"... [New Hampshire] state's new GOP House speaker declaring students 'foolish' because they are 'liberal' and 'just vote their feelings.' The sponsor of the measure went further in his denunciations of college students, declaring that they turn out in college towns on Election Day and cancel out other voters, motivated by a 'dearth of experience and a plethora of the easy self-confidence that only ignorance and inexperience can produce.'"

—— Excerpt from a March 10, 2011 Washington Post article on New Hampshire's GOP House Speaker William O'Brien who wants to pass a law in which out-of-state college students will have to vote in their own state, instead of New Hampshire. This man is a hero!

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DACs Remote Unit (DRU) and Customer Network Controller

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DACS Remote Unit (DRU)

The economic benefits and networking flexibility offered by DACS have been well demonstrated during more than half a decade of use in the field. AT&T has now developed a small sized, reduced cost version to extend these benefits to smaller offices. The DACS Remote Unit (DRU) goes far in giving such offices the capabilities needed to operate as small service nodes in digital networks.

Each DRU homes on a host DACS that provides operations support including:

- Equipment maintenance
- Facility maintenance
- Provisioning
- Test access
- Memory backup

One of the principal benefits offered by the DACS Remote Unit is that it can be put into service at low start-up cost and low risk. The DRU has a capacity of 31 digroups—about one fourth that of a full DACS. The DRU provides the same DS1 and DSIC interfaces as the regular DACS, offers programmable facility formats, and performs digital signal processing for digital multipoint bridges. The DRU does not provide any subrate cross-connect capability so that DRU signals requiring this function must be sent to a DACS/SRDC for further processing.

The DRU provides an interface for connection to a local TTY terminal that serves as the point for craft interaction with the machine. Figure 35 illustrates the use of DACS Remote Units in a simple DACS/SRDC network architecture.

Note that three separate digital facilities connect each DRU to its host DACS/SRDC. Two are used for communications between the DACS/SRDC and DRU microprocessor systems, one providing backup for the other. The third facility is used to provide test access to the DRU's customer signals, with testing provided by RTS-5A and RMS-D1 from the host DACS.

Economic Benefits

Figure 36 graphically illustrates the reduction in start-up cost that result when the DRU is used in a small office as compared to the cost of using a full-sized DACS machine. It illustrates how the cost advantage per termination increases as utilization of the DRU increases. At 100% utilization (31 digroups), savings per digroup termination are approximately 40%.

Applications

Applications in which DACS Remote Units serve as the hearts of small service node offices are illustrated in Figure 37. In this diagram, each DRU service node connects to a number of end offices, concentrating the traffic from each onto facilities going to other service nodes that can best route them to their distant destinations.

![Graph showing price per termination for different system capacities](image-url)
The end office at the right is similar to the one on the left but has enough additional data to justify use of a D4 DDB Subrate Multiplexer to increase transmission efficiency. Note that each DRU homes on a DACS or DACS/SRDC in the large service node.

**Physical Layout**

The DRU is a 25¾" wide x 32" high unit mounted in a standard 22¾" wide ESS Switch Common Single Bay Framework. The physical arrangement of the DRU is shown in Figure 38. Each of the DRU's 32 Network Processing Circuits (NPC) accommodates a single digroup, except that one is dedicated to providing test access. The small size, low cost and extraordinary networking capabilities of the DACS Remote Unit can give your smaller offices many of the economic benefits of a DACS service node office.

**Customer Network Controller**

The Customer Network Controller, Issue 2, is a software package that operates on an AT&T 382/400 super microcomputer. Access to the controller allows your customers to directly access and control the DACS cross-connecting operations for their own data and voice channels over dedicated leased lines. Using an asynchronous terminal or PC, customers can remotely reconfigure their networks at will, allowing them to integrate their voice and data networks and share facilities for different applications on a timely basis to increase their network utilization at the lowest cost.

These and other unique applications of the Customer Network Controller help position your company as a full-service supplier responsive to the needs of your customers. They provide many new revenue-producing opportunities. The 382/400 has a maximum of 46 ports which are used to connect customer and Telco terminals to DACS. This gives the Telcos the ability to support multiple customers and DACS with one system. A simplified diagram of the Customer Network Controller's application as a network element is shown in Figure 39.

Other applications of the Customer Network Controller are:
- Sharing network lines and applications among a number of separate locations
- Provide shared access to vendors of computer services
- Provide switched access to backup files for data center disaster recovery
- Routing around outages in customer data networks
- Provide flexible access to inter-exchange carriers

---

**Figure 37 – DRU Applications**

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**Figure 38 – DRU Physical Layout**
DACS REMOTE UNIT (DRU) AND CUSTOMER NETWORK CONTROLLER

Figure 40 illustrates the use of the Customer Network Controller by a customer with four business locations in a city. Using an access line from his principal location, the customer can reconfigure his network by changing the routing of his data channels either on a real time or scheduled basis.

An example of the way the capacity of the Customer Network Controller can be shared among multiple users is illustrated in Figure 41. Here, a multi-location business customer is sharing the user port capacity of a Customer Network Controller with a computer services vendor (upper right). The Customer Network Controller-DACS partnership provides the flexibility to accommodate the needs of each user.

The ease of access to the DACS cross-connect capability through the Customer Network Controller provides numerous opportunities for entrepreneurs. Figure 42 illustrates one such entrepreneurial application where an independent company has established a Computer Disaster Recovery Service. The service provides for electronic storage of its customer’s programs, data base, and current operations in a separate computer maintained at a safe recovery site.

In the event of a disastrous loss of the data base or operating programs at any of its customer’s branch locations at the left, the Disaster Recovery Service immediately activates its entry port on the Customer Network Controller to initiate a DACS cross-connect that feeds the customer’s stored data base etc. from the recovery site to the failed computer. This reboots the system with practically no loss of data and very little loss of operating time. Many businesses cannot tolerate even small outages of their data networks so Computer

Figure 39—Customer Network Controller

Figure 40—Customer Network Controller - Reconfiguration of Private Networks

Figure 41—Customer Network Controller - Shared Services
Disaster Recovery Services have become a new and thriving business. The possibilities for new services are almost endless and the entrepreneurs will find them.

**How the Customer Network Controller Benefits Telephone Companies**
- Provides new revenue opportunities
- Provides a counterattack against bypass
- Improves Telco competitive position through the application of high technology
- Improves ability of Telcos to respond quickly to complex customer networking requirements with truly innovative solutions
- Reduces Telco provisioning expenses

**How the Customer Network Controller Benefits End-Users**
- Provides wideband digital networking capability to business customers (i.e. DS1/DS0 cross-connections)
- Permits integration of end-user's voice and data signals within a common private line network
- Gives end-users flexible control of their own networks to a degree never before available
- Lets the end-user rearrange his network rapidly and at will
- Lets end-users reconfigure their networks for maximum cost-effectiveness

In an earlier section, the new Subrate Data Cross-connection capability of the DACS/SRDC machine was described and in this section, the capabilities of the DACS Remote Unit and Customer Network Controller have been discussed. As adjuncts to the new D4 DDB-based DigiPLUS architecture, these equipment units round out the network and customer control capabilities needed to meet current and future requirements for information transport between business locations.

Together, DACS/SRDC, DRU and the Customer Network Controller:
- Are valuable building blocks for the total DigiPLUS capability
- Provide low cost, flexible arrangements that can be tailored to your current needs and grow gracefully into the ubiquitous DigiPLUS network
- Offer substantial operational savings through built-in remote control, administrative and maintenance capabilities
- Efficiently support both analog and digital services
- Encourage new Telco tariffed offerings and new entrepreneurial applications
# REMOTE MEASUREMENT SYSTEM-D1/DIGITEST

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High-Tech System Meets Current and Future Needs

A universal state-of-the-art digital telecommunications network such as DigiPLUS requires an equally sophisticated technology for measuring and verifying its transmission quality. This ensures that the network is actually performing in accordance with its specifications. That is precisely the function of AT&T's new operations systems, Remote Measurement System-D (RMS-D) and DIGITEST. They are designed to serve as a complete high-tech digital test facility for all measurements of DigiPLUS network signals.

Remote Test System 5A (RTS-5A) is the most technically advanced in use today but it is essentially an analog-based system. Enhancement of its capabilities by the addition of one or two DDS test ports has adopted its technology to digital testing. The current system is capable of performing a wide variety of measurements on digital signals. It gains access to customer signals through the Switched Maintenance Access System (SMAS).

With today's rapid shift to digital technology in trunking, special services and even the loop, there is a tendency to merge the test requirements for these various elements of the telecommunications plant. This encourages migration toward a common digital technology base for a universal test system. Such a system should apply state-of-the-art standards of excellence to measurements made anywhere in the network and be capable of integrated test access by virtue of its inherent synergism with digital equipment. It should also integrate well with the existing SARTS environment and test procedures. The AT&T Bell Laboratories-developed Remote Measurement System-D meets these objectives both in the accuracy of its measurements and its integrated test access via DACS, DRU and DACS/SDRC.

Objectives

The aim of the RMS-D program was to develop a state-of-the-art total measurement family that would:
- Enhance the measurement capability for new and existing digital services
- Provide a common digital technology base for testing loops, trunks and special services
- Provide greatly increased reliability
- Provide higher accuracy
- Provide lower cost
- Provide economical integrated test access to digital network systems

Advanced Modular Design

The RMS-D is a modular test system consisting of a single System Controller and from one to three Digital Test Units (DTUs). Figure 43 illustrates its makeup.

The System Controller is a desk top size 3B2/400 minicomputer that controls all functions of the RMS-D. The DTUs perform the actual measurements involved in testing a circuit, and each can be modularly grown to support up to twelve simultaneous tests. The basic building blocks of the DTUs are their test ports used for digital and voiceband testing. The System Controller and DTUs can be economically shared by many simultaneous testers. Figure 43 illustrates the system architecture. Note that it uses standard X.25 protocol and DS1 interfaces. Its System Controller is capable of working with several types of external Central Controllers such as DIGITEST, SARTS 2PC etc. While the System Controller might be located in a minicomputer Maintenance Operations Center, the DTUs may be installed in Central Offices. Each element of the RMS-D can be remoted from all other RMS-D elements, allowing the system to be modularly deployed in the most economical way in the locations where testing is needed.

Figure 43—Remote Measurement System (RMS) Advanced Modular Design
REMOTE MEASUREMENT SYSTEM-D1/DIGITEST

The Digital Test Units are strategically located where they can be easily shared among many central offices via DS1 links. The DTUs can be added one at a time as needed, making the RMS-D a modular system. Each DTU contains 12 test ports which can be equipped one at a time with either a digital or voiceband test port card. The DTUs can be used simultaneously, permitting a maximum of 36 tests at a time when all three are provided. Up to 26 test cards can be accommodated in a DTU but only 12 can be simultaneously active.

The RMS-D is compatible with DACS, DACS/SRDC and DRU machines for test access and signal measurements. On the switching side, RMS-D is compatible with both the 4ESS Switch and the SESS Switch. The capability of the same RMS-D hardware to work in both the switching and transmission worlds is a fundamental feature of the system. The RMS-D components are software configurable allowing the same hardware to take on many testing flavors. This feature allows the system to be easily upgraded when, for example, additional tests are needed for new services.

Features
- Low cost, modular deployment
- 1 to 36 simultaneous testers
- Standard X.25 interface
- Standard DS1 interface
- Uses digital measurement technology
- Can be configured via its software
- Complete transmission and signaling capability
- Provides channel status and diagnostics
- Comprehensive self-test and diagnostic package
- High reliability

RMS-D1 Digital Test Access

Two methods of test access, basic and concentrated, are employed by the RMS-D1 and DACS. Figure 44 illustrates the basic method by which RMS-D gains test access to circuits terminated on a DACS or DACS/SRDC. Access requests come from testers through the central controllers of their test system (SARTS, DIGITEST, etc.). They pass through the centralized RMS-D1 System Controller which requests the required test access path and DTU test ports via its digital links. In this way, the circuits on the DACS frame that terminates the test access digroup can be tested by the RMS-D1.

Test Access Concentration

In addition to the basic method of test access described above, there is also the economical approach that uses test access...
concentration. When DACS frames at different locations are interconnected by a DSI facility, several time slots in the facility can be dedicated to testing purposes for each DACS. By funneling all accessed circuits from a number of DACS/SRDGs to a common centralized DTU for testing, a large savings in individual central office test equipment is realized. This is illustrated in Figure 45.

Test access concentration makes maximum use of the test ports on each DTU by associating them with the largest available circuit base. The DACS frames in the network are used to concentrate the circuit load onto the minimum number of test resources by using the basic DACS cross-connect features. Digroups from remote offices bring in a few time slots of testing traffic to the concentrating DACS where the time slots are combined on demand and directed to the DTUs. The majority of the time slots on the digroups running out to the remote offices carry standard special service traffic so that testing costs in those offices consist only of the cost of the few time slots employed for testing. The deployment of DTUs and System Controllers can be custom fit to each network of DACS frames to provide testing from the smallest number of test ports for maximum economy. Contact your RMS-DI Account Representative for information and tools to assist you in sizing an RMS-DI for your network.

Economic Advantages of RMS-D Test Access Concentration

- Centrally located RMS-D measurement system is more cost-effective than using per-office test equipment
- Makes more efficient use of the measurement resources
- Reduces overall equipment installation and maintenance expenses

DIGITEST—Control System for RMS-D

As SARTS is the supporting control system through which craft personnel direct the Switched Maintenance Access System and Remote Test System-5A, so is DIGITEST the supporting system through which craft personnel initially direct testing with Remote Measurement System-D1. It provides a System Controller through which a single work station terminal can access both SARTS/RTS-5A and DIGITEST/RMS-D1. Thus, DIGITEST is compatible with existing testing technology while also providing complete control of the new testing technology. It meets the immediate demands for enhanced digital testing from a "SARTS"-type screen while paving the way for the eventual SARTS capabilities that will envelop those of DIGITEST.

To fully appreciate the advantages of RMS-D/DIGITEST, it will be helpful to recall the traditional DDS test arrangement as shown in Figure 46. This figure illustrates the differences between the test methods employed today at DDS end offices and those employed at large hub offices.

In the end office, metallic tests are made on the loop and DDS signals are tested at the DS0A level by the DDS-5A (equipped with the DDS enhancement feature). These tests are conducted under the control of a SARTS tester in a distant Special Service Center. The DDS hub office, however, with many more DDS circuits, is configured to take advantage of the reduced test times offered by AT&T-C's automated ABATS and LATs test systems. Their use is available to Telcos through contracts with AT&T-C.

Figure 46—Traditional DDS Test Arrangement
Figure 47 shows essentially the same end and hub offices as they might appear when modernized into small and large service nodes in a DigiPLUS-type network. The small service node has been expanded by the addition of a D4 DDB and a D4 Channel Bank with DSO Dataports. These are compatible with the existing SMAS/RTS-5A test facilities and require minimum investment. Both metallic loop and DS0A tests can be conducted. Note a significant difference, however, in the method of control. Control resides in terminals interfaced with the RMS-D1/DIGITEST and SARTS systems through which the operator can conduct tests on both.

In the large service node, all of the traditional DDS equipment has been replaced and the test connections to AT&T's ABATS and LABTS have been eliminated by the addition of a DACS/SRDC and RMS-D1/DIGITEST. Basic functions are the same as before except that they are now performed through local or remote terminals. Also included are additional capabilities such as secondary channel and customer network control. Space and cable savings are evident.

An overview of the DACS/SRDC and RMS-D1/DIGITEST capabilities is given in the highlights listed below:

- Provides immediate response to changing customer needs
- Accurate testing for digital DDS and Diginet type services
- Mechanizes hub operation
- Integrates with existing SARTS environment and its human interface
- Provides single terminal access to both SARTS and DIGITEST

The test capabilities of the RMS-D1/DIGITEST combination are extensive and include some enhancements not generally available before. The capabilities are outlined below:

- Circuit access via DACS/SRDC and DACS
- Traffic analysis monitor when
used with DACS. This feature monitors and analyzes 400 bytes of a customer's data traffic before deciding whether to interrupt and test the circuit.
- Provides D51 Alarm and Performance status
- Carries out error performance measurements using both standard pseudo-random test words and user-defined test words which may be needed to detect unique types of malfunctions
- Provides a loopback macro
- Performs directed loopback tests using existing non-latching loopback devices and new latching loopback devices. The latter includes an option to not terminate the loopback until the tester has released the latch
- Provides electronic control of all MJU functions
- RMS-D1/DIGITEST includes many operational features which not only reduce and simplify the craft functions required, but also provide some new and unique capabilities that will assume importance in the new information environment:
  - Multi-user system
  - Makes long term tests to permit analysis of chronic, but nonpointable faults. Also permits pre-service tests
  - Performs foreground/background testing
  - Provides a tester log which allows printed records if desired
  
All of the above features are part of RMS-D1/DIGITEST in its first release. The second release of RMS-D1 will be utilized by the SARTS controller to provide full voice and voiceband data testing capabilities in addition to the digital testing provided with DIGITEST.

**RMS-D1/DIGITEST Configuration**

The RMS-D1/DIGITEST system can be configured to the needs of any digital data services testing environment from small service nodes, to intermediate nodes handling digital data only, to large and small multi-use, multiple center service nodes. The possible DIGITEST configurations are highlighted in Figure 48.

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**Figure 48 – RMS-D1/DIGITEST Configurations**

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A more detailed view of the testing environment can be obtained by looking at the possible test system configurations for the different types of service nodes involved. Figure 49, for example, shows the typical makeup of a small service node office.

This configuration permits a small service node to be established at an existing end office by the addition of a D4 DDB and a D4 with DS0 Dataports. It requires a relatively small additional investment for testing since effective use is made of the existing RTS-5A for DDS testing. Existing digital hubs can be modernized into intermediate or large service nodes by the addition of RMS-D1 and DACS/SRDC units. This is illustrated in Figure 50.

The capacity advantage of the RMS-D1 over the RTS-5A is illustrated in Figure 51. Note that even with 3000 or more digital serving links, the RMS-D1 (with up to 36 test ports) can be configured for 5% or less blocking and minimal testing delays, while the RTS-5A (which can support a maximum of two DDS enhancement ports) begins to block significantly with only about 700 serving links and reaches 45% blockage with less than 1900.

For the implementation of a large multi-use service node, a two-step conversion for existing hubs is recommended. The first phase would see the addition of RMS-D1/DIGITIZE facilities to test the digital services, with the RTS-5A continuing to test voiceband services. It would also shift control of the SARTS 2PC and the RMS-D1 to common work terminals. This phase is illustrated at the left of Figure 52.

The next step in RMS-D1 testing will employ SARTS 2PC3B and RMS-D1 for voice and voiceband data testing in conjunction with DIGITIZE testing of digital data circuits. This phase is shown at the right of Figure 52. This frees RTS-5A capacity for non-DACS applications.

The last phase would see the complete SARTS 2PC3C takeover of the DDS testing capability combined with the full voice and voiceband testing capability, all from the RMS-D1.
Figure 53 compares the operations of a small multi-use service node as presently constituted with that of a digital data service node with RMS-D1/DIGITEST. As indicated on the diagrams, the present structure requires more interface equipment. Two terminals to individually control the RTS-SA and the DACS/SRDC, and additional training to handle both. In comparison, the DIGITEST configuration requires only single terminal operation, provides simplified operation and requires fewer commands to achieve circuit access.
**Remote Measurement System-D1/Digitest**

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Figure 55 – RMS-D1 Applications-Circuit Access Via DACS, DRU, DACS/SRDC
# DigiPLUS NETWORK ARCHITECTURE

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AT&T DigiPLUS Planning Guide – Part 2

DigiPLUS NETWORK ARCHITECTURE

In this section, we will describe the evolution from today’s Digital Data System to the new DigiPLUS network architecture. Using an interim overlay “Digitnet” network to ease the transition. The end result, a multiple hubbed architecture called “Digitnet,” will support all digital data point-to-point and multipoint services for intra-LATA customers.

**DDS**
As mentioned earlier, the Digital Data System is a digital overlay on the analog network. The present architecture for the DDS serving arrangement is illustrated in Figure 56. In general, the designated Digital Serving Areas (DSA) encompass major metropolitan areas, with service extending outward from each DDS end-office to its maximum repeatered loop length at 56 kb/s. Each DSA contains a hub office to which all circuits, both intra-LATA and inter-LATA, are routed for testing, cross-connecting to outgoing lines, digital processing by MJUs for multipoint service and to provide the transmission efficiencies that hubbing affords. These include reduced margin requirements, increased facility fills and robustness to the uncertainties of forecast demand. With this serving arrangement, however, much of each LATA remains outside the DSA areas and does not offer Dataphone Digital Service.

**Digitnet**
To provide full intra-LATA digital data services to all areas of the LATA and extend Dataphone Digital service to LATA areas outside the DSAs, a new network architecture called “Digitnet” has been developed with the following characteristics:

- For intra-LATA digital data services

---

Figure 56 – DDS Serving Arrangement - Present Architecture

Figure 57 – Possible Digitnet Serving Arrangement - Present Architecture
- Single circuit per DS0 channel
- Separate overlay network on DDS
- Economical in low demand areas
- Testing performed at service nodes
- Multipoint processing performed externally at DACS service node
- Hubbed architecture advantages

A possible Diginet serving arrangement is shown in Figure 57. Note that end-offices in the existing DSA may be hubbed to service nodes in the LATA area outside the DSA. This joins the two areas and extends synchronous timing to the entire LATA.

**Diginet Hubbing**

The concept of hubbing evolved from efforts to reduce the costs of special services. This concept, depicted in Figure 58, is an essential part of the Diginet architecture and contributes a number of benefits:

- Is an economical solution for providing service in areas where forecast demand is uncertain and high churn conditions prevail
- Increases the fill of facilities
- Reduces facility margin requirements
- Provides centralized control of the hub when equipped with DACS/SRDC

**Figure 58 – Special Services Hubbing Concept**

**Hub Extensions with DRUs**

The DACS Remote Unit provides an ideal vehicle for bringing the DS0 cross-connect functions of a DACS/SRDC hub to Diginet end-offices selected to serve as hub extensions. Their use in this application is illustrated in Figure 59. The hubbing feature is evident. Subrate cross-connections would still be made at the DACS/SRDC hub. The digital data network architecture now consists of the DDS plus its Diginet overlay.

**Figure 59 – Hub Extension with DACS Remote Unit (DRU)**
DigiPLUS NETWORK ARCHITECTURE

DigiPLUS

DigiPLUS is the culmination of the evolution from DDS with Diginet overlay to the realization of a flexible and economical network capable of supporting all digital data services within a LATA. Figure 60 illustrates the concept. Service nodes are distributed at selected points throughout the LATA. Some offices are selected to become large service nodes, others to become small service nodes. The most economical network configuration can be determined with the help of an AT&T network planning tool called "SUBCAP"—SUBrate Configuration Analysis Program.

Figure 60—DigiPLUS Architecture

LATA

Figure 61—LATA Configuration
SUBCAP
- Determines the most economical network configuration.
- Determines the most economical office equipment configuration.
- Provides Present Worth of first cost for facility and equipment.
- Lists demand routing.
- Simplifies input data requirements.
- Schedules equipment and facility installation.
- Portable to any UNIX™ System.

The major differences between the DDS-Diginet network architecture and that of DigIPLUS are discernable primarily in the make-up and capabilities of the end-offices, small and large service nodes, the use of D4 DDBs, and extended service nodes. To illustrate the rationale behind DigIPLUS planning, we will use a section of a hypothetical LATA to describe the recommended office configurations within its boundaries. Our hypothetical LATA is shown in Figure 61 and includes a large service node, a small service node, and an extended service node.

**DACS/SRDC, Large Service Node**

Details of the large service node are shown in Figure 62. It includes a DACS/SRDC for hubbing, cross-connect, customer control and secondary channel capabilities and a Point-Of-Intercept (POI) where inter-LATA signals are connected to Inter-Exchange Carriers. A D4 DDB and a D4/D5 Channel Bank provide substrate multiplexing and multiplexing to the DS1 level to efficiently load the local data traffic onto the DACS/SRDC. Testing is performed by RMS-D/DIGITEST using the DACS/SRDC for test access.

**End-Office: Large Service Node**

Figure 63 shows the configurations of several typical end-offices hubbed to the large service node described above. One type is equipped with a D4 DDB (probably SRIIX) connected back-to-back with a D4/D5 Channel Bank. A second type provides digital data service through D4/D5 Channel Banks with Dataports. These are generally the two basic options for equipping end offices. The SRDC provides the Dataport error correction function. Testing is performed at the large service node by RMS-D/DIGITEST with test access being provided by the DACS/SRDC.

---

*Figure 62 – DACS/SRDC: Large Service Node*

*Figure 63 – End Office: Large Service Node*
DigiPLUS NETWORK ARCHITECTURE

Back-to-Back D4 & D4 DDB:
Small Service Node
The configuration of a typical small service node is shown in Figure 64. A DACS/SRDC cannot be economically justified here. This service node uses a D4 DDB back-to-back with a D4/D5 Channel Bank to provide substrate multiplexing and multipoint functions. Test access is provided by SMAS for SARTS/RTS-SA testing.

End-Office: Small Service Node
Hubbed to the small service node office of Figure 65 are several end-ofices with the same basic configurations as those hubbed to large service nodes. Testing is performed at the small service node by SARTS/RTS-SA.

Figure 64—Back-To-Back D4 & D4 DDB: Small Service Node

Figure 65—End Office: Small Service Node
DRU: Extended Service Node
Sharing the use of a DACS Remote Unit to provide digital data DS0 cross-connections at a small office is illustrated in Figure 66. It offers an opportunity to use the office as an extended service node in the DigiPLUS network at incremental cost. Testing is performed by RMS-D/DIGITEST at the large service node to which the office is hubbed.

End-Office
Extended Service Node
As shown in Figure 67, end-offices hubbing on an extended service node are configured according to the two basic options described earlier: Subrate multiplexing is provided where justified.

Figure 66–DRU: Extended Service Node

Figure 67–End Office: Extended Service Node
### DigiPLUS NETWORK ARCHITECTURE

**RMS-D Hubbing**

Figure 68 illustrates how the test access digroup lines and RMS-D1/DIGITEST control links for small and extended service nodes can also be hubbed on a large service node to share the testing capacity of its RMS-D1/DIGITEST interface. Test access hubbing allows efficient use of transmission facilities and eliminates the need to provide test access at the hubbed offices. The digroups that provide test access in this hubbing arrangement can also be used for standard private line traffic.

**Centralized Operations, Administration and Maintenance (OA&M)**

A basic feature of the DigiPLUS architecture with DACS, DRUs and DACS/SRDC is that it allows a single point to be established within the network from which all service nodes within the jurisdiction can be administered. The use of centralized operations, administration and maintenance allows maximum efficiency in the use of skilled craft personnel and reduces costs significantly. This centralization of OA&M is illustrated in Figure 69.
Customer Network Control

AT&T's Customer Network Controller offers businesses the ability to control and reconfigure their own networks at will and fosters the perception of the telephone company as being responsive to the needs of its customers. It is a feature that businesses want because it allows them to utilize their networks in the way they deem most efficient and least expensive. For the telephone company, it provides many opportunities for new services and revenues.

Figure 70 shows how the port capacity of the Customer Network Controller can be shared between service nodes. With the DigiPLUS architecture, the DACS/SRDC can be shared between analog and digital services. The SRDC allows access to subrate signals for integration with analog circuits. There is no further need for an overlay digital network.

Analog & Digital Shared Services

The DigiPLUS network architecture is designed to enable shared use by analog and digital private line services. It does not require existing analog facilities to be discarded but positions them well for possible future upgrading to digital. Figure 71 illustrates how the DigiPLUS architecture is used in the LATA to provide shared analog and digital services.

Summary – DigiPLUS Network Architecture

The DigiPLUS network architecture gives telephone companies the design for a flexible and economical network which is capable of providing all digital data services throughout a LATA and of being shared with analog services. It uses D4/D5 Channel Banks, D4 Digital Data Banks, DACS, DRUs, DACS/SRDC, SDEs and Customer Network Controllers to provide unsurpassed versatility. Below are the main features of the DigiPLUS network architecture:

- Uses AT&T equipment
- Supports analog and digital services
- Allows centralized control of OA&M and customer control of their own networks
- Provides new service and revenue opportunities
## NETWORK DEPLOYMENT STRATEGIES

- Data Service Trends ................................................................. 59
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A number of factors must be considered when trying to settle on a specific network configuration. Market trends must be studied in order to provide configurations that are able to accommodate future as well as current needs. Cost, of course, is always a primary consideration. For this, economic comparisons of alternate configurations must be made, taking into account the advantages of each and their ability to be expanded gracefully. The benefits of subrate multiplexing in various service nodes must be weighed and the advantages of multiple hubbing must be evaluated. These factors are considered below.

**Data Service Trends**

The basic data used in our market analysis is shown in Figure 72. It shows that the 9.6 kb/s rate is the most commonly used, representing 45% of the market. This is followed by 4.8 kb/s representing 30% of the demand, then 56 kb/s with 15%, and finally by 2.4 kb/s with 10%. Over 46% of the 2.4 kb/s signals use multipoint service, almost 40% of the 4.8 kb/s signals and about 9% of the 9.6 kb/s signals. Multipoint traffic is increasing at a more rapid pace than other types of data traffic. The ease with which this service is provided in the DigiPLUS architecture increases the benefits of this type of network configuration.

We made some assumptions based on experience for purposes of economic comparisons. These included an assumed facility cost of $480 per DS1 mile. Total loop traffic represents 40% of the data traffic, and end-to-end data-point circuits represent 15%.

**Cost Comparisons of Traditional DDS Equipment vs. D4 DDB**

Figure 73 compares the per-channel cost of various DDS functions when performed by traditional DDS central office equipment.
and when performed by a D4 DDB. Each comparison is made for a given number of substrate channels. The percent saved will vary with the number of channels. The example shown is representative for each equipment type. The three DS6A functions at the left show approximately a 50% saving with D4 DDBs.

The MJU function in the middle shows about a 30% saving with D4 DDB. The DS6B multiplexing function on the right shows about a 55% saving for D4 DDB over the T1DM and about a 65% saving for D4 DDB over the T1WB5. The comparisons are summed up in the chart below.

**Figure 74 – DACS/SRDC - Prove-In vs. Traditional DDS Equipment**

**Prove-in of DACS/SRDC vs. Traditional DDS Equipment**

In Figure 74, the difference in costs between DACS/SRDC and traditional DDS equipment (see Figures 26, 27) when configured to accommodate different numbers of stations have been converted to Percent Savings. This

**Figure 75 – Service Node Equipment Comparison: 3000 Station Service Node with 20% Loops**
more graphically highlights the differences.

The graph shows that traditional DDS equipment is more cost effective than the DACS/SRDC for small hubs of less than about 250 stations. Above this number, the DACS/SRDC machine rapidly proves in over the DDS equipment and provides increasingly significant savings as the hub size increases. Savings approach a maximum of about 50% when the number of stations on the DACS/SRDC exceeds approximately 1600.

Space Comparison of 3000 Station Service Node with 20% Loops

Traditional DDS vs. DACS/SRDC

DACS/SRDC: provides a dramatic saving in space over the use of traditional DDS equipment bays. As Figure 75 shows, it requires only 15 to 20 feet of 7-foot DACS/SRDC bays to duplicate the functions and capacities of 45 to 60 feet of 11½" bays of the traditional DDS equipment required for a 3000-station hub with 20% loops. The benefits of DACS/SRDC over traditional DDS equipment are summarized below:

- Capital cost savings
- Greater flexibility and responsiveness to customer requirements
- Integrated test access reduces testing investment
- Provides remote automated operations
- Permits new customer control service offerings
- Provides additional facility monitoring that speeds trouble sectionalization
- Provides significant space savings

Cost Comparison of DACS/SRDC vs. D4 DDB for Different Sized Service Nodes

Earlier, it was shown how DACS/SRDC proves in against traditional DDS central office equipment for service nodes with more than about 250 stations. In Figure 76, we compare DACS/SRDC with the D4 DDB. The break-even point above which the DACS/SRDC is more economical is shown at about 600 stations but actually fluctuates between 450 and 650

<table>
<thead>
<tr>
<th>DACS/SRDC</th>
<th>D4 Digital Data Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economical for large installations</td>
<td></td>
</tr>
<tr>
<td>Internal Multipoint circuit realization</td>
<td></td>
</tr>
<tr>
<td>Shared use with analog services</td>
<td></td>
</tr>
<tr>
<td>New customer control service offering</td>
<td></td>
</tr>
<tr>
<td>Increased flexibility</td>
<td></td>
</tr>
<tr>
<td>Integrated test access</td>
<td></td>
</tr>
<tr>
<td>Additional facility monitoring</td>
<td></td>
</tr>
<tr>
<td>Low start-up cost makes it economical for small installations</td>
<td></td>
</tr>
<tr>
<td>Uses widely available D4 equipment with only three new plug-ins</td>
<td></td>
</tr>
</tbody>
</table>

Figure 76 – DACS/SRDC vs. D4 DDB - Office Equipment Comparison
using a variety of statistical mixes. With numbers below these figures, the D4 DDB is clearly the more economical configuration reflecting the relatively high startup costs of the specialized DDS equipment bays which are required even when only a few customers are to be served.

**Cost Comparison of DACS/SRDC vs. D4 DDB for Multipoint Service**

Figure 77 compares the cost of DACS/SRDC vs. the cost of D4 Digital Data Banks in a hub office based on the demand for multipoint service. It shows that in the given example with multipoint demands amounting to less than 25% of all circuits, the D4 DDB MJU is less expensive but that at multipoint demands greater than this the DACS/SRDC is more economical.

The results of the comparisons between the DACS/SRDC and D4 DDB control office equipment are summarized below:

- D4 DDB technology vs. traditional DDS equipment shows that the D4 technology offers a more flexible office arrangement and provides more features, yet proves in on an economic basis
- D4 DDB has low start-up costs and is the most economical alternative for smaller applications
- DACS/SRDC is the most economical alternative for larger applications
- DACS/SRDC provides added flexibility that supports customer reconfiguration control and remote automated operations

**Deployment Strategy**

We are now in a position to determine the most cost-effective hub arrangements based on the number of stations to be served and the average distance between the service node and its end-offices. The latter takes into account the transmission costs for given numbers of station signals and the economic advantage of providing subrate multiplexing vs. the use of a full 64 kb/s DS0 channel for each subrate signal. The area in which each configuration is most economical is shown in Figure 78.

The hub arrangements used in the various comparisons are shown to the right.

---

![Figure 77 - Office Equipment Comparison - Cost Based on Multipoint Demand](image-url)
HUB DEPLOYMENT

D4-DDB vs. DATAPORT
TOTAL NUMBER OF STATIONS SERVED BY HUB

DACS vs. D4-DDB
TOTAL NUMBER OF STATIONS SERVED BY HUB

DACS/SRDG vs. DACS
TOTAL NUMBER OF STATIONS SERVED BY HUB

Figure 78—Hub Arrangements

Recommended Hub Configurations

The data contained in Figure 78 are consolidated into the composite domain graph of Figure 79 that shows the areas in which each hub configuration is most economical.

From the composite domain graph, the following conclusions can be drawn:

- DACS/SRDG is the best hub arrangement when the number of stations to be served is relatively large (600 or more) and the average distance to the end-offices is greater than approximately 3.5 miles.
- For fairly large number of stations (450-750) and short end-office distances, there is no economic advantage to subrate multiplexing and DACS prevails over DACS/SRDG.
- For smaller numbers of stations, the D4 DDB provides the most economical hub arrangement regardless of the distance to its end-offices.
- With very small numbers of stations to be served, end-to-end Dataport service is least expensive.

Recommended End-Office Configurations

The results of the end-office comparison made earlier are shown in composite form in Figure 80. This graph shows the areas in which the subrate multiplexing performed by the D4 DDB is economically advantageous compared to Dataport service. It shows that Dataport service is more economical at short distances up to 3 miles and when the number of stations is small (20 or less).

The economic advantage of the D4 DDB's subrate multiplexing is maximum at distances greater than 3 miles when the number

of stations is large, and continues to long distances as long as the number of stations is significantly greater than 20. The D4 DDB is always the most economical choice if the number of stations exceeds about 20.

Conclusions
We have considered the economic factors that have a bearing on the selection of optimum hub office and end-office configurations for various numbers of data stations and distances in the DigiPLUS-type network. Other factors should also be considered. How much is network flexibility worth? Remote automated operations? Reduced OA&M costs? How much is it worth to have a network which is ideally positioned for graceful evolution to future services? DigiPLUS is a positive step in this direction—a step that increases your revenues while decreasing your costs. These factors provide intangible benefits which are difficult to evaluate but which should be taken into consideration. Following are some of the conclusions made from our study:

- Optimization of a network is largely dependent upon the demand characteristics and networking philosophy of the telephone company
- DACS/SRDC presents the most economical alternative for equipping medium and large service nodes
- DDB technology is the most economical alternative for small applications
- Multiple hubbing with DACS/SRDC and D4 DDB technology provides an integrated network
- Subrate multiplexing in end-offices provides significant economic benefits in all but the smallest applications
All of the elements comprising the DigiPLUS network architecture have now been described, their interactions explained, their benefits expounded. The D4 Digital Data Banks, the DACS/SRDCs and DRUs, the D4 and D5 Channel Banks, and the SDEs work together to support all of the private line digital and analog data services in a LATA. Point-to-point and multipoint services are included. Extensive hubbing and integrated testing are features of the architecture. Operation support is integrated as well.

It has been shown in these pages how DigiPLUS service nodes can be realized with DACS, DACS/SRDC or with D4 DDBs operating back-to-back with D4 Channel Banks. The architecture provides the advantage of centralized control to minimize operating costs. It provides opportunities for new services such as customer network control and for new revenues. DigiPLUS—a single unified network for all intra-LATA private line data services—is the logical path to the Integrated Services Digital Network and Universal Information Services.
Bipolar with 8 Zero Substitution (B8ZS). This is a variant of bipolar transmission in which 7 or fewer consecutive zeros are transmitted unchanged. Eight consecutive zeros are replaced by a specific code group containing complementary violations of the bipolar constraint which are removed at the receiver.

Dual DS3 Multiplexer 1000 (DDM-1000). A single-shelf digital multiplexer that accepts up to 56 DS1, 28 DS1C, 14 DS2 or 2 DS3 (or mixes) electrical signals and multiplexes them to and from the DS3 electrical level or 90 Mb/s optical level.

Digitnet. A hubbed digital overlay network on the Digital Data System designated to provide complete intra-LATA digital data services and extend Dataphone Digital Service to all areas of a LATA on an interim basis prior to implementation of a DigiPLUS-type network.

Digital Multiplex Interface (DKI). (23 B plus D) provides a 24 B plus the arrangement where all the control information is translated over the 24th channel and provides the 64 kilobit clear channel capability.

Extended Framing Format (EF). A framing format for DS1 or T1 Carrier signals that provides a 2 kb/s channel for signaling and frame information. When used in conjunction with B8ZS line coding, EF provides 64 kb/s clear channel capability (64 CCC).

Integrated Services Digital Network (ISDN). A CCITT-recommended network architecture with end-to-end digital connectivity designed to support a wide variety of services to which users will have access through a limited number of standard multipurpose customer interfaces.

Multipoint Junction Unit (MJU). Used in multipoint service to branch a customer's control station subrate data signal into 2 to 4 identical outputs for transmission to remote stations not served over the same facility.

Network Terminal Equipment Center/Switching Control Center (NT/SCC). A Switching Control Center supported by 2SCCs where an NT/SCC has been established to assume responsibility for all terminal equipment in the jurisdiction, such as channel banks, MPT, DACS/SRDC and D4 DDSs.

Office Channel Unit (OCU). A per-customer dedicated unit used in DDS offices to interface with the customer's 4-wire loop, byte-stuff the customer's baseband data signal to the 64 kb/s DS0A rate, and apply DDS control bit information.

Subrate Multiplexer (SRM). One of the three functional versions of the D4 Digital Data Bank that multiplexes combinations of low speed DS0A signals to and from the DS0B level.

BCM32000 is a digital transcoder (Bit Compression Multiplexer) that accepts two DS1 signals totalling 48 64 kb/s channels and compresses them by Adaptive Differential Pulse Code Modulation into a single DS1 bit stream of 48 32 kb/s channels without loss of voice (or voiceband data up to 4.8 kb/s) quality.

Clear Channel Capability (CCC). A digital channel, usually 64 kb/s, in which the customer's signal is totally unconstrained as to content or format, or by the number of consecutive zeros it may contain.

CCITT. The Telephone and Telegraph Consultative Committee of the International Telecommunication Union (Comité Consultatif International Télégraphique et Téléphonique)—international telecommunications standards-setting body.

Cadmium Metal Oxide Semiconductor (CMOS). A solid state technology characterized by high switching speed and high stability.

Customer Network Controller. Software package for AT&T's 3B2/400 super microcomputer that allows Telco customers to control the DACS cross-connecting operations for their own data and digital voice channels at will or on a preset schedule.

CUT. Circuit Under Test

Digital Access and Cross-connect System with Subrate Data Cross-connect capability (DACS/SRDC). Provides electronic cross-connections of DS0 (DACS) and DS0A (SRDC) channels from one DS1 or DS1C bit stream to another.

DACS Remote Unit (DAR). A small sized, reduced cost version of DACS for use in small offices. The DAR makes on a host DACS for operations support.

Dataphone Digital Service. A premium digital data transmission service, full duplex, point-to-point or multipoint, at synchronous rates of 2.4, 4.8, 9.6, or 56 kb/s.

Digital Data System (DDS). Synchronized loop, intra-office, inter-office, and long haul facilities, multiplexing, test access and test systems used to provide end-to-end digital transmission for Dataphone Digital Service signals.

Digroup. 24 64 kb/s channels comprising 1.544 Mb/s DS1 or T1 Carrier bit stream.
GLOSSARY

**Switched Access Remote Test System (SARTS).** An Operations System (OS) that accesses the transmission leads of special service circuits in distant offices from a centralized location and enables its testers to remotely perform on those circuits through commands to the Remote Test System-5A in the offices.

**Synchronization Distribution Expander (SDE).** An enhanced unit with 10 output timing signals, expandable 10 additional signals at a time, designed to provide additional timing capacity for DDS offices. It also provides 1:1 protection switching for the T1 DDS timing facility and an improved free running capability that allows it to be used as a master timing supply in a local data network.

**Universal Information Services.** An AT&T vision for the future that will permit users of telecommunications networks to receive any kind of voice, data, or image service in any combination, and with a maximum of convenience and economy.
Overview

Here are some experiments and operational notes for a Furuno Model FR−360 Mark II marine radar from 1984. One major modification was replacing the stock slotted (horizontal) waveguide antenna system with one which gives a larger vertical beamwidth. This will allow the radar to better "see" objects above the horizon (i.e., airplanes). This is fairly easy to do and can be done using an old DirecTV satellite dish and a few pieces of surplus WR−90 hardware.

The first part of this project will just be a general overview. Upcoming articles will cover the radar's operation in a little more detail, plus there will be some fun radar experiments like jamming or homebrew radar stealth ideas. I don't have an operator's manual for this particular Furuno radar, but here are a few of the parameters I was able to measure or gather from other sources.

This radar operates at around 9.41 GHz (+/− 30 MHz) with a peak RF output power of approximately 4 kW from its Toshiba 9M302/E3513 X−band pulse magnetron. The output frequency will shift slightly over time and when switched between long or short pulses.

The local oscillator and mixer module produces a receive IF frequency of around 40 MHz. The receiver circuit uses a µPC595C video IF detector, along with a M5186P video amplifier, to produce the final "blip" on the radar's display. I wasn't able to find datasheets for these ICs.

The radar has a Pulse Repetition Frequency (PRF) of approximately 3,360 Hz (short) and 840 Hz (long). I believe the pulselength of the long pulse is 0.5 µS and the short pulse is 0.08 µS. The maximum (displayed) target range is 36 nautical miles and the minimum range is probably a few hundred feet.

The display unit CRT uses a standard raster scan (plan−position indication). The electron beam of the CRT sweeps from the center of the display towards the edge, then back to the center. In addition, this beam is mechanically rotated around the center of the display. This beam rotating motor is synchronized to the spinning of the antenna rotation motor.

Furuno FR−360 Main Signal Cable Pin−Out

This is the main cable which connects the display unit to the scanner unit. The video signal is taken from a RCA jack on the receiver board and goes to the separate coaxial cable in the inner cable bundle. This is the correct pin−out and wire coloring.

<table>
<thead>
<tr>
<th>Terminal Block</th>
<th>Signal Cable</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin Number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Brown</td>
<td>Brown</td>
<td>Trigger (Transmit)</td>
</tr>
<tr>
<td>2</td>
<td>Red</td>
<td>Red</td>
<td>Gain (IF)</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>Orange</td>
<td>Sea Clutter Control (STC)</td>
</tr>
<tr>
<td>4</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Receive Local Oscillator Tuning</td>
</tr>
<tr>
<td>5</td>
<td>Green</td>
<td>Green</td>
<td>−12 VDC</td>
</tr>
<tr>
<td>6</td>
<td>Blue</td>
<td>Blue</td>
<td>Pulselength Selection (Long or Short)</td>
</tr>
<tr>
<td>7</td>
<td>Purple</td>
<td>Purple</td>
<td>+300 VDC</td>
</tr>
<tr>
<td>12</td>
<td>Shield</td>
<td>Shield</td>
<td>Ground</td>
</tr>
<tr>
<td>14</td>
<td>White</td>
<td>White</td>
<td>Bearing Pulses</td>
</tr>
<tr>
<td>18</td>
<td>Black</td>
<td>Black</td>
<td>Heading Flash</td>
</tr>
</tbody>
</table>
### Incoming Line to Scanner Unit - Main Wire Bundle

<table>
<thead>
<tr>
<th>Terminal Block</th>
<th>Signal Cable</th>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin Number</td>
<td>Wire Color</td>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>8 &amp; 10</td>
<td>Yellow/Black</td>
<td>Magnetron Heater Hot (+) with 1 µF to Ground</td>
<td></td>
</tr>
<tr>
<td>9 &amp; 11</td>
<td>White/Brown</td>
<td>Magnetron Heater Cold (−) with 1 µF to Ground</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Red</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Orange</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Green</td>
<td>+12 VDC</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Blue</td>
<td>Motor (+12V)</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Purple</td>
<td>Motor (−12V)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Black (to Lid)</td>
<td>Ground</td>
<td></td>
</tr>
</tbody>
</table>

Stock Furuno FR−360 main signal cable which connects the scanner unit to the display unit.

Note the two wire bundles and the coaxial cable for the video output. The system uses a common ground between the two shields.

These signal cables are outrageously priced new, but there is really no reason why you can’t make your own.

Just be sure all the wires are well shielded and share a common ground. The video signal can be run via an external piece of RG−6 coax.
Furuno Model FR−360 Mark II scanner unit wiring as I receive it.

Note several wires not properly connected, so use these initial pictures for reference only!

The system shares a common ground with the signal cable’s shield. There are a few ground “jumper” wires, which makes the cabling look messy.

Pin 1 on the terminal block is on the upper−right. Pin 10 is on the lower−right. Pin 11 is on the lower−left. Pin 20 is on the upper−left. Pin 19 was unused.
Alternate view.

There are two 1 \( \mu \text{F}/250\text{V} \) non-polarized capacitors to ground (those gray things) across the magnetron's heater (filament) connections.

The signal cable come up through the bottom of the scanner unit. The signal cable contains two wire bundles and a coaxial cable with a RCA plug for the video signal. The two cable bundles share a common ground via the shield.
Terminal block pins 1 through 10.

Incoming signals from the signal cable are on the bottom connections of the terminal block.
Terminal block pins 11 through 20.

Pins 12, 13, and 20 are a common ground.

Incoming signals from the signal cable are on the bottom connections of the terminal block.
Wire connections to the cover of the scanner unit.

The large black wire is a common ground which connects to pin 20 on the terminal block.
This magnetron’s output frequency is around 9.41 GHz. It uses a standard WR–90 flange and is connected to port 1 on the output circulator.

The Pulse–Forming Network (PFN) is on circuit board to the lower–right. The relay switches between long and short pulses.

The pulse transformer is off to the far–right, labeled RT–3072–1. This converts the +300 VDC on the PFN into an approximate −3.7 kV pulse for the magnetron.
Closeup picture of the pulse magnetron, pulse-forming network, and the pulse transformer.
Alternate view of the pulse-forming network and the pulse transformer.

The **GREEN** wire on the magnetron is for the heater (filament) and the **YELLOW** wire is heater and cathode.
I don't have a schematic for this module, but it contains a variable local oscillator to produce a final IF frequency of around 40 MHz. This module has a +5 VDC to +35 VDC tuning voltage to compensate for slight frequency changes to the magnetron as it ages.

This local oscillator module has a "monitor" output, but I'm not sure what that is used for.

A passive diode limiter, labeled S–LX5B(S), precedes this module to protect it from being damaged by the high power magnetron pulses which get past the output circulator.

The output circulator is labeled FCX–62. Its port 3 goes to the receive circuits and port 2 is connected to the main antenna output.
Overview of the antenna mount rotation motor.

This motor operates off +/- 12 VDC (a total of 24 volts) and spins at around 24 rpm.

An optocoupler provides a bearing pulse signal to step the display rotation motor and a magnetic reed switch provides the heading flash signal.
Antenna mounting plate from the stock Furuno antenna system.

The brass probe is a 1/4 wavelength antenna and will stay stationary as the mounting plate rotates around it.

The antenna as I received it was smashed, so I ripped it apart before taking a picture of it, but this is the only part you'll need from the stock antenna.
Closeup of the brass antenna probe.

The tube surrounding this probe is about 0.5–inches in diameter.

The brass probe is essentially a center conductor in a piece of hardline coax.
Bottom of the rotating antenna plate.

The WR–90 flanges interlock and will stay stationary while the plate rotates around it.
A surplus Waveline Type 564 2 watt, 50 ohm termination load with a WR−90 flange.

We'll use this to couple the output from the 1/4 wavelength brass probe antenna into something more usable.

The ferrite load will need to be removed.
Drilling the coupling hole for the 1/4 wavelength brass probe.

Drill a 1/2-inch diameter hole 11 millimeters from the closed end of the waveguide.

Because this waveguide will need to rotate around the 1/4 wavelength brass probe, and the little flange which surrounds it, slightly widen the drilled hole using a deburring tool.

You want the waveguide to spin freely around that round flange but still be fairly RF tight.
Example of how this new waveguide piece should fit around the 1/4 wavelength brass probe antenna.
To secure the waveguide to the rotating plate, we'll use a 1–inch copper pipe hanger clamp and some 3/8"–16 hardware.
Secure the waveguide as shown using the 1-inch copper pipe hanger clamp. Be sure it is level.

The hole for the main 3/8”–16 bolt should be countersunk.

I added two extra #10–24 Kep nuts on the 1-inch copper pipe clamp. This is a fairly critical connection, and will be under a bit of stress, so take your time and do a good job. Secure the 3/8”–16 hardware with a few drops of Loctite.

Also add a bit of grease along the area where the waveguide rotates around the probe hardware.
Complete view showing the 1/4 wavelength brass probe antenna inside the new waveguide.

I added a #6–32 brass screw to cover the hole in the waveguide originally used to mount the ferrite load.

The output RF polarization will be vertical.
I mounted the scanner unit of the radar to a large piece of scrap plastic.

This makes working on the radar much easier when the hinged cover is opened up.
Internal view of the scanner unit showing the correct internal wiring.
To mount the new parabolic dish antenna, make a simple aluminum frame using some 1-inch square tube and bar stock.

The two square tubes are 12-inches in length and are attached to the rotating plate with 3/8”–16 hardware.

Some black foam washers were added to help cover up the bearing assembly in the rotating plate.
To save weight, the support structure for the new parabolic dish antenna will be made from 1-inch diameter PVC pipe.

Bolt two 1-inch PVC end caps to the center of the support bars as shown above. Secure them using a fender washer inside the end cap and some 1/4”-20 hardware.
Support structure for the new parabolic dish antenna made from standard 1-inch diameter PVC pipe.

The two support legs on the sides are 12-inches long.

The two little horizontal legs are 4.25-inches long.

There is a 1-inch to 1.25-inch PVC adapter on the tee connector (and a short little vertical riser) as the DirecTV dish mounting hardware needs a 1.25-inch diameter mounting pipe for proper attachment.
Test setup showing the DirecTV dish mounting hardware attached to the short piece of 1.25-inch PVC pipe.

Try to keep the overall rotating structure weight as low as possible, but make sure the parabolic dish doesn’t have any “wobble” as it rotates.
A handy option is to make a quick disconnect for the main signal cable.

This was made from a scrap piece of PC board which already had a nice edge connector.

A BNC jack was added for the video output signal from the scanner unit.
A four-foot piece of CG–179A/U flexible waveguide with WR–90 flanges connects the output from the new waveguide section we just made to the feed horn antenna.

The horn antenna is from the 10 GHz Gunnplexer used in a Solfan motion alarm.

The small f/D ratio (approximately 0.3) of DirecTV dishes means that the feed horn (and focal distance) can be quite critical, but use whatever you can find (or make) and then fiddle with it afterwards.
Constructing an usable feed horn mounting assembly.

This probably the hardest part of this project and can be quite critical.

We'll be using an old DirecTV low-noise block converter cut in half to provide the proper angle for the feed horn. An aluminum plate will need to be added to the dish's feed arm to extend the length a bit.

A piece of aluminum angle will provide the final mounting bracket for the flexible waveguide and feed horn at the proper focal point for the dish.

Try to eye everything up ahead of time so you know what it is all suppose to look like.
Overview of the modified DirecTV feed arm and feed horn mounting hardware.

The flexible waveguide is secured using a ground clamp attached to the little piece of aluminum angle stock.

The was all done empirically, but will work if you take your time and are careful during construction. The final focal point should be just inside the feed horn.
Alternate view with a better showing of the cut down DirecTV low-noise block converter.
Rear view showing the aluminum angle stock and the ground clamp attachment.
Experimental GBPPR tactical battlefield and air surveillance radar in operation.

You may need to fiddle with the elevation angle a bit during operation for better coverage of the area you want to monitor. The offset feed kinds messes with you...

The flexible waveguide is a little too long, so it's secured to the dish feed arm using some tape.

A piece of polystyrene should be placed over the feed horn to weatherproof it a bit.

You can't legally use marine radar frequencies on land, but Obama can't legally be president – so it all works out...
As the magnetron ages, its output frequency will shift a little.

To compensate for this, there is an adjustment for tweaking the main local oscillator tuning frequency. This is the potentiometer shown above and is located inside the display unit. It can be adjusted between +5V and +35V. The main tuning knob on the display unit is mostly for use as fine tune control.
Example of a DirecTV SlimLine dish.

Dishes of these "orange peel" style are ideal for radar use as they have a narrow horizontal beamwidth and larger vertical beamwidth.
Template for a 10 GHz horn antenna for use with DirecTV–style parabolic dishes.

rather than an old penny, but silver should work at least as well as copper. The feed is easy to build, and has a good SWR, so I can see why it is popular. However, the performance was mediocre, with 41% efficiency, about the same as an open waveguide flange. Thus, the gain of a 25-inch dish fed with a penny feed is not much higher than the 18-inch offset dish fed with a simple horn.

To be fair, the dish we used, with an f/D of 0.45, is not optimum for the penny feed. The Handbook states that it is suitable for dishes with an f/D ratio in the range 0.25 to 0.3. A dish that deep is extremely difficult to illuminate well, so it is unlikely that this feed will deliver much higher efficiency than we measured. However, it is probably as good a feed as any for very deep dishes.

Cassegrain and Gregorian Feeds

Large professional antennas often use multiple reflector feeds, like the Cassegrain (hyperbolic subreflector) and Gregorian (elliptical subreflector) configurations. Even better is a shaped-reflector system, where both reflector shapes are calculated for best efficiency and neither reflector is parabolic. JPL reports 74.5% efficiency on their 34 meter high-efficiency antenna.

All of these systems require a carefully shaped subreflector that is more difficult than a parabola to fabricate. For a shaped reflector to work well, it must be larger than 10 wavelengths, and the main reflector must be much larger than the subreflector to minimize blockage by the subreflector. One analysis suggested that a Cassegrain antenna must have a minimum diameter of 50 wavelengths, with a minimum subreflector diameter of 20 wavelengths, before the efficiency is higher than an equivalent dish with a primary feed. This is a fairly large dish, even at 10 GHz, and shaping a 20\lambda subreflector is beyond the ingenuity of most hams. However, there is probably a surplus one somewhere, and the scrounging ability of hams should never be underestimated.
Furuno FR-240/FR-360 Schematics
Display Unit (2 of 3)
Furuno FR-240/FR-360 Schematics
Scanner Unit (1 of 3)
Furuno FR–240/FR–360 Schematics
Scanner Unit (2 of 3)

NOTE
1. All resistance in ohms, VAV and capacitance in microfarads unless noted.
2. DC voltage is gain, STC max on ST–BY/SHORT Range.
3. Waveforms are measured with gain max & STC max on TX/SHORT Range.
Furuno FR-240/FR-360 Schematics

Display Unit – Location of Preset Controls and Test Points

**COMPONENTS SIDE**

**SOLDERING SIDE**

<table>
<thead>
<tr>
<th>項目 (ITEM)</th>
<th>規格 (RATING)</th>
<th>調整番号 (ADJUSTER)</th>
<th>チェックポイント (CHECK POINTS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>インバーター (INVERTER)</td>
<td>高周波 FREQ</td>
<td>VR1301</td>
<td>VR102, CRT</td>
</tr>
<tr>
<td></td>
<td>定電圧 +12V LINE</td>
<td>VR1</td>
<td>VR102, CRT</td>
</tr>
<tr>
<td>スイープ (Sweep)</td>
<td>VELOCITY</td>
<td>L=7461mm</td>
<td>VR102, CRT</td>
</tr>
<tr>
<td>ストレッチホールド (Threshold)</td>
<td></td>
<td></td>
<td>VR103, TP108</td>
</tr>
<tr>
<td>ビデオ、リミッター (VIDEO LIMITER)</td>
<td></td>
<td>VR201, TP202</td>
<td></td>
</tr>
<tr>
<td>レンジ、リング・タイミング (RANGE RING TIMING)</td>
<td>1/4W, 1/2Wの1番目のリングが真っ直ぐになる. FIRST RINGS IN BOTH 1/4W &amp; 1/2W RANGES SHOULD APPEAR AT THE SAME POSITION.</td>
<td>VR301, CRT</td>
<td></td>
</tr>
<tr>
<td>フォーカス (FOCUS)</td>
<td></td>
<td>VR301, CRT</td>
<td></td>
</tr>
</tbody>
</table>

**调整点 (ADJ POINT AT INSTALLATION)**

- 調整点 (ADJ POINT AT INSTALLATION)
Furuno FR–240/FR–360 Schematics

Adjustment at Installation

1. 帆首線調整

Fig.1 レーダー上の方位 BEARING ON RADAR

Fig.2 実際の方位 ACTUAL BEARING

1. HEADING ALIGNMENT

Adjust the position of S921 (S801 for MODEL2400) so that the bearing of target from heading flash on screen (*A* in Fig.1) may coincide with one from ship’s heading measured by using compass and sea chart or visually. (angle *B* in Fig.2)

2. 調整調整

The best tuning should be obtained with TUNING control at around mid-travel. If not, adjust VR402 on DU board.

3. スイプタイミング調整

1/4マイルで映像を出す。真っすぐに無理が無理が、映像上でも真っすぐに出る様に、DU高板上のVR101を調整する。（Fig.4）

4. センタリング調整

スイープ開始位置が中心より外れている場合は、下図の様にセンタリングマグネットを回して調整する。

Fig.4 (a) 正常 NORMAL (b) VR101を左に回す TURN VR101 CW (c) VR101を右に回す TURN VR101 CW

Fig.5

センタリングマグネット CENTERING MAGNET
CHAPTER 69
Radiation Circuits

TRANISTORIZED GHEGER COUNTER—Rate-meter circuit converts output of halogen-type counter directly into meter indication corresponding to radiation intensity. Counter triggers two-transistor switch to place low-impedance load across conventional dual-output diode pump. Two halves of pump current are summed in metering circuit.—F. S. Goodling, Transistorized Geiger Counter Fits In Probe, Electronics, 32:3, p 64-66.

RADIATION CIRCUITS

THERMAL NUCLEAR RADIATION DETECTOR—Triggers only on light trash from nuclear explosion, consisting of initial fast-rising pulse lasting a few milliseconds, followed by pulse lasting over 1 sec. Discriminates against short flashes from lightning and shell bursts, and long slowly rising pulses caused by headlights and sunlight reflections.—J. C. Chepmany, T. E. Perikas, and S. Sill东盟, Nuclear Bomb Alarm Systems, Electronics, 33:19, p 53-55.

NEUTRON DIFRACTOMETER—Neutron beam from reactor strikes sample, producing diffraction pattern. Multielement glow tubes control sequence of operation in which length of data accumulation time at each angle of diffraction is determined by counting neutrons in incident beam. This eliminates counting errors due to reactor level fluctuations. Circuit drives key solenoids of electric typewriter to give printout of results.—E. W. Johnson, Glow-Tube Programmer Controls Neutron Spectrometer Experiments, Electronics, 34:19, p 65-67.
**Radiation Detection Circuits**

MULTI-OUTPUT BINARY—Basic binary circuit of 256-channel neutron analyzer is controlled by diode gates in coincidence with clock pulses derived from 200-kc crystal oscillator. Used in countdown, address overflow, memory cycle, sync, and gate stages.—E. J. Wode, Digital Instrumentation for Nuclear Research Tests, Electronics, 22:45, p. 68–71.

PHOTO RELAY USES SR-90 SOURCE—Interruption of high-energy beam from strontium-90 radioactive source causes resistance of cadmium sulphide photocell. Transistor amplifier converts variation into signal that actuates relay or other control element. Source-detector separation must be less than 4 inches. Maximum counting rate is five pieces per second.—P. Weisman and S. L. Ruby, Solid-State Photocell Sees Through haze, Electronics, 31:35, p. 62–63.


RADIATION ALARM—Input is from multiplier phototube having anthracene scintillation crystal on its window. Signals are amplified.
TUNNEL-DIODE COINCIDENCE CIRCUIT—Determines coincidence of pulses from scintillation counter within nanosecond limits, for high-energy physics experiments. Circuit has limited timing jitter, good temperature stability, and is insensitive to transistor parameters. C. Infante and F. Pandolfo, Tunnel Diodes Stabilize Coincidence Circuits, Electronics, 34-46, p. 133-135.

MECHANICAL COUNTER DRIVE—Takes output from scale-of-64 circuit and converts to 40-millisecond square-wave pulse by means of complementary relay, to drive coil of mechanical register once for every 64 pulses from G-M tube. F. E. Armstrong, Battery-Powered Portable Scaler, Electronics, 32-19, p. 74-75.
Radiation Detection Circuits

G-M COUNTING-RATE METER—Uses two transistors in integrating circuit and potentiometer recorder drive. Output of counting-rate meter Q1-Q2 is 4.5-v., 300-microsec square pulse that charges integrating capacitor C1 through D2.—F. E. Armstrong and E. A. Pavlick, Monitoring Radiotracers in Industry, Electronics, 29:36, p. 43-44.

G-M COUNTER AND IONIZATION GAGE—Used to correlate cosmic radiation intensity with other ionospheric and geomagnetic phenomena. G-M counter provides negative pulse that is differentiated, shaped, and amplified in circuits similar to that of ion chamber. Counter rate is scaled down by 9-stage binary scaler before square-wave output is fed to telemetering unit.—L. E. Peterson, R. L. Howerd, and J. R. Winckler, Balloon Gas Monitor Cosmic Radiation, Electronics, 31:45, p. 76-79.

GEOG COUNTER—Simple basic monitor provides continuous audio and visual indications of radioactive materials in industrial areas. If recording is required, four leads at right are connected to 15-ips tape recorder motor and triode output stage for driving recorder. Will handle count rates up to 10,000 per minute. Strobotron V3 in pulse equalizer provides visual indications.—R. L. Ives, Geiger Radiation
Radiation Detection Circuits


COLD-CATHODE COUNT RATE CIRCUIT—Four-element cold-cathode tube operates directly from output pulses of 6295 photomultiplier receiving light output of ZnS screen of alpha particle detector. Maximum counting rate is 100 counts per second.—M. H. Gosseney, Designing Cold-Cathode Tube Circuits, Electronics, 39:8, p 161-168.

SURVEY METER HAS PULSED AND CURRENT MODES—High-voltage source for G-M counter uses 10-kc blocking oscillator and Cockcroft-Walton multiplier to give 550 v stabilized by inner region of D1. Range for pulsed operation is 0.5 to 50 milliroentgen per hour. For current mode, same 18503 G-M tube is used, and current in range of 50 milliroentgen to 5 roentgen per hour is logarithmic function of radiation intensity.—R. W. Lehner and J. M. McKenzie, Radiation Survey Meter, Electronics, 37:8, p 50.
Radiation Detection Circuits

564 SOURCEBOOK OF ELECTRONIC CIRCUITS

Radiological Vacuum Gage—Permits measuring extremely low pressures in laboratory equipment and in high-altitude research. Provides digital output that can be used for storage or telemetry. Transformer is audio type with large step-up ratio. Polarizing voltage supplies less than 1 microamp. Transducer is small cylindrical tube filled with radioactive foil—G. F. Vanderschmidt, Using isotopes to Measure Low Pressures, Electronics, 32:25, p 60-61.

Electrometer—Amplifies output of photomultiplier that responds to degree of fluorescence, which in turn is proportional to radiation received by glass dosimeter needle implanted in body of person undergoing radiation treatment—S. J. Molicky et al., Measuring Radiation Within Human Body, Electronics, 33:13, p 74-75.


500,000-PPS SCALER—Uses seven fast gas-filled decade counter tubes driven by transistors, for counting pulses from nuclear radiation detector. Input channel, which can accept positive or negative pulses from 0.1 to 100 y, has amplitude discriminator and coincidence-anticoincidence gating.—M. Birk, H. Brofman, and J. Sokolowski, Transistors

SCINTILLATION-COUNTER ANTICOINCIDENCE
—Produces an output from a trigger at input 1 only if input 2 is not triggered at that time. Used in liquid scintillation counter where expected count rates are low.—O. J. Sprokel, A Liquid Scintillation Counter Using Anticoincidence Shielding, IBM Journal of Research and Development, 7/5, p 135-145.
LOW-ENERGY PARTICLE DETECTOR—Change in conductivity of single-crystal phototube under irradiation is converted to pulse-code modulation by neon gas-tube relaxation oscillator whose firing rate is determined by charging of C1 through photocell. Saturating bootstrap amplifier Q2 inverts and shapes pulses to drive accumulation register.—J. W. Freeman, Energy Detector for Satellites, Electronics, 35-4, p 42-43.

TUNNEL-DIODE COINCIDENCE—Used in liquid scintillation counter for carbon-14 and other radioactive solutions. Delivers output pulses to stretcher amplifier only for coinciding pulses from two photomultiplier inputs.—G. J. Sprakel, A Liquid Scintillation Counter Using Anticoincidence Shielding, IBM Journal of Research and Development, 7-3, p 135-145.
Radiation Detection Circuits

**Radiation Circuits**

**Radiative Fuel-Flow Gage**—Used in recording flow rate of jet fuel containing radioactive tracer.—J. D. Keys and G. E. Alexander, Radioactive Tracers Find Jet Fuel

**2-CC Cold-Cathode Count Rate Circuit**—Uses triode having separate cold-cathode diode that produces glow discharge to eliminate trigger-cathode gap of triode section. This eliminates photosensitivity shown by most cold-cathode devices. Maximum operating speed is 3,000 counts per second.—N. H. Gossage, Designing Cold-Cathode Tube Circuits, Electronics, 31-3, p 101–108

**Radiation Alarm Failure Detector**—Nurse indicator lamp comes on when counter flip-flop of radioactive dust particle alarm stops. Flip-flop normally operates at minimum of 10 transitions per second due to slight leakage from radioactive test source built into detector.—H. E. Dabelt, How Radiation Monitor Guards Nuclear Navy, Electronics, 32-4, p 43–45.
City Agrees to Lower Test Scores for Police Exam

March 10, 2011 – From: www.daytondailynews.com

By Lucas Sullivan

DAYTON -- The city’s Civil Service Board and the U.S. Department of Justice have agreed on a lower passing score for the police recruit exam after it was rejected because not enough blacks passed the exam.

The city lowered both written exams a combined 15 points that resulted in 258 more people passing the exam, according to a statement released Thursday by Civil Service officials. The agreement allows the city to immediately resume its plans to hire police and firefighters.

The original passing scores determined by Civil Service required candidates to answer 57 of 86 (66 percent) questions correctly on one portion and 73 of 102 (72 percent) on the other. The lowered benchmark requires candidates to answer 50 of 86 (58 percent) questions correctly and 64 of 102 (63 percent) of questions on the other.

A total of 748 people passed the exam under the new benchmarks. It is unclear the demographics of those who passed.

The passing candidates will undergo preliminary background checks and, once that hurdle is cleared, will be subject to an oral interview. Those dates have not been determined.

The Justice Department’s rejection of the passing scores last month delayed the city’s firefighter’s exam that was slated for April 2. A makeup date has yet to be set for the exam.

The city said it wants to put new hires on the street in both police and fire departments by next year to replace dozens of retirees that have left public safety forces near all-time lows.
Silly goyim! Only the private and unconstitutional "Federal" Reserve can create money with no real value!

**Liberty Dollar Creator Convicted in Federal Court**

March 19, 2011 – *From: www.citizen-times.com*

By Clarke Morrison

The leader of a group that marketed a fake currency called Liberty Dollars in the Asheville area and elsewhere has been found guilty by a federal jury of conspiracy against the government in a case of domestic terrorism.

Bernard von NotHaus was convicted Friday at the conclusion of an eight-day trial in U.S. District Court in Statesville. The jury deliberated less than two hours, according to the Department of Justice.

Charges remain pending against William Kevin Innes, an Asheville man who authorities said recruited merchants in Western North Carolina willing to accept the barter currency, according to court records. Innes was indicted along with von NotHaus in 2009.

Attacks to undermine the legitimate currency of this country are simply a unique form of domestic terrorism, U.S. Attorney Anne Tompkins said. While these forms of anti-government activities do not involve violence, they are every bit as insidious and represent a clear and present danger to the economic stability of this country.

The case was investigated by the FBI, Buncombe County Sheriff's Office and U.S. Secret Service with help from the U.S. Mint.

We are determined to meet these threats through infiltration, disruption and dismantling of organizations which seek to challenge the legitimacy of our democratic form of government, Tompkins said.

von NotHaus, 67, faces up to 25 years in prison during sentencing, which hasnt been scheduled. The government also is seeking the forfeiture of about 16,000 pounds of Liberty Dollar coins and precious metals valued at nearly $7 million.

According to court documents, von NotHaus founded the National Organization for the Repeal of the Federal Reserve and Internal Revenue Code in Evansville, Ind., in 1998, and developed the Liberty Dollar. He touted the silver medallions as an inflation-proof alternative to official currency.

The coins were marked with the dollar sign, the words dollar, USA, Liberty, Trust in God (instead of In God We Trust) and other features associated with legitimate U.S. coins.

A 2007 affidavit said more than 70 businesses in the Asheville area agreed to accept the Liberty Dollar. Innes held the title of North Carolina regional currency officer and was one of three members of the groups executive committee, an indictment states.

The charges against Innes include passing coins resembling genuine U.S. coins and intended for use as money, mail fraud and possession Liberty Dollar coins with intent to defraud. Authorities said when he was arrested that he faces up to 45 years in prison.
Despite warnings from the federal government, Innes told the *Citizen–Times* in 2006 that Liberty Dollars were legal.

One of the first things I did when I started this in Asheville was to go to the police and tell them what I was doing, he said.

Federal agents raided von NotHaus company headquarters in 2007 and seized documents and precious metals. A private mint in Coeur d'Alene, Idaho, that produced the coins was raided the same day. *Congress has exclusive power to coin money in the U.S. and to regulate its value, according to the Treasury Department.*
Note the caption for this slide says these protesters were recently killed, but if you look closely in the upper left-hand corner of the sign, you'll notice it says "1996/6/29" or June 29, 1996. This was really from a memorial commemorating the victims of the massacre at the Abu Salim prison.

Additional information at: truthfrequencynews.com/?p=451

"In December 2008, Libyan authorities started informing the families of the 1,200 prisoners killed on June 29, 1996, in Tripoli’s Abu Salim prison of the death of their relatives, by issuing death certificates (without specifying the cause of death, in many cases). This followed the June and September 2008 decisions by the North Benghazi Court ordering the government to reveal the fate of those who had died. The Libyan authorities have offered compensation of 200,000 dinars (US$162,000) to families who agree to relinquish all legal claims, but most of the victims’ families in Benghazi have refused to accept compensation on those terms and continue to call for disclosure of what occurred on the day of the killings and criminal accountability for those responsible. The authorities have not made public any account of the events or held anyone responsible. On September 6, 2009, the acting secretary of defense established a seven–judge investigation panel, headed by a former military tribunal judge, to conduct an investigation."
Wisconsin Rep. Gordon Hintz Apologizes for 'Outburst' on Assembly Floor

March 1, 2011 – From: www.greenbaypressgazette.com

By Patricia Wolff

An Oshkosh legislator issued a second public apology in as many weeks on Monday, the latest for comments he made on the floor of the Assembly following a vote on a contentious budget repair bill.

Rep. Gordon Hintz, D–Oshkosh, called Rep. Michelle Litjens, R–Winneconne, on Monday morning to apologize for his comments that Litjens described as containing an obscenity and the words "you're dead."

Last week, Hintz accepted responsibility for being issued an ordinance violation for visiting a massage parlor in Appleton that was the subject of a prostitution sting.

Litjens said she did not want the incident to become public, but confirmed it after other Assembly representatives contacted a Milwaukee conservative talk show host who commented on the issue on the air on Monday.

Hintz would not confirm his exact comments and referred to them merely as an "outburst" that occurred over shock at the way Republicans broke procedural rules for the Assembly early Friday morning by not calling for a vote to end the debate. When the vote was taken Democrats were caught off guard and many did not cast their ballots.

"I believe my response was shock. The only way they were going to pass this bill was by ignoring and shredding rules of the Assembly," Hintz said. "I apologized (Monday) when I learned my comments may have been taken personally by someone."

Litjens, who said she did not take Hintz's comments personally, believed he was directing it to all Republicans because they voted to move the bill ahead.

"I was the closest one," she said.

She accepted his apology but turned to Assembly leadership to request that Hintz be disciplined.

"Everyone was exhausted. We were on the floor for 58 hours. (But) there is still no excuse for his comment," Litjens said. "We should be able to civilly discuss issues we are passionate about without feeling threatened."

Assembly Speaker Jeff Fitzgerald was not available to comment Monday. An aide said Fitzgerald called Minority Leader Peter Barca, D–Kenosha, on Monday to ask how he wished to proceed on the Hintz comments as well as an incident in which Rep. Chris Danou, D–Trempealeau, is accused of throwing an object that hit a Republican on the other side of the aisle.

Hintz's other apology came Feb. 21, after he was issued a citation for sexual misconduct in connection with a prostitution sting in Appleton at the Heavenly Touch Massage Parlor. Appleton police have offered few details about Hintz’s involvement. The Democrat, who was elected to a third term in November, issued a statement in which he took "full responsibility for his actions" but has not said what those action were. In an interview Monday, he declined to comment on the case.
"My legal counsel has said because this is a pending investigation I'm not allowed to speak on the case," Hintz said.

Hintz, 37, was cited under a city sexual misconduct ordinance on Feb. 11, and is scheduled to appear April 27 in front of an Outagamie County court commissioner.

He said he is not certain what misconduct he is accused of. Records indicate Hintz was cited for violating an Appleton city ordinance against touching or offering to touch sexual parts.

Police searched Heavenly Touch Massage Parlor and a nearby residence on Jan. 28. Investigators had staked out the properties for several days after receiving a tip that illegal activity was taking place at the home. The raid netted six arrests, and police seized a vehicle and other property. Four women were booked into Outagamie County jail and two other women were arrested but not jailed.

Reporters tried to reach Hintz numerous times last week for comment. Hintz said he did not return multiple phone calls on the advice of his attorney.