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NORSAR

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U. ARRAY MONITORING AND FIELD MAINTENANCE

This section includes a review of actions of remote array monitoring at NORSAR Data Processing Center (NDPC) and maintenance accomplished at the subarrays and the NORSAR Maintenance Center (NMC) by the field technicians.

Subarray Monitoring Schedule

The planned schedule for the remote array monitoring (AM) has been well met. Only on one occasion were the monitoring routines delayed one week. The schedule is presented in Table U.1. The off-line computer requirement for AM is in average approximately 20 hours per month. Including the on-line tests the on-line computer time requirement is approximately 77 hours.

TABLE U.1
Monitoring Rates for AM Programs

Biweekly	Monthly	Bimonthly	Quarterly	Annually
LPCAL RSA/ADC Test	SLEMTEST	MISNO CHANEVSP SACPSP*	CHANEVLP	SACPLP
* Subarrays with newly overhauled seismograph amplifiers are analyzed every four months.				

Maintenance Visits

Figure U.1 shows the number of visits to the different subarrays in the period. Excluding visits caused by troubles in the communications system, the subarrays have in average been visited 3.2 times. The large difference from average for subarray 04B is explained by troubles in mass position (MP) bridge and appurtenant power supply (7 visits). At 05B cable breakage repair counts for four visits.

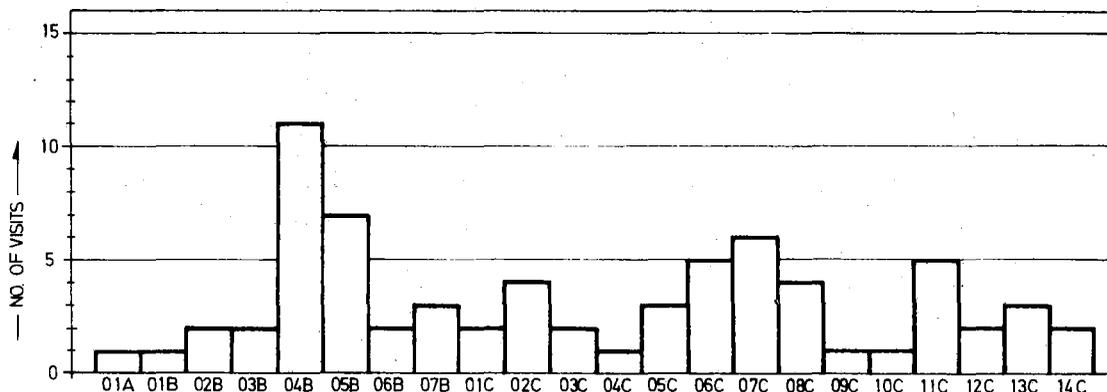


Figure U.1 Number of maintenance visits to the NORSAR subarrays, 1 January-30 June 1974.

Preventive Maintenance Projects

Work accomplished as part of this type of the preventive maintenance of NORSAR is described in Table U.2. The work at Well Head Vaults consisted of maintenance such as painting of the wood frame, replacement of RA-5 amplifiers and control of all circuits at the site. The new RA-5s installed had been fully overhauled with new power batteries mounted.

TABLE U.2

Preventive maintenance accomplished at NORSAR during the period

Unit	Action	No. of Channels		Comments
		Accomp.	Remaining	
SP Seism.	Adjustment of damping	17	1	02C02; 03C01,02,05,06; 05C01,02; 06C02,03; 07C01,06; 08C01,02,05; 11C05,06; 13C05. (Remaining 10C03)
RA-5	Modification of RA-5 input card	8	2 *)	02C01,02; 03C01,02,05; 11C04,05,06. (Remaining 10C04; 12C05)
LTA	Adjustment of SP DC offset to positive bias (Ref. Larsen and Nilsen 1974)	113	-	01A; 01B; 02B01-05; 04B; 05B; 06B; 07B; 01C; 02C; 03C01,04,05; 05C; 06C; 07C01-04,06; 08C; 09C01,03-06; 10C; 11C; 12C; 13C01,02, 04-06; 14C
WHV and	Construction maintenance	30	20	02C01,02; 03C; 05C; 06C; 07C; 08C; 11C; 13C05.
RA-5	RA-5 replacement	38	22	
*) Both are modified for noise suppression, but variable damping resistance is lacking.				

Disclosed Malfunctions on Instrumentation and Electronics

Table U.3 gives the number of accomplished adjustments and replacements of field equipment in the total array with the exception of those mentioned in Table U.2.

TABLE U.3

Total number of required adjustments and replacements in the NORSAR data channels, 1 January - 30 June 1974.

Unit	Characteristic	SP		LP	
		Repl.	Adj.	Repl.	Adj.
Seismometer	Damping		3		8
	RCD			5	1
Seismometer amplifier	Gain	4			
	Distortion	1			
LTA	Ch. gain		13		2
	Filter discr.	1			
	DCO	17	2		
	CMR		8		2
BE Card		15			
SLEM					
BB gen.		1	3		
SP gen.			1		
RSA/ADC		1	4		
DU		1			

Malfunctions of Rectifiers, Power Loss, Cable Breakages

No malfunctions on the subarray rectifiers have been reported. Main AC power faults caused shorter outages on four subarrays: 02B, 03B, 04B and 10C.

The cable breakage season started in the middle of May; since then eight cable breakages have occurred in all types of cables.

Workshop Repairs

All units removed from the field (refer Repl. columns in table U.3) this and previous reporting period have been repaired, with the exception of a few SP seismometers. The number of SP LTA cards taken to NMC for repair are increasing. At present 80 cards with ripple and DC offset faults are remaining at NMC. Most of these will be usable after the proposed wide-range DC offset adjustment modification is accomplished.

New Instruments and Facilities at NMC

A simulated SP subarray at NMC was taken into regular use in January when an on-line communication line, connecting NMC and NDPC was released by NTA. The possibility to pre-check components before installation in the field has been very valuable, especially during the accomplishment of the preventive maintenance program including replacement of RA-5 seismometer amplifiers.

Improvements

The status of a number of investigations to prepare lasting solutions to problems or time-consuming maintenance of certain units experienced during the operation of NORSAR is commented in Table U.4.

TABLE U.4

Status of proposed improvement of NORSTAR's field equipment.

Subject	Action
Depression of noise in SLEM discrete inputs (DI)	Modification is under testing at 05C (modification 3b in Larsen 1973) and at 06C (see Figure U.2).
Too low surge rating of BE protection card	Modified BE cards with 5 W wire-wound resistors are under testing at 11C on all SP channels.
False triggering of CTV water monitor	Modified prototype has been tested at 04B. A report is in print.
Trends towards negative DC offset in the SP/LTA.	Original offset trim potentiometers is replaced by 360 K Ω potentiometer, which gives adjusting range of ± 135 mV (previously ± 30 mV). Modification has been tested at 03B and 05C. Results are presented in Larsen and Nilsen 1974.

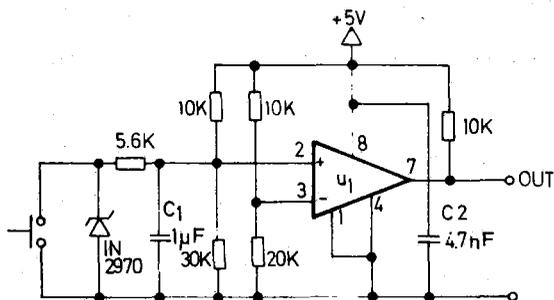


Figure U.2 Input comparator with noise filter.

Comparator U_1 : LM 311H National Semiconductor
or ML 311T Microsystems International

Resistors: All 1/4 W \pm 5%

Capacitors: C_1 metallized mylar 100V
 C_2 ceramic 25 or 50 V

Conclusion

The field instrumentation and facilities are in good stanard and have operated satisfactorily throughout the period. Compared with previous periods (see Steinert and Nilsen 1973 a,b and Bungum 1974, Chapters P and Q) the corrective maintenance has been somewhat less in this period, thus indicating a stable trend. As experienced previously a seasonal instability in the LP seismometers' MP and FP has been observed during spring thaw, requiring a number of unscheduled calibrations.

The preventive maintenance program for the WHVs and RA-5s has been kept up to schedule and will be fulfilled this summer and fall.

The observation of a trend towards negative DC offsets in the SP channels, caused by a permanent change in the pre-sampling filters, has resulted in a report on a proposed modification which is necessary to restore the LTA cards taken in for "unadjustable" DC offset. An array average negative DC offset of 4 quantum units at fall 1973 has been compensated by adjusting the channel offset with positive bias whenever feasible. At the end of the reporting period the array average was nominal.

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