



CairnGorm Mountain Ltd.
[REDACTED]
Aviemore
Inverness-shire PH22 IRB
Scotland, Great Britain

Stans, August/09/2013

SSB Cairngorm, Scotland

Measurement report 2013, S13-24538

The inspection has been carried out from 23rd - 25th July 2013 by [REDACTED]

Trip counter:	11'471
Operating hours main motor 1:	9'708
Operating hours main motor 2:	9'659

DRIVE STATION CONTROLS

General controls:

- | | |
|---|----|
| - Control cabinets checked | OK |
| - Optical control of the installations and switches | OK |

Control PSS / SPS:

- | | | |
|-------------------------|---------|---------|
| - PSS CRC (ASTA) | =1-A201 | 1744 |
| - PSS battery (ASTA) | =1-A200 | 3.1 VDC |
| - SPS battery (Drive) | =1-A250 | 3.7 VDC |
| - SPS battery (Visinfo) | =1-A260 | 3.7 VDC |

Voltage and current measurements:

- | | | |
|----------------------------------|---------|-----------|
| - Line power supply | | 3x410 VAC |
| - Power supply 230 VAC | | 240 VAC |
| - Battery charge emergency brake | =1-G201 | 26.2 VDC |
| - Battery charge emergency brake | =1-G201 | 9.0 A |

- Battery charge service brake	=1-G202	26.6 VDC
- Battery charge service brake	=1-G202	9.0 A
- Power supply +/-15 VDC	=1-A101	14.8 / -14.9 VDC
- Power supply +5 VDC, RS232	=1-A101	5.0 VDC
- Power supply +5 VDC, processor	=1-A101	5.0 VDC
- Power supply +/-15 VDC	=1-A102	14.9 / -14.9 VDC

Brake control:

- Valve voltage emergency brake	=1-Y101	23.1 VDC
- Valve voltage emergency brake	=1-Y102	27.0 VDC
- Valve voltage service brake	=1-Y103	25.4 VDC
- Valve voltage service brake, close / open	=1-Y104	12.4 / -12.1 VDC

Drive control [v = 100%; ↑ 1 up, ↓ 1 down]:

- Reference value (operation mode direct) ↑		10.04 VDC
- Reference value (operation mode direct) ↓		10.04 VDC
- Reference value (PSS output) ↑		8.33 VDC
- Reference value (PSS output) ↓		8.33 VDC
- Motor speed ↑	=1-M1/2	1'552 U/min
- Motor speed ↓	=1-M1/2	1'551 U/min
- Tachogenerator TA1 ↑	=1-B2	59.5 VDC
- Tachogenerator TA1 ↓	=1-B2	59.4 VDC
- Tacho adaption TA1 ↑	=1-A104	8.29 VDC
- Tacho adaption TA1 ↓	=1-A104	8.27 VDC
- Pulse encoder TM ↑	=1-B1.2	2'586 Hz
- Pulse encoder TM ↓	=1-B1.2	2'586 Hz
- Tacho adaption TM ↑	=1-A103	8.35 VDC
- Tacho adaption TM ↓	=1-A103	8.35 VDC
- Pulse encoder TA ↑	=1-B30	1'664 Hz
- Pulse encoder TA ↓	=1-B30	1'667 Hz

Speed trigger / Speed supervision:

- 0,3 (1)	↑ / ↓	0.37 / 0.27 m/s
- 0,3 (2)	↑ / ↓	0.34 / 0.26 m/s

Brakings / Overspeed:

- Service stop no-load, speed		10.0 m/s
- Service stop no-load, deceleration time		18.5 s
- Service stop no-load, deceleration		0.54 m/s ²
- Service stop no-load, torque at stop		-443 Nm
- Deceleration time from v = 100% to v = 0%		10.3 s
- Acceleration v = 0% until v = 100%		29.2 s
- Deceleration supervision service stop TM		OK
- Deceleration supervision service stop TA		OK
- Deceleration supervision slow stop TM		OK
- Deceleration supervision slow stop TA		OK

- Interlock of service and emergency brake		OK
- Test valve emergency brake		OK
- Overspeed 110% 1 up		11.16 m/s
- Overspeed 110% 1 down		11.16 m/s
- Overspeed 115% 1 down		11.66 m/s
- Service brake supervision "open" 1		OK
- Service brake supervision "open" 2		OK
- Service brake supervision "close" 1		OK
- Service brake supervision "close" 2		OK

Pilz programmer:

- Fibre optic encoder 1.1 (pulse interval ratio)	=1-B112	51 %
- Fibre optic encoder 1.2 (pulse interval ratio)	=1-B113	51 %
- Fibre optic encoder 2.1 (pulse interval ratio)	=1-B122	52 %
- Fibre optic encoder 2.2 (pulse interval ratio)	=1-B123	50 %
- Pulses with oscilloscope checked		OK
- Counter, cabin 1 in DST	C1 / C2	0 / 0 Imp
- Correction, cabin 1 in DST	C1 / C2	32 / 27 Imp
- Counter, cabin 2 in DST	C1 / C2	6600 / 6600 Imp
- Correction, cabin 2 in DST	C1 / C2	33 / 26 Imp
- Fixpoint supervision, entrance cabin 1, window start		9.95
- Fixpoint supervision, entrance cabin 1, fixpoint		9.60
- Fixpoint supervision, entrance cabin 1, window end		9.15
- Fixpoint supervision, entrance cabin 2, window start		9.95
- Fixpoint supervision, entrance cabin 2, fixpoint		9.60
- Fixpoint supervision, entrance cabin 2, window end		9.15
- S7-Counter, cabin 1 in DST	C1 / C2	0.0 / 1970.0 m
- S7-Counter, cabin 1 in CST	C1 / C2	1970.0 / 0.0 m
- Approach supervisions	Speed	Trip at / Stop at
- Approach supervision, cabin 1 with TD	10.0 m/s	128.0 / 41.7 m
- Approach supervision, cabin 1 with TD	4.0 m/s	26.0 / 17.2 m
- Approach supervision, cabin 1 with TM	10.0 m/s	130.0 / 42.8 m
- Approach supervision, cabin 1 with TM	4.0 m/s	25.0 / 17.0 m
- Approach supervision, cabin 2 with TD	10.0 m/s	128.0 / 40.3 m
- Approach supervision, cabin 2 with TD	4.0 m/s	23.0 / 16.7 m
- Approach supervision, cabin 2 with TM	10.0 m/s	128.0 / 43.7 m
- Approach supervision, cabin 2 with TM	4.0 m/s	24.0 / 16.4 m

Remote supervision system:

- Voltage	B+/B-	26.4 VDC
- Current	B+	1.63 ADC
- Current	F8	1.48 ADC
- Power supply	=33-059u	24.3 VDC
- Tunnel gate supervision, normal voltage	=33-048u1	12.4 VDC
- Tunnel gate supervision, normal current	=33-048u1	22.8 mA
- Tunnel gate supervision, interrupt	=33-048u1	13.4 / 110 VDC / Ω
- Tunnel gate supervision, short circuit	=33-048u1	10.6 / 1.5 VDC / $k\Omega$
- Stop intermediate station, normal voltage	=33-058u	12.3 VDC
- Stop intermediate station, normal current	=33-058u	22.0 mA
- Stop intermediate station, interrupt	=33-058u	13.7 / 155 VDC / Ω
- Stop intermediate station, short circuit	=33-058u	10.8 / 2.1 VDC / $k\Omega$
- Haul rope supervision, normal voltage level 1	=33-073u	11.3 / 51 Vpp / % adjusted: 14.8 / 66 Vpp / %
- Haul rope supervision, test level 1	=33-073u	0.1 / 2 Vpp / % adjusted: 0.1 / 2 Vpp / %
- Haul rope supervision, switch off level 1	=33-073u	5.6 / 20 Vpp / % adjusted: 5.0 / 20 Vpp / %
- Haul rope supervision, switch off resistance level 1	=33-073u	3'570 Ω adjusted: 1'500 Ω
- Haul rope supervision, normal voltage level 2	=33-075u	11.0 / 51 Vpp / % adjusted: 15.0 / 66 Vpp / %
- Haul rope supervision, test level 2	=33-075u	0.1 / 2 Vpp / % adjusted: 0.1 / 2 Vpp / %
- Haul rope supervision, switch off level 2	=33-075u	5.7 / 20 Vpp / % adjusted: 5.1 / 20 Vpp / %
- Haul rope supervision, switch off resistance level 2	=33-075u	3'812 Ω adjusted: 1'500 Ω
- Transmitter TF	=33-177u	1.3 Vpp
- Amplifier TF	=33-029u2	15.0 Vpp
- Receiver TF cabin 1 (cabin in DST)	=33-211u	7.1 Vpp
- Receiver TF cabin 1 (cabin in CST)	=33-211u	5.9 Vpp
- Receiver TF cabin 1, power supply	=33-211u	18.1 VDC
- Receiver TF cabin 1	=33-213u	1 / 17 VDC
- Receiver TF cabin 1, power supply	=33-213u	5.0 / 17.9 VDC
- Receiver TF cabin 2 (cabin in DST)	=33-221u	5.3 Vpp
- Receiver TF cabin 2 (cabin in CST)	=33-221u	5.7 Vpp
- Receiver TF cabin 2, power supply	=33-221u	18.0 VDC
- Receiver TF cabin 2	=33-223u	1 / 17 VDC
- Receiver TF cabin 2, power supply	=33-223u	5.0 / 17.9 VDC

COUNTER STATION CONTROLS

General controls:

- Control cabinets checked OK
- Optical control of the installations and switches OK

Control PSS / SPS:

- SPS battery =41-A292 3.6 VDC

Voltage and current measurements:

- Line power supply 3x426 VAC
- Power supply 230 VAC 243 VAC
- Battery charge =41-G120 26.7 VDC
- Battery charge =41-G120 3.4 A

Tension hydraulic:

- System 1, nominal force 100% =41-B400 495 kN
- System 2, nominal force 100% =41-B401 505 kN

CABIN 1 CONTROLS

General controls:

- Optical control of the installations and switches OK
- Command elements checked OK
- Optical control of the electronic boards OK
- Testing of screw connection (random checks) OK

Control PSS / SPS:

- Touch panel calibrated OK

Voltage and current measurements:

- Line power supply 3x419 VAC
- Power supply 230 VAC 241 VAC
- Battery charge =11-A900 26.3 VDC
- Battery charge =11-A900 11.1 A
- Battery voltage =11-G1 24.8 VDC

Remote supervision system:

- Voltage	B+/B-	25.6 VDC
- Current	B+	1.76 ADC
- Current	F8	1.97 ADC
- Haul rope supervision, transmitter	=13-073u	15.0 Vpp
- Haul rope supervision, transmitter voltage during test	=13-073u	0.0 Vpp
- Transmitter TF	=13-176u	10.0 Vpp
- Amplifier TF	=13-183u2	19.2 Vpp
- Amplifier TF	=13-184u2	19.1 Vpp
- Receiver TF drive station (cabin in DST)	=13-210u	3.8 Vpp
- Receiver TF drive station, power supply	=13-210u	17.8 VDC
- Receiver TF drive station	=13-211u	1 / 17 VDC
- Receiver TF drive station, power supply	=13-211u	5.0 / 18.0 VDC

Track brake control system 1:

- Battery charge	=11-G100	27.5 VDC
- Battery charge	=11-G100	0.2 A
- Battery voltage	=11-G100	25.6 VDC
- Tacho voltage (v = 100%) ↑	=11-B100	50.2 VDC
- Tacho voltage (v = 100%) ↓	=11-B100	50.8 VDC
- Normal current valve 1	=11-Y101	16.9 mA
- Normal current valve 2	=11-Y102	16.9 mA
- Normal current valve 3	=11-Y103	17.0 mA

Track brake control system 2:

- Battery charge	=11-G110	27.4 VDC
- Battery charge	=11-G110	0.3 A
- Battery voltage	=11-G110	25.4 VDC
- Tacho voltage (v = 100%) ↑	=11-B110	50.6 VDC
- Tacho voltage (v = 100%) ↓	=11-B110	49.8 VDC
- Normal current valve 1	=11-Y111	17.1 mA
- Normal current valve 2	=11-Y112	16.7 mA
- Normal current valve 3	=11-Y113	16.7 mA

CABIN 2 CONTROLS

General controls:

- Optical control of the installations and switches	OK
- Command elements checked	OK
- Optical control of the electronic boards	OK
- Testing of screw connection (random checks)	OK

Control PSS / SPS:

- Touch panel calibrated OK

Voltage and current measurements:

- Line power supply 3x420 VAC
 - Power supply 230 VAC 241 VAC
 - Battery charge =21-A900 26.3 VDC
 - Battery charge =21-A900 12.0 A
 - Battery voltage =21-G1 24.7 VDC

Remote supervision system:

- Voltage B+/B- 26.2 VDC
 - Current B+ 1.82 ADC
 - Current F8 1.70 ADC
 - Transmitter TF =23-176u 10.0 Vpp
 - Amplifier TF =23-183u2 18.5 Vpp
 - Amplifier TF =23-184u2 18.2 Vpp
 - Receiver TF drive station (cabin in DST) =23-210u 1.6 Vpp
 - Receiver TF drive station, power supply =23-210u 18.0 VDC
 - Receiver TF drive station =23-211u 1 / 17 VDC
 - Receiver TF drive station, power supply =23-211u 5.0 / 18.0 VDC

Track brake control system 1:

- Battery charge =21-G100 27.5 VDC
 - Battery charge =21-G100 2.3 A
 - Battery voltage =21-G100 25.5 VDC
 - Tacho voltage (v = 100%) ↑ =21-B100 52.5 VDC
 - Tacho voltage (v = 100%) ↓ =21-B100 51.7 VDC
 - Normal current valve 1 =21-Y101 16.8 mA
 - Normal current valve 2 =21-Y102 16.8 mA
 - Normal current valve 3 =21-Y103 16.8 mA

Track brake control system 2:

- Battery charge =21-G110 26.4 VDC
 - Battery charge =21-G110 3.4 A
 - Battery voltage =21-G110 25.2 VDC
 - Tacho voltage (v = 100%) ↑ =21-B110 50.1 VDC
 - Tacho voltage (v = 100%) ↓ =21-B110 49.6 VDC
 - Normal current valve 1 =21-Y111 16.6 mA
 - Normal current valve 2 =21-Y112 16.6 mA
 - Normal current valve 3 =21-Y113 16.6 mA

REMARKS

- While beginning with the 10 m/s drive testing we faced several problems in car two. We could not finish a single trip without service stops. After replacing tacho =21-B100, TB supervision board =21-A110 and bypassing the oil level switch =21-B33, there was no more problems with driving 10 m/s. (see following points)
- The tacho supervision on car two appeared several times. On the tacho signal =21-B100 (TB System 1) an AC Value of up to 13.0 VAC has been measured. In the past, these tachos has been self-maintenanced, what we do strongly not recommend.
- Several service stops appeared because the TB pressure on car two sunk below 260 bar while driving. Since the oil level switch =21-B33 is bypassed we did no more have any of these stops. The switch should be replaced. The hydraulic system should be checked by deactivating the pump and tracing the loss of pressure.
- It has been observed two times in succession when car two was standing at the lower part of the track, that the TB pressure sank from 280 to 240 bar just while the dropout test. In this situation it has been observed as well, that relay =21-K114 occasionally began to flutter while the car was not moving and the dropout test was not active. The only electrical device what can be responsible for both phenomenons is the TB supervision board =21-A110. It has been replaced and will be tested in Stans.
- The S7 software in both cars has been adjusted. So there are no more valve supervision entries in the first fault list after every trip.
- The failure F-20, which appears on the drive station PSS CPU =1-A201 since some time, could be resolved by replacing the periphery device PSS DIF2 =1-A214.
- The haulrope supervision has been adjusted.

Kind regards

FREY AG STANS

Tramway Controls

