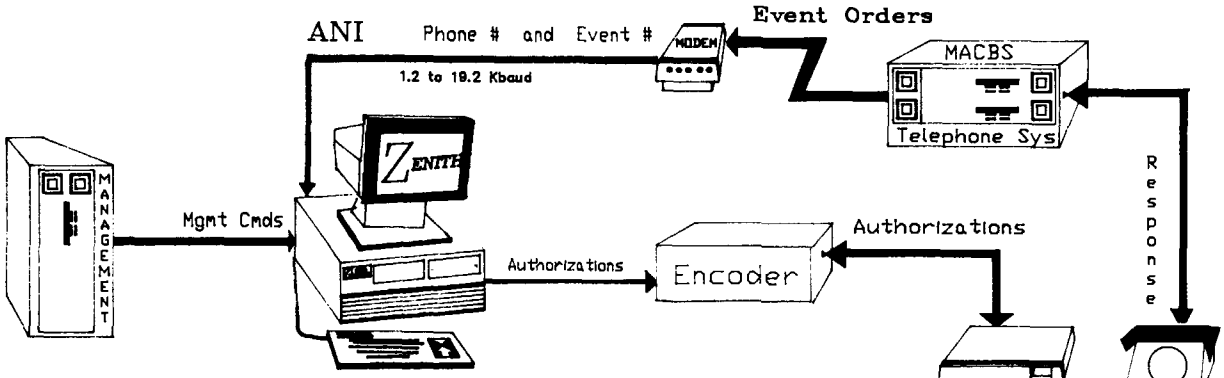


FIGURE 1

bypassing, the normal telco switching equipment, and directly connecting to the Science Dynamics Multi-Access Cable Billing System (MACBS). A simplified block diagram is shown in Figure #1.

The routing of the call out of the normal telco network is an important factor. This means the telco network is not subject to peak loading, that could overload or crash the local switch network, should a high volume of calls occur in a short period of time.

When the PPV call reaches the MACBS, it is held in a buffer while the MACBS requests the calling number or ANI from the originating switch. Once the ANI has been received, both the called number (identifying to the event) and the calling number (identifying the subscriber) are sent in an asynchronous ASCII data packet, via a modem to the CATV company. When verification has been received that the modem at the CATV company is available to accept the order, a response is given to the calling subscriber. The response is a digitally synthesized message, thanking the caller for the order and requesting the caller to please hang up.

NETWORKING SWITCHES

The first step in designing a ANI passing IPPV network is determining which switches are involved. This is best assessed through a list of the number of subscribers by prefix or NNX you wish served.

The list will indicate to the telephone company which switches are involved and the probable call volume that will be processed. The telephone company will then design a network that will link the switches together into one or more MACBS.

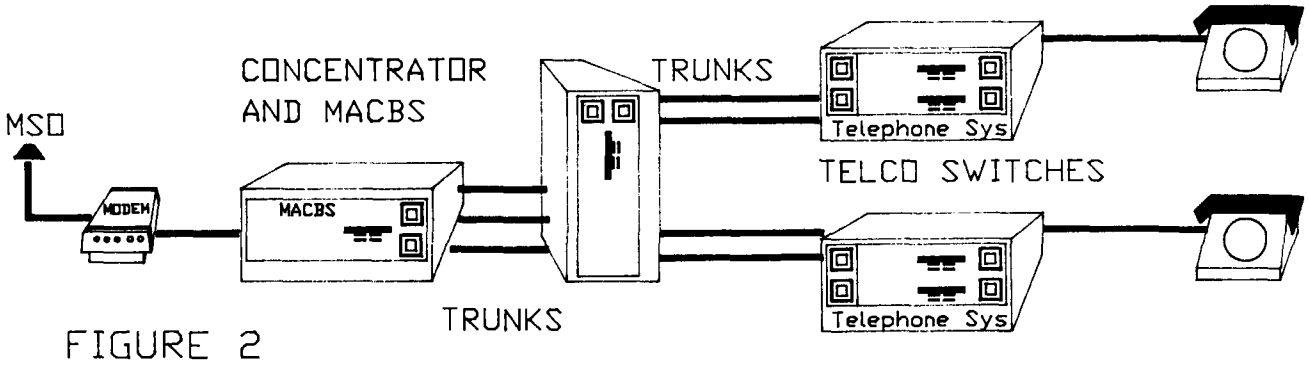


FIGURE 2

This is most commonly done through a series of ANI sending trunks called TSPS trunks, linked together into a Tandem computer, acting as a concentrator. The output of the Tandem will be trunked in to the MACBS as shown in Figure #2 .

The number of trunks needed to link the switches into the MACBS is dependent on three factors:

* the call volume
* the peak loading
* the holding time per trunk

Many of the newer electronic and digital switches can be fairly easily converted to pass the ANI to the MACBS by entering new translations. The older electro-mechanical switch may require physical re-wiring but in some cases even if rewired may not be capable of ANI passing.

The telephone company is the only one who can determine what equipment changes and networking is required. Only after a timetable has been given can the true potential of an ANI network be explored.

PRIVATE BRANCH EXCHANGES

Many organizations today are using their own internal telephone exchange or private branch exchange (PBX). The PBX can route calls within the organization to other extensions, as well as connect them to the public telephone network, to place outgoing calls.

When an outgoing call is dialed, the PBX will select one of a group of trunks that connects the caller to the public telephone network. This random selection of outgoing trunks created a problem for an ANI system, since the ANI would only identify the trunk group. To identify the specific phone or customer in the PBX network that placed the request, an additional identifier needed to be added.

For the hotel industry using an in-house PBX, a separate Barker Channel would be needed to reflect the PBX PPV order number and the increased cost of the event.

When the PBX order number is dialed, the MACBS will route the call through a separate interface. A voice response will request the customer to enter their PPV number on their touch-tone phone. The MACBS will respond back, repeating the PPV number and requesting they press the star (*) key if the number was correct or the pound (#) key if the number was incorrect.

If the star (*) key is pressed the MACBS will thank the customer and request they hang up. A pound (#) key entry will request they re-enter the number again.

The ANI indicates the trunk group for the MACBS, which in turn translates the prefix of the calling number into the identity of the hotel, along with its four digit PPV number. This information would then be processed in the controller in the same manner as a standard ANI data packet and authorizes the descrambler for the requested event.

The PBX in the hotel would note the PPV order number in much the same way as it handles long distance in room calls. A translation would be entered into the PBX so the proper charge and description would be noted on the guests room bill.

Once each month, the cable company would send the hotel a bill, with backup of each transaction, for the buys made during the month. This same scenario could be used for any PBX application to gather the ANI identification.

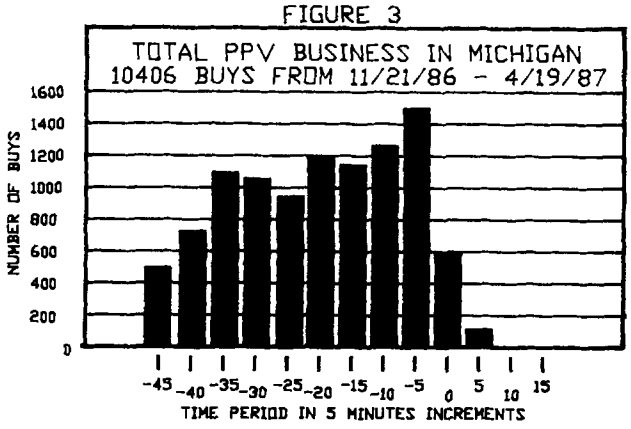
NETWORK THROUGHPUT

The throughput of an ANI network or the number of transactions a network can process, is determined by:

* number of trunks
* holding time per trunk
* peak loading
* controller processing capability

To some extent peak loading is influenced by the length of the order entry window, customer familiarity, confidence in the system, and the popularity of the events.

FIGURE 3

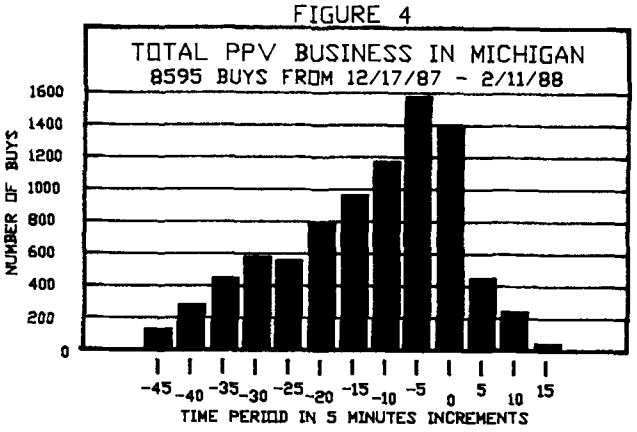


The first order entry window Centel used was 45 minutes prior to the start of the event. Six months after the system was launched, a peak loading study was done see Figure 3. The findings revealed a more level ordering pattern than expected. We also found that 18% of the subscribers tried to place an order after the event started. With this in mind, we extended the order entry window to include the first 15 minutes of the event.

Between December 17, 1987, and February 11, 1988, a second peak loading study was done see Figure 4. This study demonstrated a substantial increase in orders just before the event, which we attributed to the customer's increased confidence and familiarity with the ANI order entry system.

Throughput of the MACBS is proportional to the number of trunks that terminate into it and the holding time that each customer remains on line during a transaction. The holding time is affected by the length of the audio response given the customer. We presently use "Your order has been accepted. Thank you. Please hang up". This message results in an average of 16.5 seconds of holding time per trunk, or 3.6 calls per minute per trunk. Shortening the message to "Thank You" and automatically disconnecting the customer would reduce the holding time to 10 seconds per transaction. Ten seconds of holding time per trunk allows six calls per trunk per minute. Using the buying curve in Figure 4, the throughput for a 24 trunk system with a 10 second holding time would be approximately 3,900 calls per event.

FIGURE 4



When designing an ANI network, Some assumptions need to be made regarding the maximum volume of calls anticipated and the peak loading you will experience. From those assumptions, the number of needed trunks can be determined. There is no practical limitation on the number of trunks into the MACBS.

AUTHORIZATIONS

There are two ways of authorizing the PPV customer's converter for the requested event:

* Through the billing system
* Directly to the addressable controller

There are both advantages and disadvantages of routing the ANI through the billing system prior to the addressable controller. The tradeoffs are increased flexibility versus reliability.

If the billing system processes the transactions prior to the addressable controller, several options are available.

* Compatibility with a wider variety of addressable converters.
* Instantaneous credit checks.
* Flexibility in packaging and discounts for multiple events.
* Controllers with less on-board memory and speed could be used.

The addressable controller maintains the subscriber database in active memory. With the ANI sent directly to the controller there are several advantages gained.

* Nearly instantaneous look-up, processing, and authorization of events.
* No interruptions due to loss of data communication with the billing system.
* No loss of events due to nightly procedures on the billing system.

In Centel's Michigan systems, it was decided to implement a statewide IPPV network by delivering the ANI directly to the controller. This decision was made to gain the maximum reliability.

It is believed that if the more crucial links in the chain of events were in Centel's control, the less likely a failure would occur and more likely that timely repairs could be made.

It has been Centel's experience that a lack of system reliability reduces customer confidence. This lack of confidence reduces the buy rate and

increases the number of duplicate order requests. In the event that you are paying for ANI services by the number of requests delivered to the CATV system, there could be a significant increase in transaction charges.

BARKER CHANNEL

To be in a position to take advantage of an impulse buying decision, the PPV offerings need to be readily available. A method that has proven to be one of the most accessible and economical is a character generated Barker Channel.

This channel, as shown in Figure #5, has a list of currently showing events, the price, associated time, and order number.

CENTEL CINEMA
Each Movie is $3.95
Monday's Movies:
7:00 pm - Title
9:00 pm - Title
11:00 pm - Title
1:00 am - Title
3:00 am - Title
To Order, Dial: 999-9090

From 45 Minutes Before until
15 Minutes after each event

FIGURE 5

In addition to the screen shown in Figure 5, there are screens that give a brief description of each movie, the rating, and it's duration.

Networking of the Barker Channel throughout the state from one central location, is done with dial-up data lines and addressable character generators made by Video Data Systems. This allows the same central location that schedules the remote addressable controllers to also control the remote Barker Channels.

VIDEO PROGRAM SCHEDULING

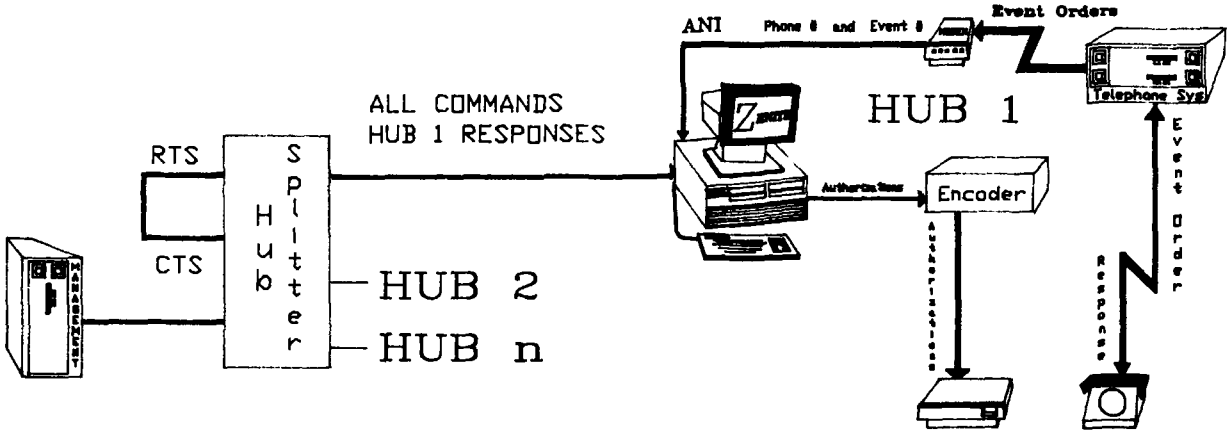
With the complexity of the PPV event schedule, having one central control point provides consistency, reduces labor cost, and reduces human errors.

The video supplier downloads the time schedule of programming to a single location. The central location converts the time schedule to management computer interface commands. These commands are multiplexed with the management computer commands and downloads the program time schedule to all controllers using the same data distribution system.

MANAGEMENT COMPUTER INTERFACE

The decision to connect all controllers to a single management computer interface, while providing local control of new installations, background global refresh, and ANI input, gives Centel the reliability of local control and the economy of centralized customer service, billing and scheduling.

FIGURE 6



This is accomplished by feeding the entire state through one box driver port. This port is sent through a multiport expander which transmits to all controllers. The controllers are addressable by hub number. Only the controller whose hub number matches the hub number embedded in each command will execute the command and respond to the management computer. Each controller supports RTS/CTS hardware handshake. The multiport expander uses the RTS signal to connect the responding controller to the management computer. The port expander issues a CTS to the controller permitting response. See figure 6.

In those cells where there are clusters of small cable systems, a single controller is used for multiple headends. It is possible to implement the statewide ANI system using only two addressable controllers. The addressing data is distributed via leased line synchronously to the local headends. This economical approach works with either Z-TAC baseband or PM rf addressable converters. A separate controller is needed for each type of converter. They are controlled by the single management computer interface port. See figure 7.

The ANI information is sent to all controllers via a multiplexing modem. The controllers will process ANI information only for those phone numbers in its data base. The management computer polls each controller for an upload of the ANI Pay-Per-View transactions.

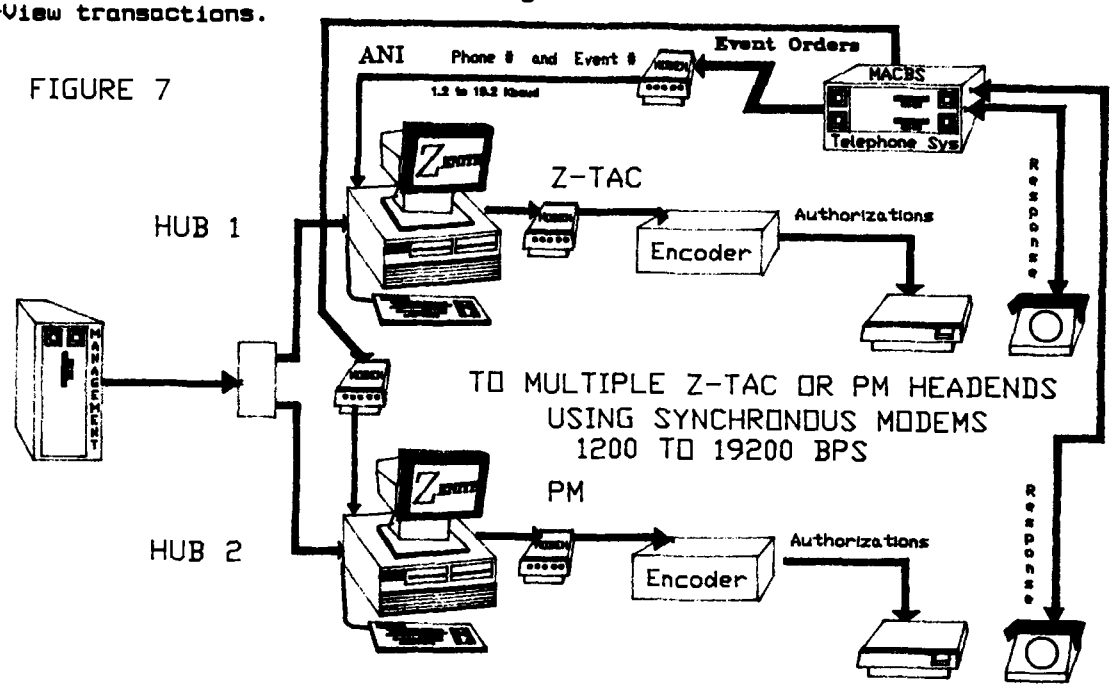
STATEWIDE ANI NETWORK ARCHITECTURE

The ANI PPV network will be initially launched in eight systems around the state. These systems are already linked together with multiport asynchronous data modems. These lines are used to carry the CableData billing information. Additional ports on these same data multiplexers will also carry the ANI, and management computer interface to the Zenith addressable controllers. The time scheduling of program control will be multiplexed with the management computer interface data. See Figure # 8 .

The scheduling of both addressable controllers, as well as the Barker Channel character generators, will be done from one central location. A conversion utility will take the video program schedule and convert it to management computer interface commands. These will then be downloaded to all hub controllers by time sharing the interface link.

Each of the initial systems, with one exception, will have their own addressable controller. This will break the network into separate, yet linked, individual cells, or hubs. Therefore, it will allow most of the network to operate independently in the event of a failure in any link in the chain. Although the ANI information shares the same phone line, a separate phone line would be no less susceptible to outage.

FIGURE 7



The second input to the controller will be used for the ANI data packets from the MACBS. The output of each area MACBS is sent to all local hub controllers. Each controller has its own systems data base downloaded into its memory. When the ANI from another hub reaches the controller, it is unable to match it with the information in its own data base, so it is rejected. Overloading is not a problem because of the speed and capacity of the Zenith 200 series controller.

The Zenith controller can accept an average of 50 ANI transactions per second with bursts of 100 per second. The database capacity can be expanded to in excess of 300,000 decoders with additional memory, and supports 15 area codes and unlimited NNX numbers.

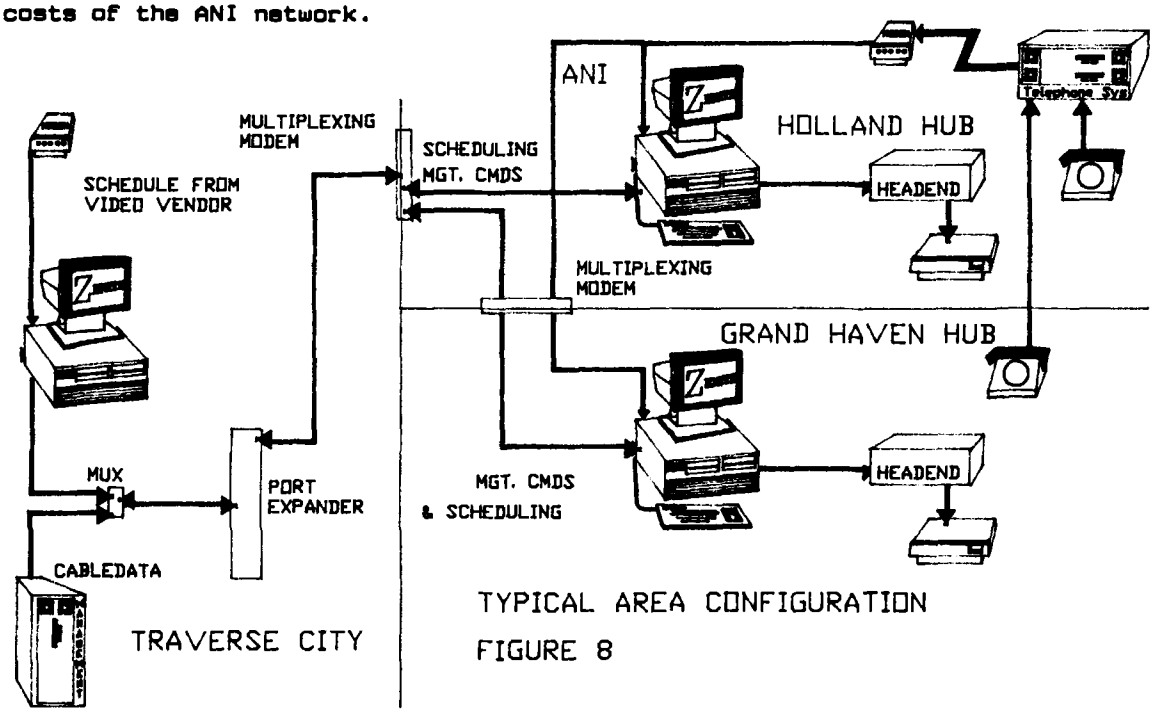
With the burden of sorting the ANI being placed on the controller rather than the MACBS, the same order number can be used by one MSO for all area systems. This method was selected for three reasons:

* The same controller schedule could be created for all systems
* The cost of the MACBS can be spread over many cable operators reducing the per transaction charge.
* The same marketing materials can be used for an operator with many CATV systems is the same area.

Each of these factors reduce the operating costs of the ANI network.

ACKNOWLEDGEMENTS

The authors would like to express thanks to Mark Bowers, Tom Roach, and Karen Briggs of Centel, Bill Courry and Russ Spranger of Michigan Bell, Vito Brugliera, and Jeff Huppertz of Zenith.



TYPICAL AREA CONFIGURATION

FIGURE 8