Seafloor Observation Network for Earthquakes and Tsunamis along the Japan Trench (S-net) -
System of landing station part -

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Seafloor Observation Network for Earthquakes and Tsunamis along the Japan Trench (S-net) project to
construct a large-scale seafloor network of cable-linked observatories is in progress around Japan
Trench and Kuril Trench in Japan. The S-net consists of 150 ocean bottom earthquake and tsunami
observation stations, ocean bottom fiber optic cables which are about 5,700 km in total length,
landing stations, IP-VPN network which delivers data to data centers, and data centers. The ocean
bottom fiber optic cables connect the observation stations to land, and they are drawn inside
landing stations.

We have constructed five landing stations; Minamiboso station in Minamiboso City, Chiba Pref.,
Kashima station in Kashima City, Ibaraki Pref., Watari station in Watari Town, Miyagi Pref., Miyako
station in Miyako City, Iwate Pref., and Hachinohe station in Hachinohe City, Aomori Pref.. The
Watari station is located on the third floor of reinforced concrete building, and other stations
are container-type data centers.
In the landing station, there are a high voltage receiving transformer equipment, an emergency
diesel generator with a tank which can store fuel for one week, uninterruptible power supplies
(UPSs), a power feed equipment (PFE) that supplies constant DC current (1.1 A) to a submarine cable
and observation units, optical receiver transmission equipment, optical wavelength division
multiplexing equipment (WDM), GPS clocks, data conversion servers, data transmission servers,
supervisory equipment, and so on.

In each earthquake and tsunami observatory under sea water, there installed two sets of three
component servo accelerometers, a set of three component velocity seismometers (analog outputs),
and two quartz type depth sensors and a set of three-component quartz type accelerometers
(frequency outputs). These data are transmitted to the landing stations as the digital data which
synchronized to a GPS clock signal supplied from the landing station. The data of frequency outputs
are frequency count values at sampling frequency of 8 kHz, and these of analog outputs are
digitized values by 24 bits AD converter at sampling frequency of 1 kHz. Data conversion servers at
the landing station receive these data. The 8 kHz frequency count data are converted into physical
value data of 100 Hz (acceleration) or 10 Hz (water pressure and temperature), and these physical
data are delivered to data transmission servers. The 1 kHz digitized analog data are converted into
100 Hz data by decimation filter, and delivered to data transmission servers.

The data received by data transmission servers will be transmit to Tsukuba data center, Tokyo
backup data center, Japan Metrological Agency (JMA), and related institutions via two control
center using an IP-VPN network.

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