TELEMEDICINE ANIK-B PROJECT

TECHNICAL REPORT

SUBMITTED BY: Ken Hauschildt
Technical Manager
E.T.V Centre
Memorial University of Nfld

INTRODUCTION

The Telemedicine Department of Memorial University was a selected Anik-B experimenter. This communication research project started during the Summer and Fall of 1980 and interconnected via satellite the University with the oil exploration ship NEDDRILL II for the 1980 drilling season (July 3 - October 22) and the Labrador communities of Goose Bay, Labrador City and Makkovik (September 1980 to September 1981).

The technical planning, installation, and systems maintenance was carried out by the Educational Television Centre of Memorial University under a subcontract for Telemedicine. (Contract period November 1979 to May 31, 1981.)

The work contracted consisted of:

The Telemedicine Headend Control Centre

The Building Interconnect System

The St. John's Satellite Equipment Interface

The Adaption of a D.O.C. 1-Meter Terminal for Installation on an Oil Rig

The Site Survey for the Labrador Satellite Equipment Locations

The Construction of the Satellite Equipment Interface Boxes.

The Installations and Operational Checkouts at the Equipment Locations

The System Trouble-Shooting and Maintenance

The Decommissioning of the Oil Rig Experiment

The Decommissioning of Goose Bay and Makkovik (September 1981 under separate contract)

The technical systems contract was carried with a budget of $88,500 and a staff support of 1 1/2 technician salaries for the project period.

THE OVERALL SYSTEM CONFIGURATION

Technical planning for these NARROW BAND communication experiments started in early 1979. The detailed plans were revised and updated as the overall project objectives and technical requirements became clear. The basic equipment layout and the detailed interconnect design was finalized with the Telemedicine Experimenter by January 1980. An overall block diagram of this system is shown in Figure 1.

The Anik-B Satellite provided two narrow band (Voice & Data) channels in a two-hop configuration to the experimenter sites. The channels were bridged together at the 9-meter terminal in Ottawa to provide a "4-Wire" party line Voice Circuit and a "4-Wire" party line Data Circuit to the experimenter in St. John's. At Goose Bay and Labrador City the voice circuits were extended via leased local loops to include additional experimenter requirements outside the hospital locations. At St. John's a special bridging arrangement allowed a "split" or "combine" operation of the satellite and the existing "Island Audio Teleconferencing System".

The originally planned technical "Time Frame" is shown in Appendix A. This "Time Frame" slipped by approximately three months because funding arrangements were incomplete.

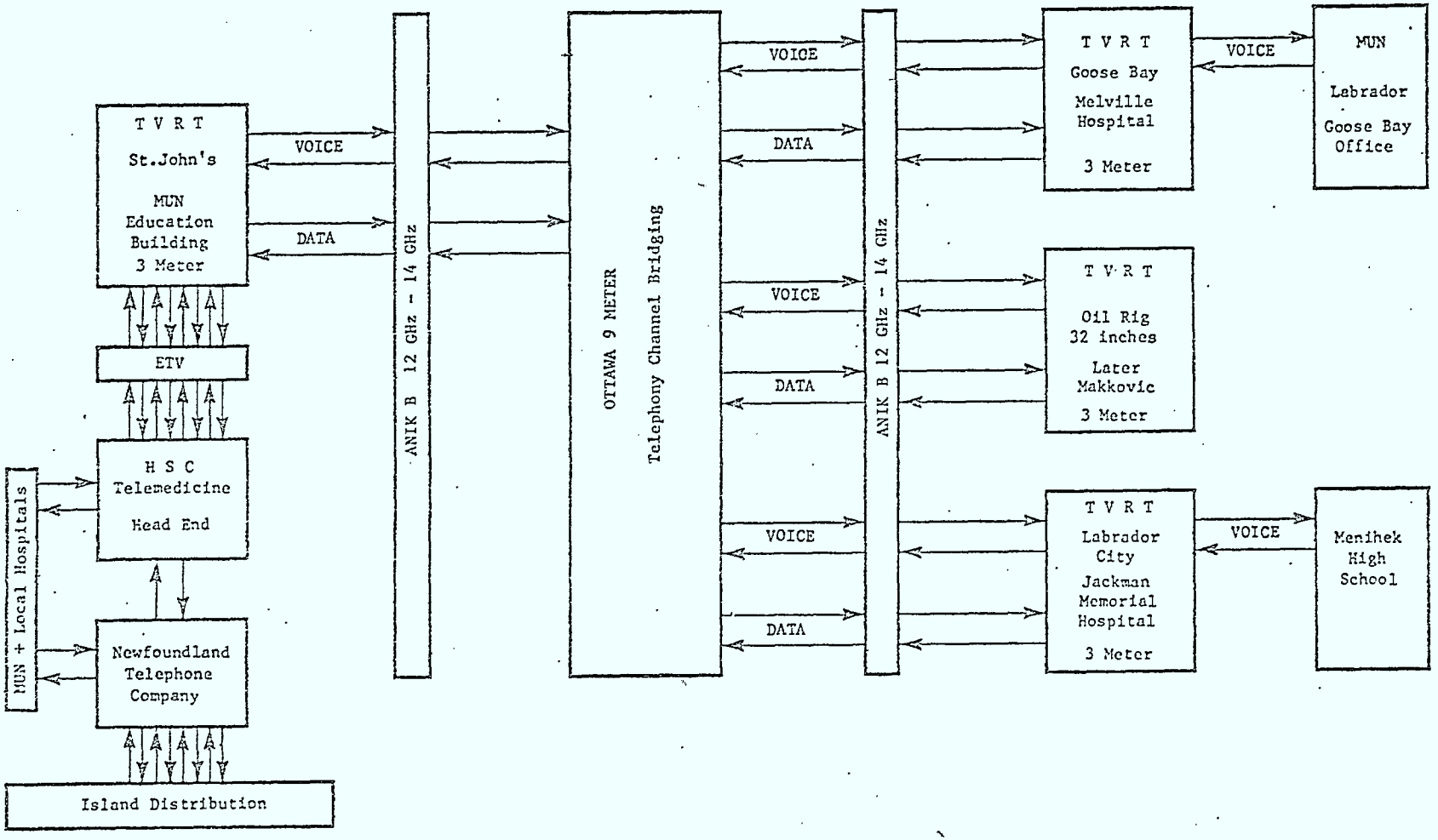


Fig. 1 ANIK B OVER ALL COMMUNICATION SYSTEM

THE TELEMEDICINE HEADEND CONTROL SYSTEM

In Figure 2 a block diagram of the Telemedicine Headend is shown. The system was built with "off the shelf" equipment which was modified as required. The major components are a AMPRO Dual Channel mono audio console complete with the required metering and monitoring, active and passive 4-wire bridging equipment (WESCOM), two voice switched repeaters (DAROME) and a 7 position Line Monitor Amplifier.

Each Studio can utilize up to 4 studio microphones (Electro Voice 672C Desk Top or 647A Lavaliers). The microphones are interconnected via studio points and the console input jackfield to the low level inputs of the AMPRO audio console. A block diagram of the console is shown in Figure 3. Internal switching allows selection of any input signal to either PGM 1 or PGM 2 output. PGM 1 output has been designated Island system (Terrestrial Audio Conferencing System) while PGM 2 has been designated Anik-B system.

The output signals are routed via jackfield positions to the active bridging equipment. Each active bridge feeds a 4 port passive bridge for additional flexability and direct DAROME Convener access, either from the studios or the control room location. The Island and the Anik active bridges can also be interconnected with an appropriate arrangment to allow the "Split" or "Combine" operation. The bridge output signals are routed via DAROME 8004 voice switched repeaters to a DI-TECH line monitor amplifier and to the "Line Interconnect" jackfield.

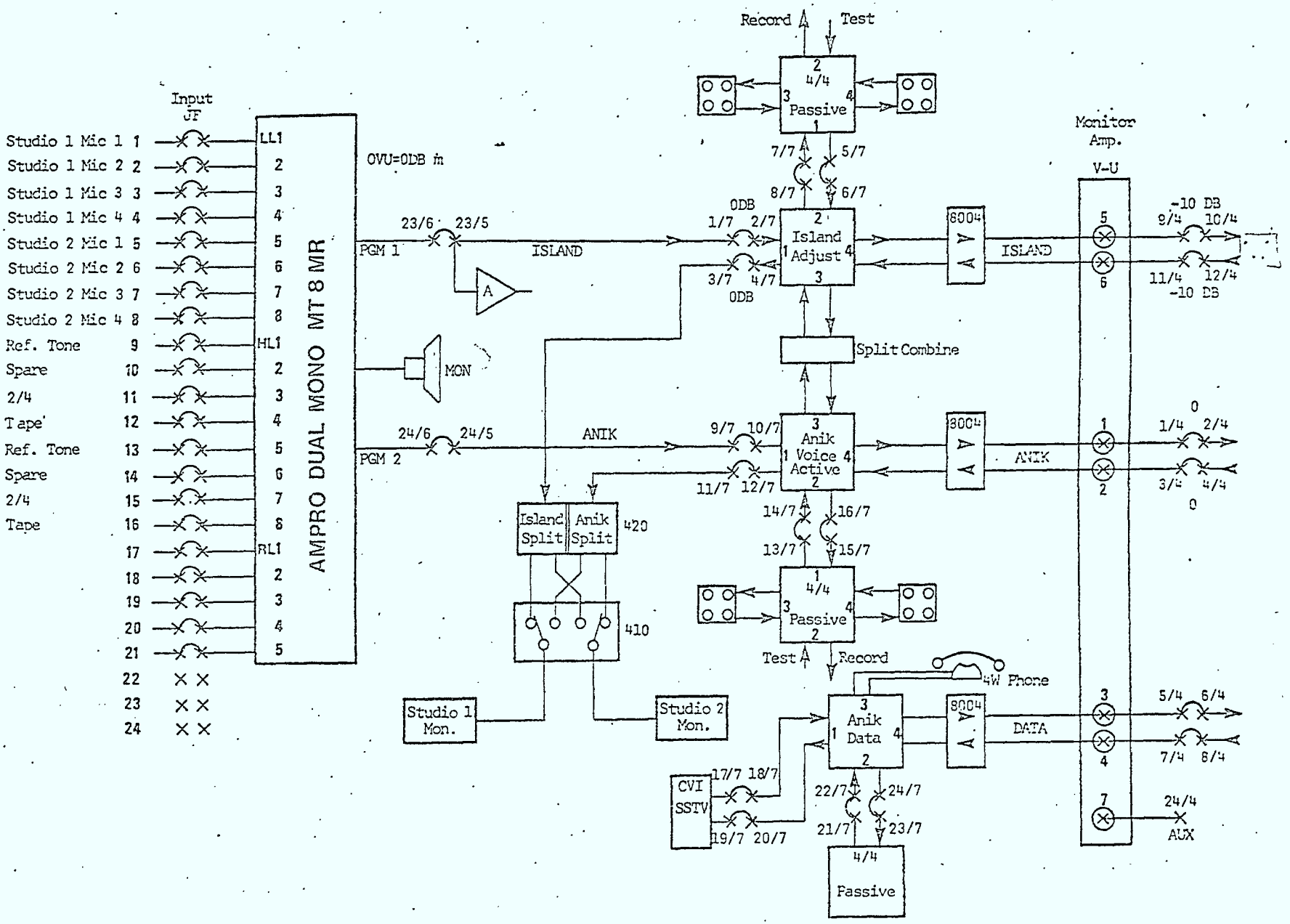
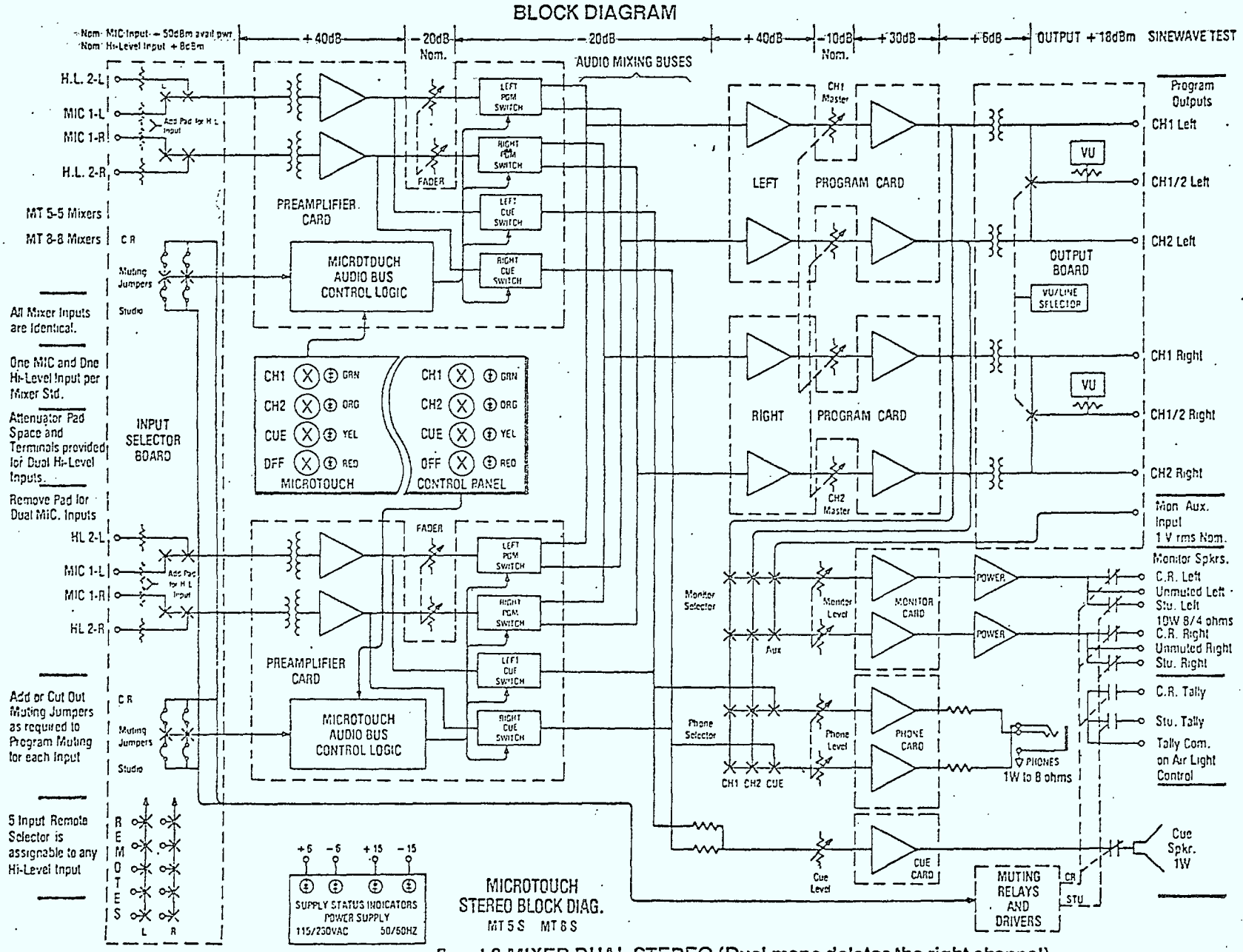

Input
JF
Studio 1 Mic 1 1
Studio 1 Mic 2 2
Studio 1 Mic 3 3
Studio 1 Mic 4 4
Studio 2 Mic 1 5
Studio 2 Mic 2 6
Studio 2 Mic 3 7
Studio 2 Mic 4 8
Ref. Tone 9
Spare 10
2/4 11
Tape 12
Ref. Tone 13
Spare 14
2/4 15
Tape 16
17
18
19
20
21
22
23
24
LL1
2
3
4
5
6
7
8
HL1
2
3
4
5
6
7
8
RL1
2
3
4
5
AMPRO DUAL MONO MT 8 MR
OVU=0DB
PGM 1
PGM 2
23/6 23/5
24/6 24/5
ISLAND
ANIK
A
MON
Record
Test
Passive
7/7 5/7
8/7 6/7
0DB
1/7 2/7
3/7 4/7
0DB
Island Adjust
Split Combine
3 Anik Voice Active
9/7 10/7
11/7 12/7
Island Split
Anik Split
420
410
14/7 16/7
13/7 15/7
Test
Record
4W Phone
Studio 1 Mon.
Studio 2 Mon.
3 Anik Data
17/7 18/7
19/7 20/7
CVI
SSTV
22/7 24/7
21/7 23/7
4/4 Passive
8004
ISLAND
ANIK
DATA
Monitor Amp.
V-U
-10 DB
9/4 10/4
11/4 12/4
-10 DB
0
1/4 2/4
3/4 4/4
0
5/4 6/4
7/4 8/4
24/4
AUX

FIGURE 2



5 and 8 MIXER DUAL STEREO (Dual mono deletes the right channel)

FIG. 3

THE BUILDING INTERCONNECT SYSTEM

Since no satellite look angle existed at the Telemedicine location, the 3-meter satellite terminal was installed at the Education Building. The signals were routed from the Telemedicine Headend to a equipment room in the basement of the Health Sciences Centre and on to the Audio Record Monitor Room at ETV. From here the signals were routed to the Penthouse of the Education Building. Figure 4 shows the interconnect system. Not all lines shown were used for the Anik-B project but belong to other communication systems.

At the H.S.C. equipment room and at the audio record room at ETV, the interconnect cables were routed over jackfields and bridged to 7 position "Line Monitors". This allowed easy level alignment and trouble-shooting. The audio record room was used for the daily "Satellite Sign On" and most other trouble-shoot procedures. A D.O.C. or a Darome unit could be patched via the jackfield to coordinate activities when required with Ottawa or the experimenter locations. During periods of no DATA transmission, the D.O.C. phone was connected to the DATA channel for convenience and coordination. That has kept the VOICE channel clear at all times for the Telemedicine experiments.

The signals from the audio record room now went to the Penthouse to be connected to an interface box and to the D.O.C. Satellite equipment.

CABLE INSTALLATION FOR ANIK B. PLUS CCTV

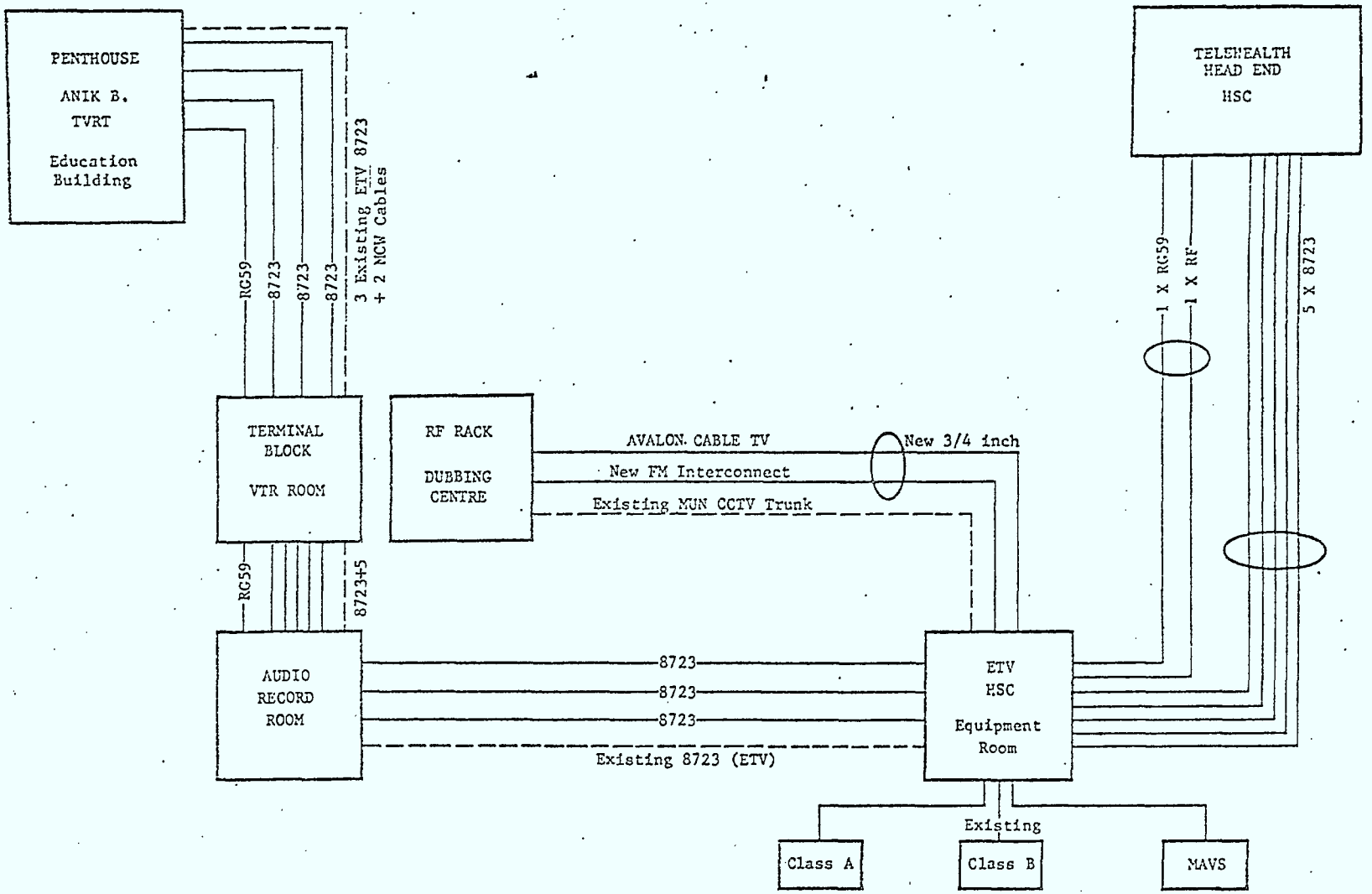


FIG. 4

THE ST. JOHN'S SATELLITE EQUIPMENT INTERFACE

The St. John's satellite outdoor terminal equipment was installed on a flat roof section just outside of ETV's penthouse microwave transmitter location. The 3-meter Anik-B antenna foundation was installed by a local contractor on top of an additional layer of 3/4 inch plywood and roof tiles. These roof tiles were also extended to cover a 4 foot wide walk to the roof exit door to avoid damage to the roof.

The St. John's Satellite Terminal was installed and checked out with the 9-meter Ottawa terminal early June 1980. Proof-of-performance tests were carried out on both telephone channels. The results are in Appendix B. The overall performance met the published channel specifications also some level differences between channels were noticed. At this time we also performed some tests on the "Experimenter Equipment Package" consisting of the Interface Box and the DAROME Convener equipment at all locations. Slow-Scan television equipment was planned to be operational from all sites but would only be implemented at one site at a time.

The St. John's Interconnect is shown in the block diagram form on Figure 5. It shows the long cable interconnect requirements of this experiment. The cable losses of approximately 3 dB at telephone frequencies were compensated for at the "Telemedicine Headend".

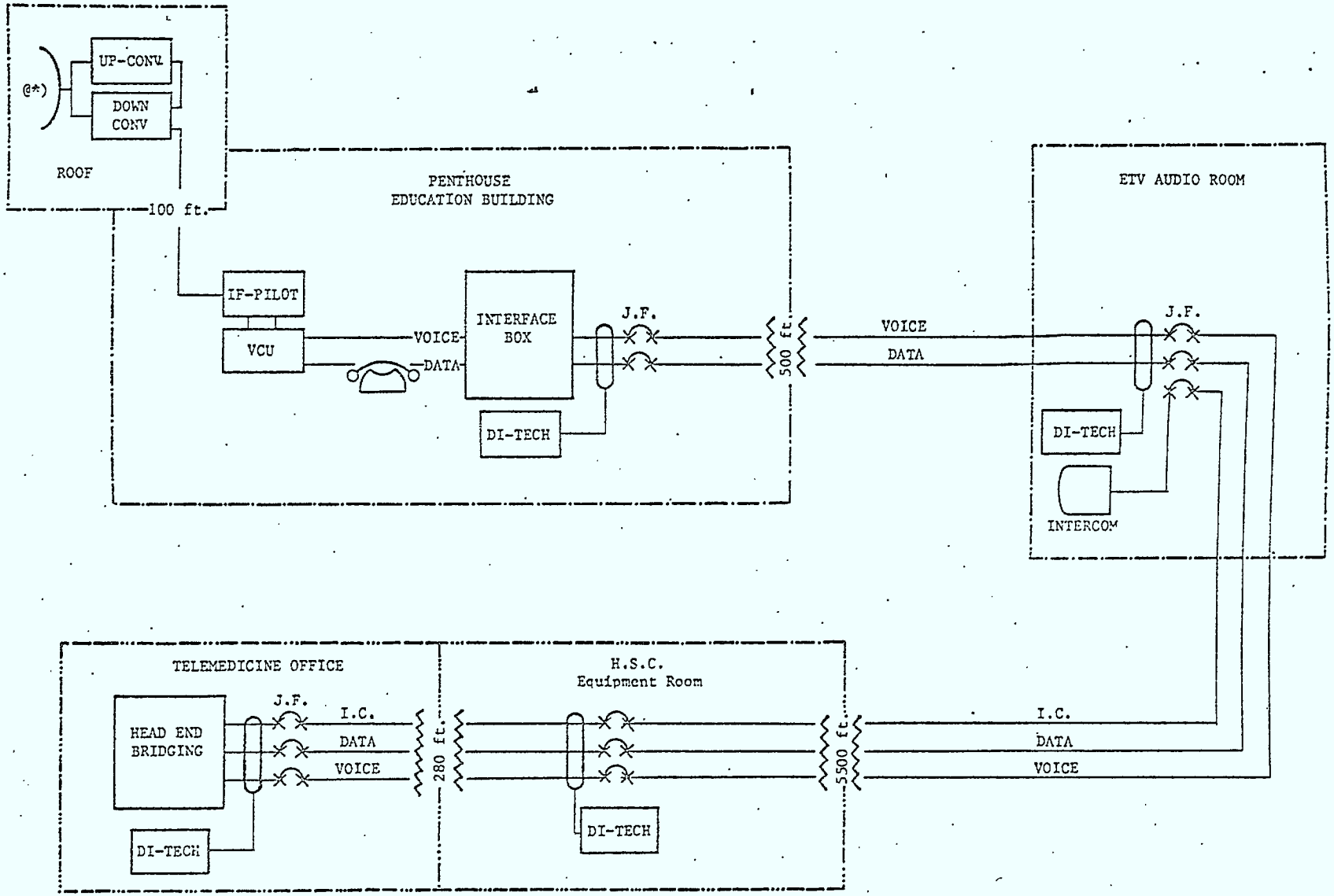

UP-CONV
DOWN CONV
@*)
ROOF
100 ft.
PENTHOUSE
EDUCATION BUILDING
IF-PILOT
VCU
VOICE
DATA
INTERFACE BOX
J.F.
DI-TECH
500 ft.
VOICE
DATA
ETV AUDIO ROOM
J.F.
DI-TECH
INTERCOM
TELEMEDICINE OFFICE
HEAD END BRIDGING
J.F.
I.C.
DATA
VOICE
280 ft.
DI-TECH
H.S.C.
Equipment Room
DI-TECH
5500 ft.
I.C.
DATA
VOICE

FIG.5

THE ADAPTION OF A D.O.C. 1-METER TERMINAL FOR INSTALLATION ON AN OIL RIG

Since some oil exploration ships are very precisely dynamically positioned and since heavy seas causing excessive pitch and roll over 2 degrees are encountered only at some portion of time, it was decided to experiment with a non-tracking 32-inch diameter (1-meter) terminal. The gain loss of the smaller antenna required approximately 6 dB of additional transponder power.

For the experiment the 1-meter Outdoor Terminal Package was installed on a mechanical pedestal that allowed the whole terminal to be rotated. The rotation ring of the pedestal was marked with holes every 5 degrees but could be locked at any position with 3 clamps. A micro-ampere meter (RF Carrier) was mounted behind the equipment package to facilitate easy antenna alignment and optimization. If the dynamically positioned exploration ship should change its "heading", the radio operator would know of this change in degrees and would be able to correct the antenna (coarse) positioning by turning the pedestal the required number of 5 degree holes, watch the meter for a reading, maximize this reading and again lock the pedestal. To confirm these alignments a venier control was available as part of the D.O.C. tripod (for AZIMUTH and ELEVATION).

The equipment packages were installed early July 1980 while the exploration ship NEDDRILL II was in St. John's Harbour. The "Swival Pedestal" was welded to the top-deck structure and the complete D.O.C. Outdoor Equipment Package was bolted to it. The equipment was interconnected to the Indoor Equipment Packages in the radio room via a ventilation cap also part of the top-deck structure. Experimenter interconnect Wall Boxes were installed at the radio room and at the infirmary. The DAROME voice-circuit was also available on the bridge and the doctor's office. The receive leg of the DATA channel was wired to a staff lounge PA system to which the CBC Radio news feed was made available every evening, pending on satellite circuit availability. A block diagram of the Oil Rig installation is shown in Figure 6. A summary of major events as they relate to the Oil Rig experiment are in Appendix c.

The major technical problem in these experiments was a section of fixed waveguide that interconnected the "up-conventer" (transmitter) output to the antenna feedhorn interconnect arrangement. The problem has been documented in separate correspondence with D.O.C. and can be overcome by using flexible waveguide for this interconnect.

For a period of this experiment the radio operators had kept a log (Appendix D) of the antenna repositioning, the time required for realignment and the RF-reading obtained.

PHYSICAL ARRANGEMENT
OIL RIG

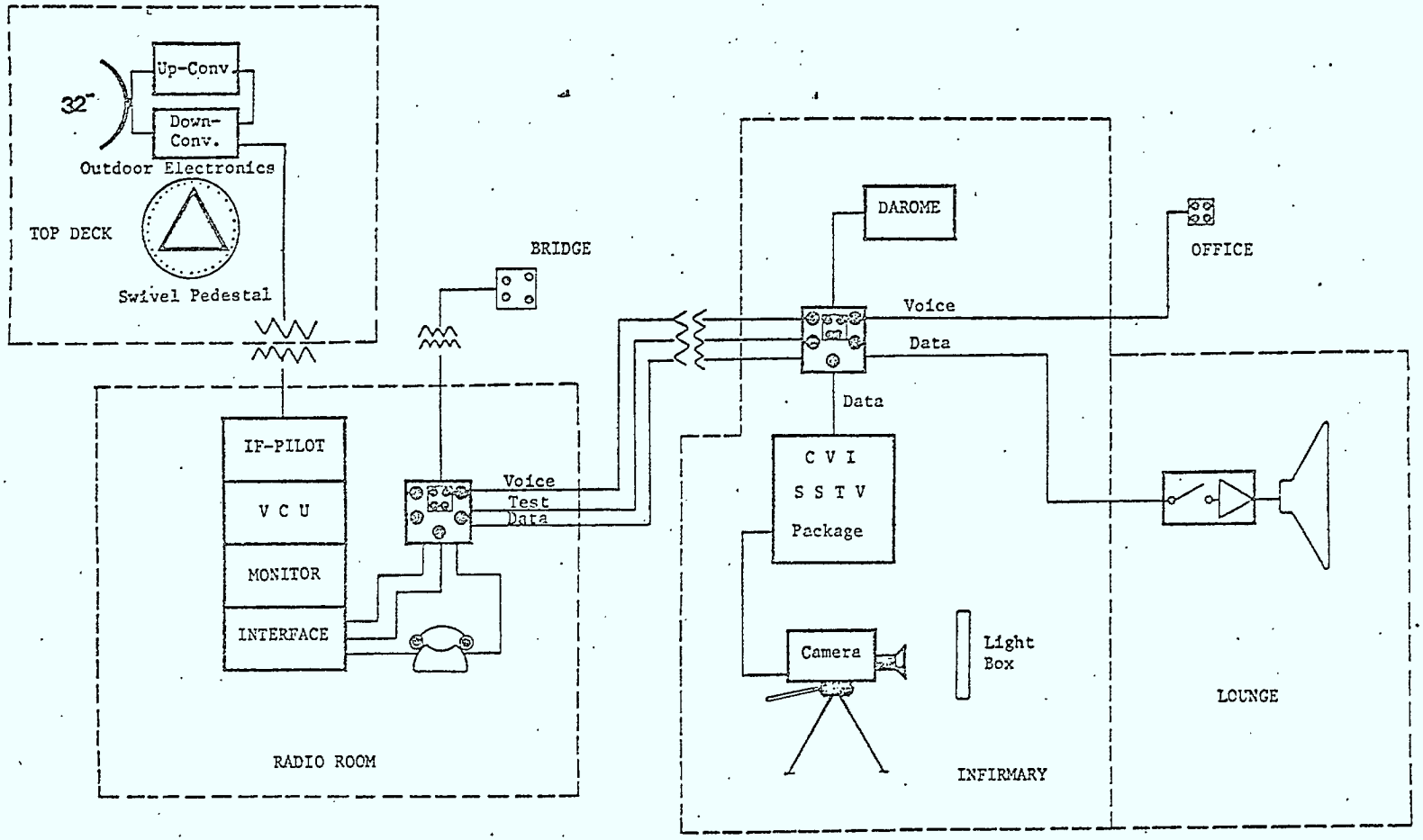


FIG. 6

CONCLUSION (OIL RIG EXPERIMENT)

Although this oil rig experiment had many problems, it was learned that the antenna position correction could be carried out with this simple pedestal when required in 1 to 5 min. maximum. Elevation adjustments were rarely required while azimuth adjustments were required when the ships heading changed. When the cost of a fully stabilized antenna platform cannot be justified, a simple motorized azimuth only pedestal could provide an alternative at a fraction of the cost for a fully stabilized pedestal.

The telephone channel performance to the oil rig had at times a slightly lower signal-to-noise ratio but otherwise met telephone channel performance characteristics. Some measurements are in Appendix E.

THE SITE SURVEY FOR THE LABRADOR SATELLITE EQUIPMENT LOCATIONS

To assist in the overall project planning and implementation, field trips to the participating hospitals took place in late February 1980 (Goose Bay, Labrador City) and in late July (Goose Bay, Labrador City and Makkovik).

Satellite look angles and other antenna installation details were confirmed as were indoor locations for equipment and the experiment room locations. A typical arrangement for the hospital installation is shown in Figure 7.

The outdoor equipment packages for Goose Bay and Labrador City could be installed on the rooftops of the respective hospital. The design of the new Anik-B 3-meter antenna foundation has a considerable higher per square foot roof loading since it is in size even smaller than the foundations used for the 2-meter Hermes project. Structural engineers had to be engaged to confirm that the roof loading of approximately 175 lbs/sq. foot was within the acceptable capacity of the roof structures. The outdoor electronics package for Makkovik was installed on the ground and required the erection of a security fence.

The indoor equipment and experimenter location was selected to provide the best acceptable compromise of locations available and experimenter requirements. Satisfactory solutions could be achieved at all locations since audio cabling could be carried out with few constraints. A typical installation was completed in 2 1/2 workdays by 2 technicians.

The equipment installation was planned so that the D.O.C. equipment and experimenter equipment installation would overlap. Therefore, the experimenter provided assistance in the D.O.C. equipment installation and the technical checkouts.

PHYSICAL ARRANGEMENT
T V R T INSTALLATION

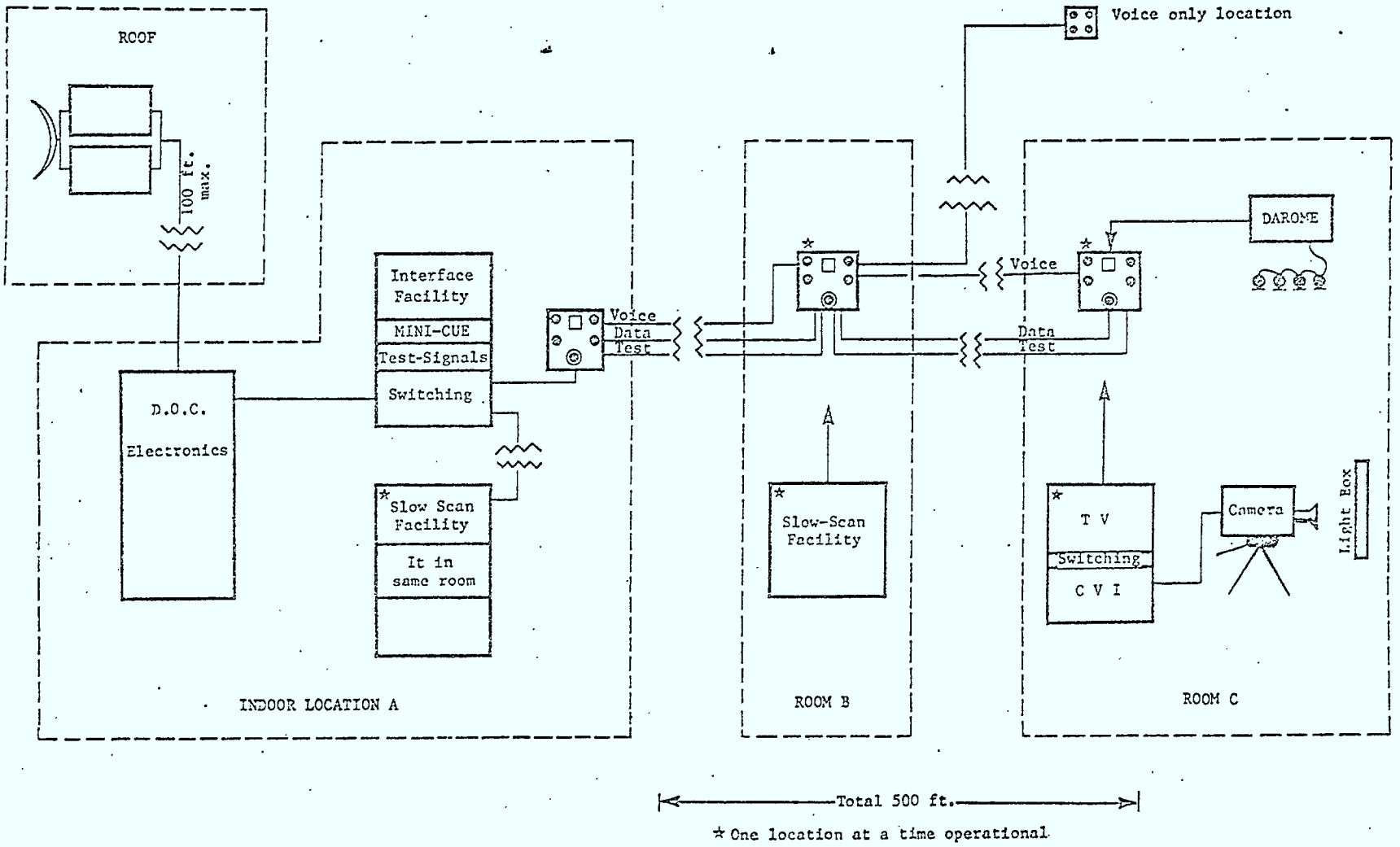


FIG. 7

THE CONSTRUCTION OF THE SATELLITE EQUIPMENT INTERFACE BOXES

To provide some local test facilities at all satellite terminal sites an "Interface Box" was designed that would allow to confirm the operational status of the experimenter equipment package at the remote sites and also transmit a known test signal back to the satellite. This test signal level could be recorded during "Sign On" and analyzed by D.O.C. in Ottawa or at ETV in St. John's.

These interface units also provided a "Loop-Back" test facility that could be activated for the Voice or Data channel at each site. This allowed a complete circuit test to any remote site whenever it was required without the assistance of the local technical coordinator. A block diagram of the interface unit is shown in Figure 8.

The interface equipment was housed in a small Hammond Rack (17.5 inches Rack space) which allowed the installation of the D.O.C. VCU unit in the same enclosure as the interface and audio monitor units. The bridging equipment required at Goose Bay and Labrador City was placed in the back of the same rack providing a compact and self-contained equipment package.

Interface Anik-B

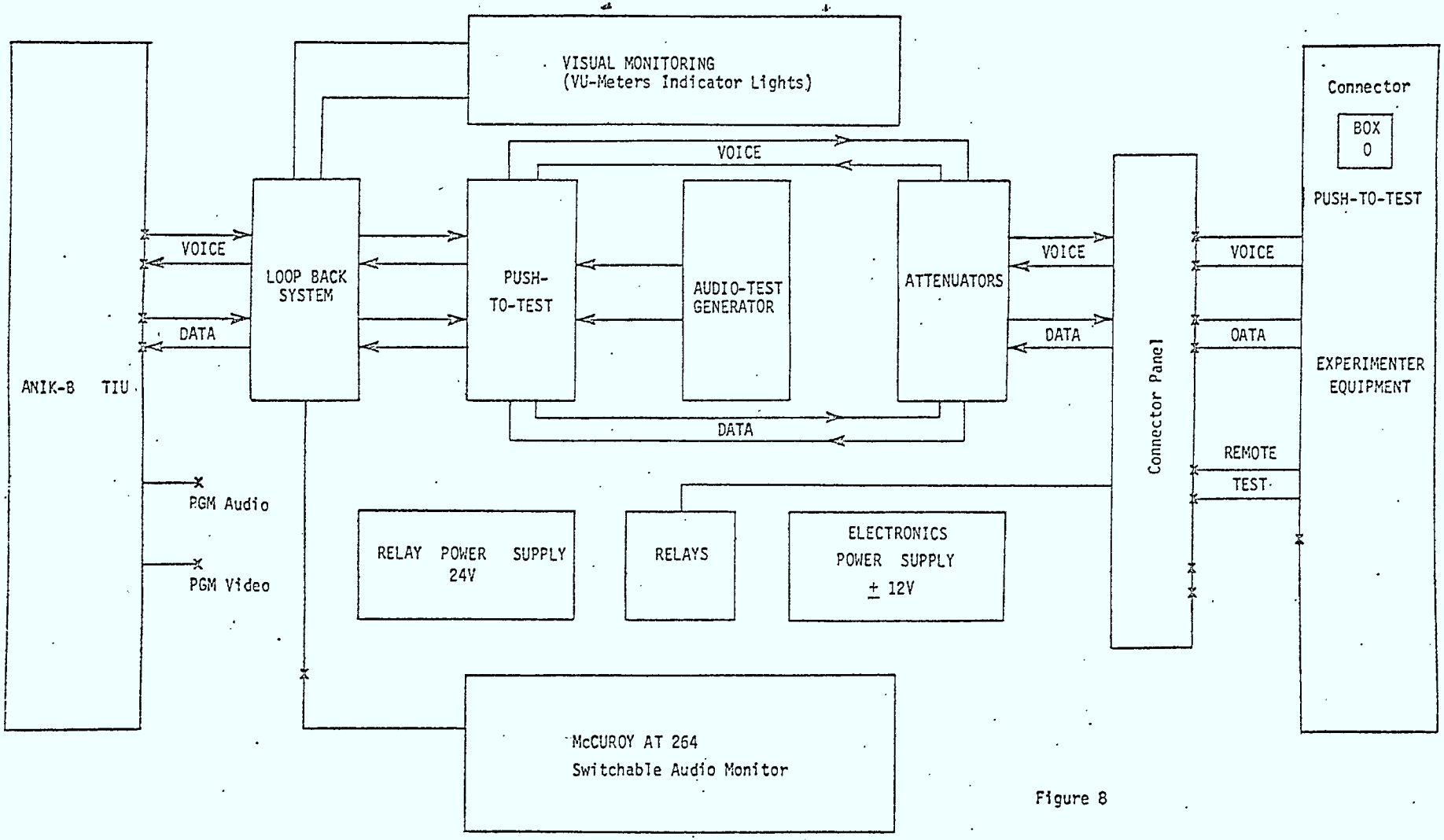


Figure 8

THE INSTALLATIONS AND OPERATIONAL CHECKOUTS AT THE EQUIPMENT LOCATIONS

The D.O.C. had the responsibility for the installation and maintenance of the satellite communication equipment. The experimenter and ETV as the subcontractor had the responsibility for the installation and maintenance of the experimenter equipment packages. At the remote locations the experimenter equipment consisted of a "Interface Box", the experimenter "Wall Interconnect Boxes", the "Darome" equipment package and "CVI Slow-Scan TV equipment" in at least one remote location.

The installation of the remote location D.O.C. and experimenter equipment took place in the week of August 18, 1980. However, the installation schedule had to be altered drastically since the D.O.C. technician had to replace a faulty transmitter unit on the oil rig NEDDRILL II. The D.O.C. Labrador installations could not be completed during the same week as the experimenter equipment was installed and therefore a complete systems check could not be carried out while both a D.O.C. technician and a ETV technician were on the site.

For the next few weeks a major effort was required to correct problems with the D.O.C. transmitter equipment at all sites. It was not until late in October that all three sites were operational for more than a few days in a row. The experimenter used the satellite communication channels when possible but had to fall back on many occasions to the "Two-Wire Dial Up" equipment.

The daily manpower requirements to trouble-shoot satellite communication channels also eased once the oil rig experiment was terminated.

Comprehensive "proof-of-performance" tests were carried out with all terminals on several occasions. Some tests were carried during "Sign On" procedures throughout the experiment period. Typical test results are in Appendix E, F and G.

As these results indicate, the overall performance of the satellite telephony channels exceeded the performance of terrestrial telephony channels. The signal-to-noise level problems encountered during the HERMES experiment interface period were not repeated. If the satellite equipment worked, it performed well.

The minor problems encountered with the experimenter equipment were related to the remote site bridging and the

tone decoding of the loop-back test switching.

Since no complete systems check could be carried out during the original equipment installations, signal level problems were encountered with the local loop interconnect to Menihek High School and the MUN Goose Bay location. These problems were overcome by realignment of the active bridging equipment which was part of the Interface Box.

The two digit DTMF code to activate the loop-back relays was falsely triggered by noise and other unknown circumstances. The loop-back decoders were reprogrammed for a three digit plus * for "On" and three digit plus # for "Off".

The reprogramming did not entirely correct the false triggering, however, it would trigger to loop-back so infrequently that no further action was thought necessary. Of course, the loop-back could be deactivated within seconds from the Headend by pressing the loop-back "Off" codes.

The Makkovik installation was delayed since it required the reconditioned equipment removed from the oil rig NEDDRILL II. The outdoor electronics package for the Makkovik terminal was installed on the ground about 60 feet from the nursing station. A security fence was erected around the 3-meter terminal installation. The interconnect cables entered the building at the basement level below ground through plastic pipes buried for this purpose in the ground.

After the D.O.C. equipment finally arrived at Makkovik, a D.O.C. and ETV technician were dispatched to complete the installation by November 26, 1980. Bad weather delayed their arrival to Makkovik until December 1. Some problems with the antenna foundation were experienced but the installation was completed and checked out by December 4, 1980. Bad weather delayed the departure of the technicians for an additional two days. Extra proof-of-performance tests were carried out. The Makkovik terminal performed with the same specification as the other installations. Future installation on the Labrador coast should be completed by mid-November to avoid severe travel restrictions and personal delays.

No additional maintenance trips were necessary for the Makkovik terminal until the decommissioning of the equipment in September 1981.

Many technical problems had to be overcome with the other satellite equipment installations. Transmitter failures were a major reliability problem.

THE SYSTEM TROUBLE-SHOOTING AND MAINTENANCE

For the operational period from late October 1980 until May 31, 1981, ETV provided ongoing systems maintenance for the overall project. This basically amounted to identifying and correcting the problem if it related to the experimenter equipment package. If the problem was with the D.O.C. satellite equipment package, we would notify D.O.C. of the problem and then assist D.O.C. with the correction whenever possible.

The majority of technical difficulties over the contract period related to the D.O.C. equipment package (transmitters). After isolation of the faulty equipment box, a replacement unit would normally be shipped from Ottawa and replaced by the technical coordinator with or without a D.O.C. technician at the site. In the case of St. John's, faulty D.O.C. equipment was in most cases replaced by ETV staff. No attempt of preventive maintenance was made for the experimenter equipment at any location. Problems would be corrected as needed and when required. Problems normally came in "two's" and "three's" and priority was normally given to the overall satellite communication system.

During the operational period, the technical involvement of ETV technicians normally consisted of the "Sign On" procedure and some tests at 9:00 in the morning of each workday with all remote sites. If a problem developed during the day, the Telemedicine Office or the 9-Meter Operator would contact ETV for the required corrective action. Murphy's Law stipulates that these problems would occur "at the worst possible time". This was true for the duration of this project creating some difficulties in assigning technicians. Many ETV activities are scheduled in advance and the unscheduled technical breakdowns of the satellite equipment caused some friction with the overall workload of the ETV Centre. A staff shortage (dismissal of the contractual project technician and the subsequent resignation of two other technicians) limited the technical back-up to this research project and caused some delays in ETV activities. The staff resources of the ETV Centre were stretched to the limit during this period.

DECOMMISSIONING

The D.O.C. and the experimenter equipment packages were decommissioned during the week of October 12, 1980 by an ETV technician while the NEDDRILL was preparing to leave its drilling location of Labrador. Originally the NEDDRILL II was to return to St. John's Harbour before leaving for its new drilling engagement in some other part of the world. There were no suitable shipping containers left on board after the installation. Return shipping containers were sent days before via a supply ship. These containers arrived late and proper packaging of some equipment was not possible. Some equipment damage occurred as the equipment arrived at ETV (October 22, 1980).

The majority of this equipment was subsequently installed in Makkovik after repairs and checkouts had been made.

Under a separate contract ETV decommissioned the equipment installed at Goose Bay and Makkovik. A field trip for D.O.C. and ETV technicians was coordinated during the week of September 14, 1981.

The terminals in Labrador City and in St. John's are still operational and will be decommissioned at a later date (To Be Announced).

APPENDIX A

Time Frame Anik B Telehealth

July 10, 1979

To have a reasonable change of a working technical system the following milestones can't be exceeded.

3 Sept. 79	Official START announced. (Delayed by three months)
By Oct. 79	Preliminary site survey. Maps Hire additional staff; (1 full-time Technician I) Minor equipment and parts purchases ($5,000). Interface design starts. Oil Rig technical feasability starts
By Dec. 79	Equipment layout and detailed interconnect design finalized. Tendering of equipment and materials.
Jan. 80	Final equipment selection complete. Ordering of all equipment and materials.
Feb. 80	Construction of interface boxes start. Changes Telehealth - ETV - HSC start. Site surveys and remote equipment installation details completed. Slow-Scan and other special Medical equipment tests start.
March 80	Site preparation contracts for remote and St. John's All equipment and materials received for interface and experimenter equipment package.
April 80	Changes at Telehealth, HSC, and ETV completed. Tests in Ottawa at bridging and signal/noise levels. Review of interface and trouble-shoot period and tests. Modifications.
May 80	All experimenter and interface equipment

	completely assembled for a simulation hookup; final tests and level settings. Proof-of-performance test. Trouble-shoot period interconnect and bridging. Workshop for hospital staff.
	Modifications and changes.
June 80	All interface and experimenter equipment shipped, installed, and checked.
10 June 80	TVT installation and interconnect completed. Trouble-shoot period starts. TVRT installation and interconnect completion. Tests with Ottawa.
	Tests with Ottawa plus other ground terminals.
	Possible modification - repairs - adjustment.
23 June 80	Proof-of-performance test of all audio, telephony, and video satellite links.
	Corrections - final adjustments.
28 June 80	Final system specification.
1 July 80	Official START (Oil Rig experiment only) (Labrador system delayed 3 months)
Oct 80	Decommission Oil Rig Experiment
May 81	Decommission (postponed) Labrador sites
31 May 81	ETV contract ends.
Sept. 14-18, 81	Decommission Makkovik and Goose Bay. (Separate contract).

APPENDIX B

P.O.P. TVRT St. John's (3M)

June 3, 1980

RCV (from Ottawa)

	Channel I	Channel II
1000 Hz 0 Db	+ 1.2	+ 4.4
+10	+10.8	+13.1
-10	- 8.2	- 4.5
-20	-17.2	-14
-30	-26.2	-23
-40	-35.1	-32.3
Noise (No Signal)	+31 dBrnc	+40 dBrnc
300 Hz 0 Db	-5.7	-2.7
3000 Hz 0 Db	-4.3	-1.2

XMT (to Ottawa) received as

	Channel I	Channel II
1000 Hz 0 Db	+ 2.1	-3
+10	+ 8.6	+2.6 (+3.8)
-10	- 7.9	-12.9
-20	-19.6	-22.9
-30	-27.9	-32.8
-40	-39.5	-42.7
No Signal (Noise)	+14 dBrnc	+13 dBrnc
300 Hz 0 Db	-14.8	- 9.4
3000 Hz 0 Db	- 3.8	-12.8

Crosstalk Channel I to Channel II:

Ottawa - XMT +10 on Channel I
St. John's - XMT +10 on Channel II

Measure:

Ottawa - measure RCV signal on Channel I = -50 Db
St. John's - measure RCV signal on Channel II = -49 Db

APPENDIX C

TECHNICAL
REPORT FOR NEDDRILL TELEMEDICINE PROJECT
Sequence of Major Events

JANUARY 1980

Preliminary meetings and discussions on the technical feasibility of installing a small satellite (ground) terminal on an oil ship started with Petro Canada.

FEB.-MARCH 1980

Technical information on various technical para-meters and data on their implications etc. were exchanged, evaluated and a decision was made to install a non steerable-small dish-satellite terminal to provide two telephony audio channels assigned one for Teleconference Voice and one for Data (Slow Scan TV, Vital Signs, Voice coordination, etc.) on board of a Petro Canada Drill ship. The major technical objective was the performance evaluation of a non tracking 32 inch dish antenna on board an oil ship on Newfoundland's East Coast.

APRIL-MAY 1980

Neddrill 2 was selected as the most likely ship. Detailed technical drawings, block diagrams, equipment specifications and layouts etc. were discussed with and then forwarded to Petro-Canada. Final mechanical arrangements for the rotation of the satellite dish antenna were reviewed. (Location - access - interconnect etc.). Possible "On Board" manpower support (Technical Coordination) could not be finalized. Other precise details had to await arrival of ship (physical distance-equipment locations etc.).

MAY 14, 1980

Meetings were held in St. John's with officials from D.O.C. Ottawa, Petro-Canada and Telemedicine in an attempt to finalize all remaining arrangements as they relate to the Neddrill 2 installation and the overall satellite experiment.

JUNE 1980

All Telemedicine equipment was assembled and interconnected for trouble shooting and simulation experiments. Some minor modifications and changes were made.

St. John's 3 Meter Terminal was installed at MUN Education Building and Proof of performance acceptable. Technical performance of Telemedicine-interface equipment was checked out

via satellite to Ottawa. Telemedicine equipment was packaged, crated and delivered to Petro Canada June 26th and 27th.

Neddrill 2 arrived June 29, 1980 at approximately 2000 hours, Pier 17.

JUNE 30, 1980 10:30 AM

First time on board an Oil Rig. Met Captain, Radio Operator, and male nurse. Discussed Telemedicine project and ways of on board implementations.

Power on board is 220 volt A.C. not 110 volt. Major effort to convert or adapt equipment for 220 volt operation. Antenna base could not be placed where orginally planned - Bridge Deck Structure was aluminium and did not permit welding. Installation falls behind schedule.

JULY 2, 1980

Quick tests are carried out between oil rig in St. John's harbor to Ottawa and to MUN. All seems well.

JULY 3, 1980

(Rig still in harbor). First comprehensive proof of performance between oil rig - Ottawa - MUN - St. John's reveal minor audio level problem on Data Channel. Otherwise performance equal to or better to commercial telephone service.

JULY 4, 1980 10:00 AM

MUN to Neddrill 2 while steaming at 11.2 knots through Strait of Belle Isle on its way to Labrador. Heading 341° - winds 8 knots from SW - cloudy - RF carrier signal 96 - slightly fluctuating ± 4. Various technical tests including "Loop Back's" were carried out - all OK. Maintained contact without interruption or antenna realignment till shortly before 1300 hours for lunch break.

Testing was continued (after Ottawa 9 M problem corrected) at approximately 1420 hours. RF carrier obtained was now 84 but fluctuations were now from 70 to 90 with no noticeable effect on Voice and or Data Channel performance. Mechanical realignment

of the antenna was accomplished in less than 5 minutes for the 1400 hours test period. Continous contact was maintained till almost 1600 hours and even so the RF carrier reading was now just above 30. Communications were still possible. No attempt to realign antenna was made and testing was discontinued for the day.

JULY 5-8, 1980

Regular short tests including some Slow Scan TV were carried out at least two periods a day, but voice contact was established regularly at 1000, 1200, 1400 and 1600 hours (ETV technician on board).

JULY 9, 1980 10:30 AM

No contact could be established with Neddrill 2. Ottawa could not see Neddrill's transmit carrier. D.O.C. Transmitter fuse blown. Immediate attempts (and additional attempts with spare fuses shipped via a crew change, July 16) failed to restore transmitter. No immediate spare equipment available from Ottawa. (ETV technician returns).

JULY 16, 1980 10:00 AM

MUN transmitter blows fuses and problem could not be corrected. Transmitter electronics shipped to Ottawa for repairs.

AUGUST 12, 1980

Attempts to restore transmitter on Neddrill 2 by ETV-MUN staff failed. They can hear us fine, but can't transmit. St. John's Terminal again operational.

AUGUST 21-24, 1980

Attempts by D.O.C. technician to restore Neddrill 2 equipment are only partially successfull. (Transmitter not enough power-barely enough for one channel). This transmitter fails on August 28, 1980. August 28-September 18 our CBC news cast could be received on board on days the antenna was aligned. (See carrier reading sheets).

SEPT. 9-22, 1980

Reliability of all D.O.C. Terminal equipment at all sites unacceptable. MUN ceases further testing and trouble shooting of satellite equipment. D.O.C. is requested to service their equipment.

Logistic to get D.O.C. technician to Neddrill 2 week of September 15th complicated. For this and other reasons it was decided to terminate Telemedicine oil rig experiment.

SEPT. 22-23, 1980

Neddrill pilot lock light out - no RF carrier readings could be obtained. Suspect additional D.O.C. equipment problems (IF - Pilot Unit).

OCTOBER 12-16, 1980

MUN-ETV Technician decommissioned D.O.C. and telemedicine equipment. Since oil rig was expected to return to St. John's suitable return shipping containers had to be sent via supply ship. Containers arrived late, proper packaging of some Telemedicine equipment was not possible. Some transport damage occurred.

OCTOBER 22, 1980

D.O.C. and Telemedicine Equipment back at MUN for refurbishing and voltage conversion for later installation at Makkovic and Labrador City.

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X8

Educational Television Centre

Telex: 016-4101
Telephone: (709) ~~753-1200~~ 737-7557

APPENDIX D

July 17, 1980

TO: Neddrill 2 Radio Operator
Mr. Peter Jongman and Male Nurse, Mr. Harry Kuipers

FROM: Ken Hauschildt

SUBJECT: Telemedicine Equipment

Our contact via Radio Telephone Hopedale on July 16, 1980 was not very satisfactory and information exchange was not clear.

Problems exist with the outdoor electronics "up-converter" (transmitter). Fuse must be a 3 amp. so that a heater circuit, if required by low operating temperature can automatically switch on.

Present status:

We have convinced the Department of Communication, Ottawa that "the fuse" is not the only problem with the "up-converter" (transmitter) and will make arrangements to replace faulty "up-converter" shortly. We will inform you as soon as possible.

Can we ask for your cooperation and patience and leave the "IF-Pilot-Receiver" unit in the "RECEIVER ON" only mode until the transmitter problem is corrected.

Further can I ask you, even so the transmitter is not working, to reposition the outdoor dish antenna once a day and record for us (sheet enclosed) the readings achieved. This will help us to evaluate the receive RF footprint of the Anik-B satellite.

Thank you for your cooperation!

K. Hauschildt

Ken Hauschildt

NEDDRILL 2 TELEMEDICINE

DATE	TIME local	REPOSITION REQUIRED	TIME REQUIRED FOR REPOSITION	RF-CARRIER (IF FLUCTUATING GIVE RANGE
EXAMPLE:				S = Steady
July 19/80	9:00 am	No	-	80 S
July 20/80	15:00 pm	Yes	5 Minutes	65 - 90
July 20/80	16:00 PM	YES	3 MINS.	95 - 100
July 21/80	10:00 PM	YES	2 MINS.	86 - 90.
July 22/80	08:00 AM	YES	1 MIN.	90.
July 23/80	12:30 PM	YES	3 MIN.	[illegible]
July 24/80	15:00 PM	YES	3 MIN	± 40 - 50
July 25/80	08:30 AM	YES	1 MIN	60
July 25/80	11:40 AM	YES	2 MIN	100
July 26/80	10:05 AM	YES	1 MIN	95 - 100
July 27/80	12:50 PM	YES	1 min	40 - 50
July 31/80	12:00 PM	yes	1 min	80
aug 1/80	12:00 PM	yes	1 min	86
aug 4/80	12:00 pm	yes	1 min	100
aug 6/80	12:00 pm	yes	1 min	80
aug 7/80	12:00 pm	yes	1 min	80
aug 22/80	12:00 pm	yes	1 min	100
aug 26/80	10:00 am	yes	1 min	80
[illegible]	10:00 am	yes	30 sec (+ 1)	80-100
Aug 29/80	1150	YES	1 min	100
SEPT 3/80	1100	YES	1 min	60 - 80
SEPT 5/80	1100	YES	2 min	90 - 100
SEPT 9/80	1020	YES	1-2 min	50 - 60

NEDDRILL 2 TELEMEDICINE

DATE	TIME	REPOSITION REQUIRED	TIME REQUIRED FOR REPOSITION	RF-CARRIER (IF FLUCTUATING GIVE RANGE
EXAMPLE:				S = Steady
July 19/80	9:00 am	No	-	80 S
July 20/80	15:00 pm	Yes	5 Minutes	65 - 90 %
SEPT 10/80	10.00 AM	~~Yes~~ NIL	(SAME HEARING g/g	100 %
SEPT 11/80	1100	NIL	(HEARING SAME)	100 %
SEPT 12/80	1000	YES	2 min	100
SEPT 17/80	1230	YES	3 min	40-60
SEPT 18/80	10:00	NIL	—	50-60

ANIK TEST LOG

DATE: Dec 1, 1989 APPENDIX E TIME: 9:00

1. St. John's Terminal

   RF Carrier Reading: 89 Pilot Lock: ☑

   Any Problems: _____

2. Confirm "Noise" overnight has not activated Loopback Decoders: Connect telephone XMT to "Anik Voice XMT" and dial

   11 ##
   21 ##
   51 ##

   Connect telephone XMT to "Anik Data XMT" and dial

   12 ##
   22 ##
   52 ##

3. Contact Goose Bay (Dial 3)

	GO	NO GO
Confirm Voice conversation Data Channel Two Way	☑	☐
Confirm Voice conversation Voice Channel Two Way	☑	☐

   Note RF Carrier: 76

   XMIT - 5.4c
   Rec - 5.4c

Note Push-to-Test RCV:	VOICE	DATA
XMT Reference Tone: Site RCV:	-1.5 / -3	-8 / -2

   Any Problems: _____

4. Contact Labrador City (Dial 7)

	GO	NO GO
Confirm Voice conversation Oata Channel Two Way	☑	☐
Confirm Voice conversation Voice Channel Two Way	☐	☐

   Note RF Carrier: 92

Note Push-to-Test RCV:	VOICE	DATA
XMT Reference Tone: Site RCV:	-9 / -2	-7 / 2+3

   Any Problems: _____

5. Contact Makkovic (Dial 515)

	GO	NO GO
Confirm Voice conversation Data Channel Two Way	☑	☐
Confirm Voice conversation Voice Channel Two Way	☑	☐

   Note RF Carrier: 96

Note Push-to-Test RCV:	VOICE	DATA
XMT Reference Tone: Site RCV:	-7 / -3	0 / 11

   014 - 014 - 1 - 20

   Any Problems: _____

6. If problems with any site contact Ottawa (Dial 0)

   Confirm "Carrier" are up
   Confirm "Bridging" for Voice Channels ☐
   Confirm "Bridging" for Data Channels ☐

   Note Problem: _____

7. Contact Telehealth by 9:15 a.m. report status

   All O.K. ☐ St. John's ☑ Goose Bay ☑
   Lab City ☑ Makkovic ☑
   MUN-Goose ☑ Menikek Lab ☐

   (Check working sites)

APPENDIX F

ANIK - B LOOP TEST Date: Dec 3/80 Time: 3:20

St. Johns with: MAKKOVIC

XMT 1000 Hz	RCV VOICE (Level)	RCV DATA
+10	+1.6	+9.0
0	-7.5	+0.1
-10	-16.1	-9.0
-20	-24.2	-18.4
-30	-32.8	-28.3
-40	-39.9	-37.6
-50	-43.5	-43.4

Noise below (VOICE -44.5) (DATA) -45.9

XMT 0 DB	RCV VOICE	RCV DATA
300 Hz	-28.7	-24
350 "	-18.9	-12.8
500 "	-9.5	-2.3
1000 "	-7.5	+0.4
1500 "	-9.8	-1.7
2000 "	-13.5	-5.3
2500 "	78.5	-11.2
3000 "	-25.4	-18.9
3500 "	-33.7	-27.8

Notes:

APPENDIX G

ANIK B Test Date: Dec 3/80 Time: 3:00 pm.

St. Johns with: MAKKOVIC

RCV P T-T Voice: -7 @ VU XMT VU: -2 VU

RCV P-T-T Data: -0.5 VU XMT VU: -1 VU

0 DB XMT Voice: Interlora VU: -2

0 DB XMT Data: Interlora VU: +1

Noise level Voice: [redacted] -45

Noise level Data: -45

Daroma XMT on Voice RCV VU: peak -2 AV -5 St. Johns VU site

Daroma XMT on Interlora RCV VU: peak -4 AV -8 VU

R.F Control Reading: 99 [redacted]

LOOP BACK VOICE. O.K.

XMIT 0 db at 1000 Hz.

Received -7.5

LOOP BACK DATA.

XMIT 0 db at 1000 Hz.

Received +0.5

Any problems: