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Remote Automatic Multipurpose Station

Prepared by

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TECHNICAL SUMMARY

During the past report period a new solid state timer was developed and fabricated for the thermoelectric power supply system.

A second field trip was made to Barrow and the timer was installed. It was set to cycle every four hours for four minutes. At this time, the carrier frequency was shifted from a temporary frequency of 6.544 MHz to its permanent assignment at 6.221 MHz. The system was placed on the air on the 29th of February and was monitored for one month from the AIDJEX site which was approximately 300 nautical miles from Barrow.

Operation of the system was excellent with a maximum outage duration on the link of 1 1/2 days due to a polar cap absorption event. This was verified with a disruption of other HF communication between Barrow and the AIDJEX camp.

At the end of the month, the system was shut down, dismantled and shipped to the AIDJEX camp on the R4D. The system was reassembled at the AIDJEX camp and placed on the air 3 April. This will allow realistic tests of the system in the ice pack environment.

TECHNICAL RESULTS

Timer

A flexible solid state timer was developed and fabricated for the LORAMS system. The unit provides selectable cycle times of 3, 4, 6, 12 or 24 hours and selectable "ON" times of one to nine minutes in one minute steps. The timing is derived from a crystal oscillator with a stability of five parts in 10^7, thus the turn on error should be less than a minute at the end of a years life. A solid state switch is used to connect the transmitter to the power supply thus there are no mechanical contacts to deteriorate under the 17 amp transmitter load.

Field Trip

A trip was made to Barrow on 18 February to install the new timer, finalize the TE cell installation and modify the system to the new assigned frequency. The new timer cards were installed in the frequency synthesizer chassis and the synthesizer was reprogrammed for the new transmit carrier frequency of 6.221 MHz. The subcarrier channel chosen for the operation was 850 Hz with a deviation $\pm$85 Hz. The modified equipment was bench tested at NARL and performed well. The DDRR antenna was transferred from the old motor generator housing to the smaller TE cell housing and the antenna was lengthened to resonate at the new lower frequency. Access doors were cut into the TE cell housing to facilitate adjusting the system with a minimum heat loss. Figure 1 shows the access to the electronic equipment and batteries.

The system was placed on the air 29 February and monitored at NARL until 3 March. Operation during this time was flawless and the housing maintained an average differential temperature between the outside ambient and electronic location of +34° C. The battery also appeared to be satisfactorily recharged between cycles. On 3 March, the monitoring point was changed to the AIDJEX camp approximately 300 nautical miles from Barrow. Strong signals from the LORAMS were received consistently at AIDJEX over the next three weeks with the exception of 1 1/2 days during which a polar cap absorption event occurred. This was verified because all other HF communication between AIDJEX and Barrow were disrupted. Severe interference was occasionally noted because the frequency is shared with other Navy services. On 28 March, the LORAMS was shut down and dismantled for shipment to the AIDJEX site. At shutdown, the battery voltage and temperature differential was the same as measured during the first few days of operation. The entire station was loaded aboard the R4D and flown to AIDJEX. On 3 April, the system was back on the air at AIDJEX and was being received at Barrow. Figure 2 shows the installation at the AIDJEX camp. The initial temperature differential after installation had dropped to 20°C because the ice seal that had built up on the inside walls at Barrow had melted during shipment. The ice seal will build up again as long as it remains cold and will melt again during the summer months. The housing was stocked with six propane bottles which will provide enough fuel for a year's operation. A barometric

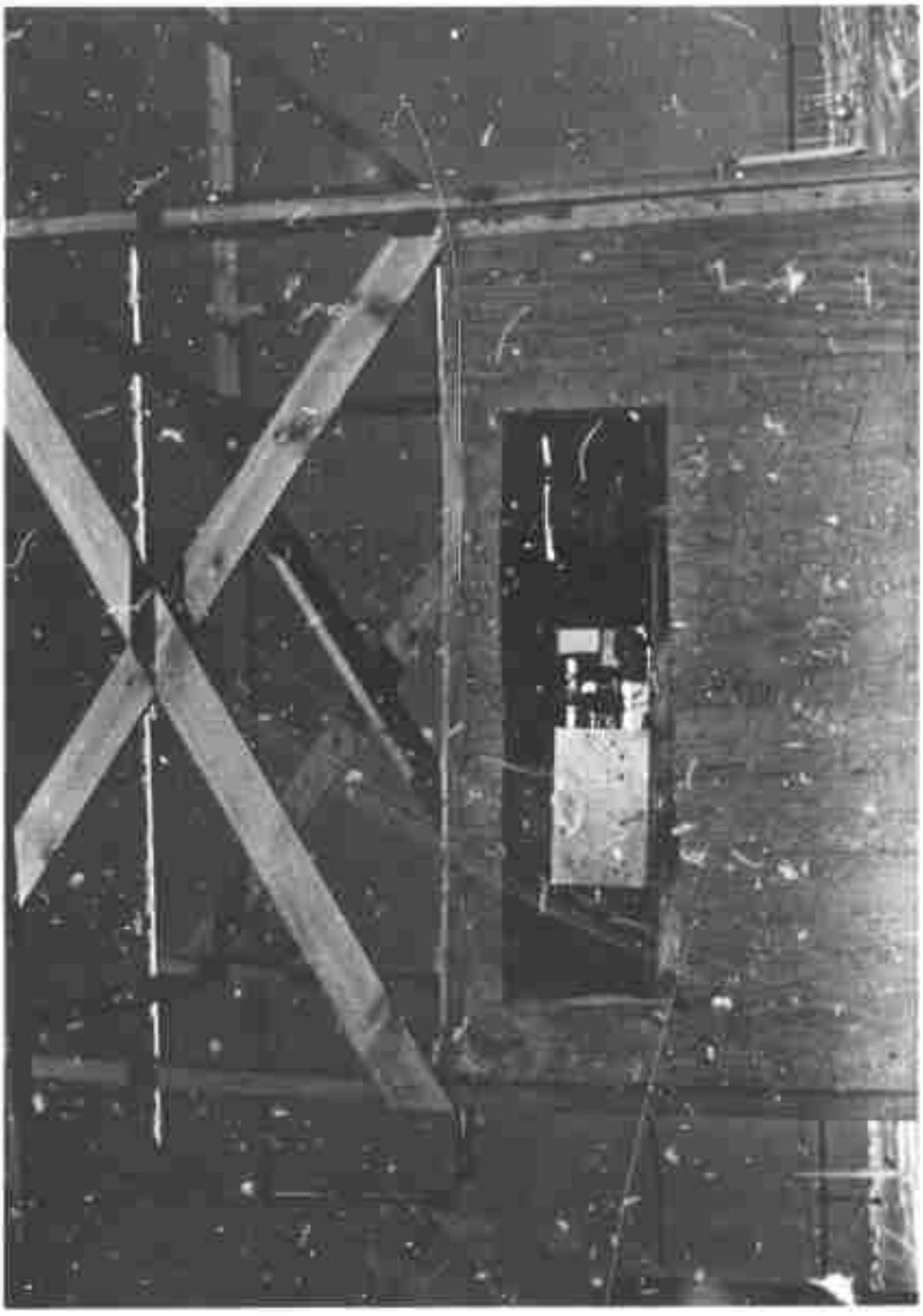

Figure 1. Access Door to Transmitter and Batteries

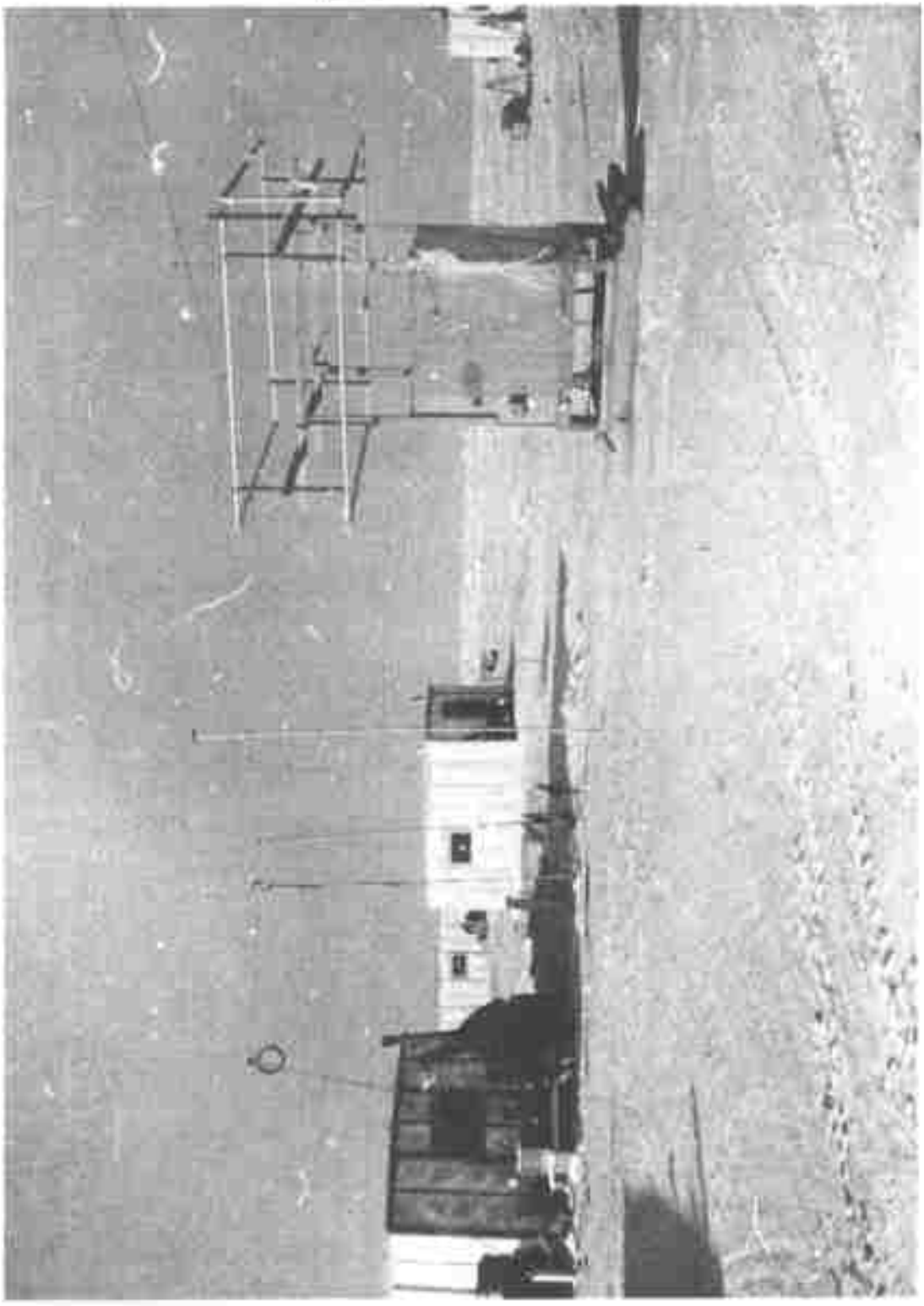

Figure 2. LORAMS Station at Aidjex Site

sensor and memory left at the site by the AIDJEX project have been connected to the LORAMS data input. Periodic recordings of this signal will be made at NARL and will allow evaluation of the modulation system being used and the data recovery system which will be developed in the next phase.

FUTURE WORK

A second LORAMS station will be fabricated and installed at NARL for long term testing. This station will use a combination TE cell and battery power supply. A receiver will be installed at Wales to monitor both LORAMS stations. A 10,240 bit recirculating digital memory and a data logger will be built.

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