

## **Brief Description over the Accuracy Testing**

In this field accuracy testing of IMS3 , we selected TWO sections of the roads mainly both in the “Urban Area” having different topography. Since it’s very difficult to achieve the GPS signal acquisition at every place, therefore we have used different approach in terms of “ Methodology ” ( especially in the geo referencing of the Images ) in order to achieve the positional accuracy results .

Each section of the road is mapped by IMS3 and apply both the methods to achieve the accuracy results in each different case. The two methods used in the testing are as follows: -

1. Use of Leica Real Time Kinematic GPS ( Post processing ) to Geo referencing the CV Data ; and
2. Use of Ground Control Points ( GCP’s ) to Geo referencing CV Data

**Method 1 :** Use of Leica Kinematic GPS with post processing Kinematic  
During this testing, we mount the IMS3 system on the top of the car along with Leica RTK GPS and use the “direct geo referencing – using post process kinematic ” method to calibrate with CV Data to produce the final Geo referenced Images Data. The results are compared by comparing the surveyed points with measured points using our software (ALV for Arc GIS) MMS application.

**Method 2 :** Use of Ground Control Points ( GCP’s ) to Geo reference sequence of terrestrial Imageries

During this testing, we mount the IMS3 system on the top of the car along with Leica RTK GPS and use the “indirect geo referencing” method to calibrate with CV Data to produce the final Geo referenced Images Data.

The GCP’s used in the geo referencing are initially surveyed at nearly 100 meter interval on the opposite side of the road. The results are compared by comparing the surveyed points (different from the one which we used in geo referencing the CV Data ) with the measured points using our software (ALV for Arc GIS) MMS application . Please refer to the attached excel file in which you can find Average, Standard Deviation, RMS Error and Maximum Difference .

## Survey for IMS3 (Dual Cam) Accuracy Test

### 1.1. Objective

The objective of this survey is to test the survey (measurement) accuracy by IMS3 (Dual Cam) by comparing to the operation of the Public Survey standard in Japan.

### 1.2. Area

This survey was made at two areas below (See Table 1 and Figure 1). ① is on the route in an urban area surrounded by tall buildings and ② is on the route in a suburban area surrounded by short buildings and woods.

**Table 1. Survey Area**

	Route Name.	Start - End	Distance	Lane
①	Kanryo Rd.	(A) Minami 1 Jyo - (B) Minami 9 Jyo: Prefectural road 453	1.0 Km	4 Lanes (2 lanes for each direction)
②	Sanroku Rd.	(A)Fushimi 2 - (B)Kaikawa 1	1.0 Km	2 Lanes (1 lane for each direction)

**Figure 1. Survey Area**

①: Kanryo Road

②: Sanroku Road.



1.3. GCP lists of Method2

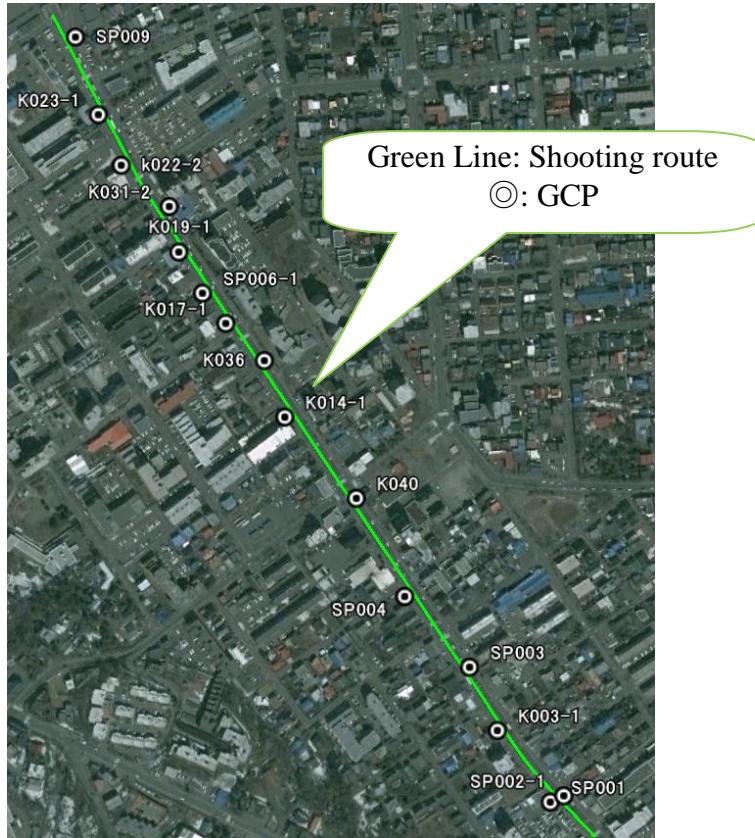


Figure 2.  
GCP location  
(Kanjyo Road)

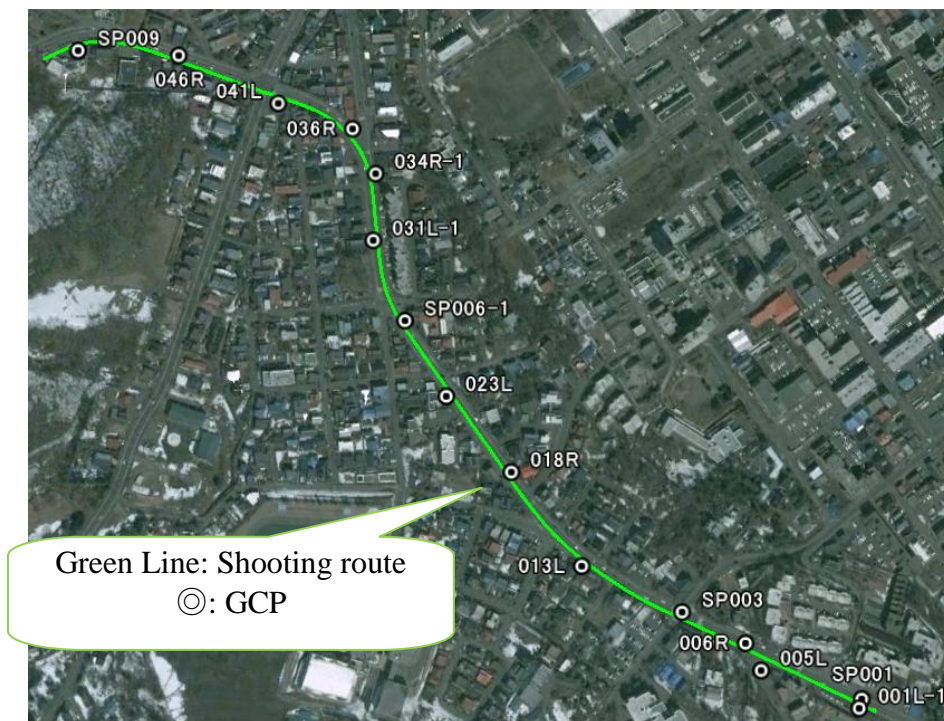


Figure 3.  
GCP location  
(Sanroku Road)

**Table 2. GCP List**

**Kanjiyo Road**

<b>Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Altitude</b>
K003-1	43.0376388391667	141.3303052402780	30.692
K014-1	43.0407965747222	141.3273695883330	27.252
K017-1	43.0417447175000	141.3265499158330	26.322
K19-1	43.0424662636111	141.3258993066670	25.702
K22-2	43.0433490791667	141.3250967269440	25.220
K23-1	43.0438637041667	141.3247756333330	24.544
K031-2	43.0429283952778	141.3257652522220	25.627
K036	43.0413680922222	141.3270859491670	26.538
k40	43.0399760922222	141.3283592538890	27.869
SP001	43.0369167683333	141.3310362088890	31.861
SP002-1	43.0369803775000	141.3312223227780	31.666
SP003	43.0382745433333	141.3299236041670	30.012
SP004	43.0389868200000	141.3290279272220	28.906
SP006-1	43.0420498913889	141.3262271280560	26.104
SP009	43.0446550475000	141.3244540766670	24.039

**Sanroku Road**

<b>Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Altitude</b>
001L-1	43.0370554433333	141.3258464694440	59.715
005L	43.0373871513889	141.3246651719440	57.376
013L	43.0383065500000	141.3224947125000	57.187
018R	43.0391376008333	141.3216428097220	54.546
023L	43.0398107711111	141.3208501538890	52.884
031-1L	43.0412030338889	141.3199550052780	49.309
034R-1	43.0418069202778	141.3199803538890	46.148
036R	43.0422123372222	141.3196946652780	44.873
041L	43.0424346250000	141.3187860694440	43.293
046R	43.0428473638889	141.3175839008330	47.770
SP001	43.0371346027778	141.3258838980560	59.899
SP003	43.0378970955556	141.3237155805560	55.310
SP006-1	43.0404839208333	141.3203456947220	52.343
SP009	43.0428671850000	141.3163956677780	54.935

1.4. Result : Absolute position accuracy

(1)Method 1

List of the measurement results by CV (Camera Vector) data which is calibrated by GPS

Kanjiyo Rd.

Point NO	Surveyed Coordinate[m]			Measured Coordinate (Video)[m]			Dis. From Camera	Difference[m]			Horizontal Dis. [m]	Remark
	X	Y	Z	X	Y	Z		Δ X	Δ Y	Δ Z		
K001-2	-106556.983	-74903.179	31.434	-106557.075	-74903.235	31.536	8.908	0.092	0.056	-0.102	0.108	
K002	-106530.860	-74919.315	31.136	-106530.894	-74919.289	31.142	5.646	0.034	-0.026	-0.006	0.043	
K003-1	-106499.880	-74939.741	30.692	-106499.898	-74939.725	30.720	5.755	0.018	-0.016	-0.028	0.024	
K004	-106471.068	-74957.876	30.246	-106471.150	-74957.857	30.264	5.481	0.082	-0.019	-0.018	0.084	
K005-1	-106434.555	-74982.554	30.017	-106434.614	-74982.513	30.025	5.884	0.059	-0.041	-0.008	0.072	
K006	-106414.426	-74995.744	29.647	-106414.465	-74995.715	29.755	5.845	0.038	-0.028	-0.108	0.048	
K007	-106388.999	-75011.684	29.276	-106389.048	-75011.687	29.263	5.379	0.050	0.003	0.013	0.050	
K008	-106368.658	-75032.120	29.066	-106368.742	-75032.216	29.140	11.002	0.084	0.097	-0.074	0.128	
K009	-106334.970	-75047.111	28.559	-106335.018	-75047.110	28.588	5.435	0.048	-0.001	-0.029	0.048	
K010	-106299.924	-75075.278	28.484	-106299.973	-75075.305	28.463	9.402	0.049	0.027	0.021	0.056	
K011	-106267.187	-75095.852	28.224	-106267.234	-75095.896	28.222	8.776	0.047	0.045	0.002	0.065	
K012-1	-106233.913	-75115.415	27.642	-106233.972	-75115.390	27.736	6.880	0.059	-0.025	-0.094	0.064	
K013	-106189.347	-75142.423	27.391	-106189.431	-75142.397	27.380	5.143	0.084	-0.026	0.011	0.088	
K014-1	-106146.483	-75175.094	27.252	-106146.516	-75175.141	27.264	8.751	0.034	0.047	-0.012	0.058	
K015	-106107.553	-75196.772	26.898	-106107.535	-75196.734	26.917	5.742	-0.017	-0.039	-0.019	0.043	
K016-1	-106066.675	-75222.787	26.418	-106066.695	-75222.761	26.462	5.271	0.020	-0.026	-0.044	0.033	
K017-1	-106040.425	-75240.722	26.322	-106040.488	-75240.767	26.370	5.704	0.063	0.045	-0.048	0.077	
K018	-105982.320	-75277.999	25.827	-105982.411	-75278.093	25.786	5.552	0.090	0.095	0.041	0.131	
K019-1	-105959.690	-75292.850	25.702	-105959.759	-75292.841	25.720	5.690	0.069	-0.009	-0.018	0.069	
K020	-105920.330	-75322.634	25.715	-105920.343	-75322.709	25.625	8.623	0.013	0.076	0.090	0.077	
K021	-105900.067	-75338.375	25.265	-105900.011	-75338.357	25.302	10.956	-0.056	-0.018	-0.037	0.059	
K022-2	-105860.903	-75357.161	25.220	-105860.992	-75357.205	25.214	8.828	0.089	0.044	0.006	0.099	
K023-1	-105803.449	-75382.693	24.544	-105803.485	-75382.713	24.544	5.485	0.036	0.020	0.000	0.041	
K024	-105770.953	-75399.451	24.239	-105771.006	-75399.459	24.286	5.498	0.053	0.008	-0.047	0.054	
K025	-105724.481	-75423.284	24.084	-105724.526	-75423.263	24.095	5.666	0.045	-0.021	-0.011	0.050	
K026	-105695.050	-75419.803	24.033	-105694.963	-75419.785	24.066	12.125	-0.087	-0.019	-0.033	0.089	
K027-1	-105736.804	-75399.067	24.307	-105736.801	-75398.977	24.299	11.568	-0.003	-0.089	0.008	0.089	
K028	-105788.296	-75376.017	24.667	-105788.323	-75376.068	24.610	8.709	0.027	0.052	0.057	0.058	
K029	-105834.005	-75352.460	25.015	-105834.064	-75352.582	25.047	8.648	0.059	0.122	-0.032	0.136	
K030	-105873.133	-75328.761	25.353	-105873.127	-75328.696	25.392	11.608	-0.005	-0.065	-0.039	0.065	
K031-2	-105908.234	-75303.207	25.627	-105908.333	-75303.201	25.682	15.237	0.099	-0.006	-0.055	0.099	
K032-2	-105941.696	-75289.318	25.643	-105941.701	-75289.377	25.693	8.434	0.005	0.059	-0.050	0.059	
K033	-105966.247	-75273.196	25.902	-105966.217	-75273.174	25.912	9.006	-0.030	-0.022	-0.010	0.037	
K034	-105995.563	-75250.294	26.238	-105995.530	-75250.277	26.279	12.007	-0.033	-0.016	-0.041	0.037	
K035-2	-106048.789	-75215.357	26.348	-106048.791	-75215.365	26.332	12.241	0.002	0.008	0.016	0.008	
K036	-106082.742	-75197.507	26.538	-106082.725	-75197.562	26.548	8.478	-0.018	0.055	-0.010	0.058	
K037-2	-106128.775	-75166.593	27.034	-106128.838	-75166.656	27.078	8.905	0.063	0.063	-0.044	0.089	
K038	-106163.357	-75140.351	27.296	-106163.371	-75140.317	27.228	12.058	0.014	-0.034	0.068	0.037	
K039	-106204.577	-75116.932	27.560	-106204.611	-75117.023	27.584	9.157	0.034	0.092	-0.024	0.098	
K040	-106238.510	-75095.457	27.869	-106238.619	-75095.423	27.884	8.349	0.109	-0.035	-0.015	0.114	
K041	-106274.026	-75069.897	28.064	-106274.010	-75069.851	28.052	10.275	-0.017	-0.046	0.012	0.049	
K042-1	-106310.595	-75047.582	28.468	-106310.610	-75047.638	28.472	8.726	0.015	0.057	-0.004	0.059	
K043-1	-106335.094	-75027.278	28.564	-106335.124	-75027.314	28.571	12.317	0.029	0.036	-0.007	0.046	
K044	-106398.841	-74989.798	29.496	-106398.859	-74989.852	29.550	8.989	0.018	0.054	-0.054	0.057	
K045-2	-106413.487	-74980.167	29.737	-106413.555	-74980.235	29.785	8.934	0.068	0.068	-0.048	0.096	
K046-2	-106448.186	-74953.454	30.304	-106448.183	-74953.412	30.391	12.380	-0.003	-0.042	-0.087	0.042	
K047	-106472.741	-74937.370	30.557	-106472.659	-74937.331	30.604	12.354	-0.081	-0.039	-0.047	0.090	
K048-2	-106512.707	-74915.164	30.971	-106512.804	-74915.241	31.010	8.944	0.097	0.077	-0.039	0.124	
K049	-106539.090	-74895.281	31.286	-106539.103	-74895.302	31.271	9.696	0.013	0.022	0.015	0.025	
K050	-106558.576	-74874.430	31.790	-106558.593	-74874.405	31.789	12.513	0.017	-0.025	0.001	0.030	
<b>Average[m]</b>								<b>0.032</b>	<b>0.012</b>	<b>-0.020</b>	<b>0.067</b>	
<b>Standard Deviation[m]</b>								<b>0.045</b>	<b>0.048</b>	<b>0.039</b>	<b>0.030</b>	
<b>RMS Error[m]</b>								<b>0.055</b>	<b>0.049</b>	<b>0.044</b>	<b>0.074</b>	

List of the measurement results by CV (Camera Vector) data which is calibrated by GPS

Sanroku Rd.

Point NO	Surveyed Coordinate[m]			Measured Coordinate (Video)[m]			Dis. From Camera	Difference[m]			Horizontal Dis. [m]	Remark
	X	Y	Z	X	Y	Z		Δ X	Δ Y	Δ Z		
001L-1	-106560.695	-75303.772	59.715	-106560.668	-75303.732	59.870	4.151	-0.027	-0.040	-0.155	0.049	
002R	-106539.242	-75326.526	59.043	-106539.396	-75326.452	59.174	7.443	0.154	-0.074	-0.131	0.171	a bus hides the target
003L	-106537.057	-75353.003	58.178	-106537.055	-75352.934	58.222	4.275	-0.002	-0.069	-0.044	0.069	
004R	-106513.986	-75372.420	57.659	-106513.938	-75372.347	57.757	9.599	-0.048	-0.073	-0.098	0.087	
005L	-106522.787	-75399.624	57.376	-106522.736	-75399.527	57.346	10.997	-0.052	-0.096	0.030	0.109	
006R	-106496.700	-75413.942	56.197	-106496.773	-75413.944	56.274	7.323	0.073	0.002	-0.077	0.073	
007L-1	-106493.978	-75440.841	55.629	-106493.995	-75440.809	55.672	4.084	0.017	-0.032	-0.043	0.036	
008R	-106472.682	-75460.579	55.314	-106472.688	-75460.524	55.398	8.483	0.006	-0.054	-0.084	0.055	
009L-1	-106474.739	-75486.000	55.991	-106474.737	-75485.949	56.026	5.840	-0.001	-0.051	-0.035	0.051	
010R-1	-106448.083	-75507.255	56.149	-106448.180	-75507.199	56.201	9.636	0.097	-0.056	-0.052	0.112	
011L	-106445.269	-75537.156	56.557	-106445.320	-75537.064	56.627	4.639	0.050	-0.092	-0.070	0.105	
012R	-106425.392	-75548.606	56.556	-106425.445	-75548.532	56.607	7.332	0.053	-0.074	-0.051	0.091	
013L	-106418.706	-75575.353	57.187	-106418.770	-75575.275	57.230	4.826	0.064	-0.079	-0.043	0.101	
014R	-106390.456	-75590.248	57.062	-106390.491	-75590.189	57.090	8.417	0.035	-0.059	-0.028	0.068	
015L	-106388.375	-75611.162	57.168	-106388.455	-75611.129	57.238	6.468	0.080	-0.033	-0.070	0.086	
016R	-106362.719	-75617.111	56.186	-106362.770	-75617.142	56.221	6.980	0.051	0.031	-0.035	0.060	
017L	-106356.184	-75633.969	55.933	-106356.265	-75633.934	56.024	4.345	0.080	-0.035	-0.091	0.087	
018R	-106325.622	-75643.748	54.546	-106325.726	-75643.763	54.609	7.136	0.104	0.016	-0.063	0.105	
019L	-106318.191	-75663.630	53.867	-106318.287	-75663.609	53.977	6.764	0.096	-0.022	-0.110	0.099	
020R	-106296.286	-75664.004	53.373	-106296.407	-75664.038	53.460	6.757	0.120	0.034	-0.087	0.125	
021L	-106289.348	-75680.414	53.123	-106289.442	-75680.343	53.061	4.593	0.093	-0.071	0.062	0.117	
022R-1	-106270.822	-75681.579	52.873	-106270.840	-75681.509	52.919	7.033	0.018	-0.070	-0.046	0.073	
023L	-106250.130	-75707.507	52.884	-106250.172	-75707.459	52.942	4.587	0.042	-0.048	-0.058	0.064	
024R-1	-106232.992	-75707.913	52.642	-106233.045	-75707.898	52.734	6.868	0.054	-0.015	-0.092	0.056	
025L	-106219.655	-75728.572	52.903	-106219.699	-75728.499	52.882	4.712	0.043	-0.073	0.021	0.084	
026R	-106197.762	-75732.011	52.742	-106197.847	-75732.035	52.826	6.689	0.085	0.024	-0.084	0.088	
027L	-106184.629	-75752.700	52.807	-106184.700	-75752.604	52.826	4.703	0.072	-0.096	-0.019	0.120	
028R	-106163.513	-75750.182	52.092	-106163.589	-75750.139	52.186	10.008	0.076	-0.043	-0.094	0.088	
029L	-106148.117	-75773.541	51.999	-106148.203	-75773.531	52.114	7.211	0.086	-0.010	-0.115	0.087	
030R	-106116.227	-75764.586	50.846	-106116.314	-75764.587	50.893	9.402	0.087	0.001	-0.047	0.087	
031L-1	-106094.665	-75778.731	49.309	-106094.759	-75778.739	49.420	4.538	0.094	0.008	-0.111	0.095	
032R	-106070.913	-75771.768	48.375	-106071.023	-75771.756	48.393	6.943	0.110	-0.012	-0.018	0.111	
033L	-106049.926	-75784.835	46.986	-106050.036	-75784.836	47.072	5.845	0.110	0.001	-0.086	0.110	
034R-1	-106027.606	-75775.922	46.148	-106027.688	-75775.959	46.330	7.993	0.083	0.037	-0.182	0.090	
035L	-106016.406	-75791.140	45.312	-106016.491	-75791.084	45.387	4.848	0.085	-0.057	-0.075	0.102	
036R	-105982.313	-75798.701	44.873	-105982.170	-75798.818	44.996	9.149	-0.143	0.117	-0.123	0.185	
037L	-105980.669	-75822.011	44.661	-105980.726	-75821.990	44.640	6.867	0.057	-0.021	0.021	0.061	
038R	-105962.439	-75822.254	44.464	-105962.432	-75822.202	44.625	9.312	-0.007	-0.051	-0.161	0.052	
039L	-105970.211	-75838.873	44.278	-105970.273	-75838.823	44.275	6.589	0.062	-0.049	0.003	0.079	
040R	-105951.227	-75854.560	43.328	-105951.299	-75854.604	43.538	6.835	0.072	0.045	-0.210	0.085	
041L	-105956.799	-75872.457	43.293	-105956.801	-75872.369	43.411	5.845	0.002	-0.088	-0.118	0.088	
042R-1	-105934.137	-75881.725	42.373	-105934.145	-75881.663	42.429	14.387	0.007	-0.062	-0.056	0.063	
043L	-105941.604	-75910.958	43.322	-105941.678	-75910.872	43.409	4.386	0.073	-0.086	-0.087	0.113	
044R-1	-105923.796	-75930.260	44.813	-105923.908	-75930.179	44.800	7.745	0.112	-0.081	0.013	0.138	
045L	-105926.575	-75953.557	46.367	-105926.634	-75953.460	46.439	4.617	0.059	-0.097	-0.072	0.113	
046R	-105909.863	-75969.897	47.770	-105909.983	-75969.832	47.801	7.539	0.120	-0.065	-0.031	0.136	
047L	-105908.013	-76012.690	50.642	-105908.088	-76012.646	50.708	6.277	0.075	-0.043	-0.066	0.087	
048R	-105892.413	-76034.454	52.722	-105892.535	-76034.406	52.849	6.809	0.121	-0.048	-0.127	0.130	
049L	-105903.005	-76045.860	53.370	-105903.065	-76045.749	53.436	5.797	0.061	-0.111	-0.066	0.126	
050R-1	-105891.999	-76063.313	54.726	-105891.991	-76063.260	54.810	8.825	-0.008	-0.053	-0.084	0.054	
<b>Average[m]</b>								<b>0.055</b>	<b>-0.039</b>	<b>-0.069</b>	<b>0.092</b>	
<b>Standard Deviation[m]</b>								<b>0.053</b>	<b>0.045</b>	<b>0.053</b>	<b>0.030</b>	
<b>RMS Error[m]</b>								<b>0.077</b>	<b>0.060</b>	<b>0.087</b>	<b>0.097</b>	

## (2)Method 2

List of the measurement results by CV (Camera Vector) data which is calibrated by GCP with 100m interval.

Kanjo Rd.

Point NO	Surveyed Coordinate[m]			Measured Coordinate (Video)[m]			Dis. From Camera	Difference[m]			Horizontal Dis. [m]	Remark
	X	Y	Z	X	Y	Z		Δ X	Δ Y	Δ Z		
K001-2	-106556.983	-74903.179	31.434	-106557.008	-74903.193	31.460	8.883	0.025	0.014	-0.026	0.029	
K002	-106530.860	-74919.315	31.136	-106530.880	-74919.282	31.067	5.644	0.021	-0.033	0.069	0.039	
K003-1	-106499.880	-74939.741	30.692	-106499.878	-74939.743	30.687	5.753	-0.002	0.002	0.005	0.003	
K004	-106471.068	-74957.876	30.246	-106471.122	-74957.867	30.288	5.475	0.054	-0.008	-0.042	0.054	
K005-1	-106434.555	-74982.554	30.017	-106434.597	-74982.515	30.072	5.854	0.042	-0.039	-0.055	0.057	
K006	-106414.426	-74995.744	29.647	-106414.486	-74995.672	29.730	5.843	0.060	-0.072	-0.083	0.094	
K007	-106388.999	-75011.684	29.276	-106389.033	-75011.633	29.163	5.393	0.035	-0.051	0.113	0.062	
K008	-106368.658	-75032.120	29.066	-106368.666	-75032.084	29.098	10.938	0.008	-0.035	-0.032	0.036	
K009	-106334.970	-75047.111	28.559	-106335.001	-75047.013	28.557	5.433	0.031	-0.097	0.002	0.102	
K010	-106299.924	-75075.278	28.484	-106299.939	-75075.221	28.489	9.381	0.016	-0.057	-0.005	0.059	
K011	-106267.187	-75095.852	28.224	-106267.251	-75095.813	28.249	8.790	0.064	-0.038	-0.025	0.075	
K012-1	-106233.913	-75115.415	27.642	-106233.948	-75115.360	27.765	6.877	0.035	-0.055	-0.123	0.065	
K013	-106189.347	-75142.423	27.391	-106189.373	-75142.359	27.361	5.145	0.026	-0.064	0.030	0.069	
K014-1	-106146.483	-75175.094	27.252	-106146.487	-75175.108	27.257	8.709	0.004	0.014	-0.005	0.015	
K015	-106107.553	-75196.772	26.898	-106107.640	-75196.840	26.941	5.743	0.087	0.068	-0.043	0.111	
K016-1	-106066.675	-75222.787	26.418	-106066.800	-75222.823	26.501	5.274	0.125	0.036	-0.083	0.131	
K017-1	-106040.425	-75240.722	26.322	-106040.435	-75240.756	26.308	5.712	0.010	0.034	0.014	0.036	
K018	-105982.320	-75277.999	25.827	-105982.325	-75278.032	25.759	5.550	0.005	0.034	0.068	0.034	
K019-1	-105959.690	-75292.850	25.702	-105959.683	-75292.846	25.707	5.703	-0.007	-0.004	-0.005	0.008	
K020	-105920.330	-75322.634	25.715	-105920.319	-75322.753	25.623	8.634	-0.010	0.120	0.092	0.120	
K021	-105900.067	-75338.375	25.265	-105899.984	-75338.369	25.309	10.929	-0.084	-0.006	-0.044	0.084	
K022-2	-105860.903	-75357.161	25.220	-105860.885	-75357.141	25.213	8.751	-0.018	-0.020	0.007	0.027	
K023-1	-105803.449	-75382.693	24.544	-105803.444	-75382.674	24.557	5.475	-0.005	-0.019	-0.013	0.020	
K024	-105770.953	-75399.451	24.239	-105771.006	-75399.415	24.278	5.489	0.053	-0.036	-0.039	0.065	
K025	-105724.481	-75423.284	24.084	-105724.596	-75423.325	24.192	5.671	0.115	0.041	-0.108	0.122	
K026	-105695.050	-75419.803	24.033	-105694.939	-75419.940	24.190	12.164	-0.111	0.137	-0.157	0.176	
K027-1	-105736.804	-75399.067	24.307	-105736.811	-75398.990	24.259	11.577	0.007	-0.077	0.048	0.077	
K028	-105788.296	-75376.017	24.667	-105788.289	-75376.037	24.564	8.705	-0.007	0.020	0.103	0.021	
K029	-105834.005	-75352.460	25.015	-105834.033	-75352.483	24.983	8.677	0.028	0.023	0.032	0.036	
K030	-105873.133	-75328.761	25.353	-105873.157	-75328.736	25.369	11.584	0.024	-0.024	-0.016	0.034	
K031-2	-105908.234	-75303.207	25.627	-105908.267	-75303.223	25.632	15.268	0.033	0.016	-0.005	0.036	
K032-2	-105941.696	-75289.318	25.643	-105941.597	-75289.404	25.660	8.433	-0.099	0.086	-0.017	0.131	
K033	-105966.247	-75273.196	25.902	-105966.108	-75273.118	25.881	9.026	-0.139	-0.078	0.021	0.159	
K034	-105995.563	-75250.294	26.238	-105995.447	-75250.209	26.243	12.018	-0.116	-0.084	-0.005	0.143	
K035-2	-106048.789	-75215.357	26.348	-106048.887	-75215.313	26.343	12.286	0.098	-0.044	0.005	0.108	
K036	-106082.742	-75197.507	26.538	-106082.799	-75197.594	26.559	8.577	0.057	0.087	-0.021	0.104	
K037-2	-106128.775	-75166.593	27.034	-106128.820	-75166.727	27.053	8.891	0.045	0.134	-0.019	0.142	
K038	-106163.357	-75140.351	27.296	-106163.307	-75140.275	27.161	12.058	-0.049	-0.076	0.135	0.091	
K039	-106204.577	-75116.932	27.560	-106204.566	-75117.002	27.551	9.153	-0.011	0.071	0.009	0.072	
K040	-106238.510	-75095.457	27.869	-106238.539	-75095.386	27.865	8.370	0.028	-0.071	0.004	0.077	
K041	-106274.026	-75069.897	28.064	-106274.018	-75069.770	28.005	10.260	-0.008	-0.127	0.059	0.127	
K042-1	-106310.595	-75047.582	28.468	-106310.568	-75047.544	28.391	8.749	-0.028	-0.037	0.077	0.046	
K043-1	-106335.094	-75027.278	28.564	-106335.103	-75027.229	28.458	12.316	0.009	-0.049	0.106	0.050	
K044	-106398.841	-74989.798	29.496	-106398.884	-74989.780	29.447	8.995	0.043	-0.018	0.049	0.046	
K045-2	-106413.487	-74980.167	29.737	-106413.606	-74980.205	29.727	8.920	0.119	0.038	0.010	0.125	
K046-2	-106448.186	-74953.454	30.304	-106448.134	-74953.408	30.353	12.421	-0.052	-0.046	-0.049	0.070	
K047	-106472.741	-74937.370	30.557	-106472.637	-74937.341	30.540	12.359	-0.104	-0.028	0.017	0.108	
K048-2	-106512.707	-74915.164	30.971	-106512.789	-74915.250	30.896	8.948	0.082	0.086	0.075	0.119	
K049	-106539.090	-74895.281	31.286	-106539.059	-74895.290	31.146	9.692	-0.031	0.009	0.140	0.032	
K050	-106558.576	-74874.430	31.790	-106558.504	-74874.365	31.672	12.549	-0.072	-0.065	0.118	0.097	
<b>Average[m]</b>								<b>0.009</b>	<b>-0.008</b>	<b>0.008</b>	<b>0.075</b>	
<b>Standard Deviation[m]</b>								<b>0.060</b>	<b>0.061</b>	<b>0.064</b>	<b>0.042</b>	
<b>RMS Error[m]</b>								<b>0.061</b>	<b>0.061</b>	<b>0.065</b>	<b>0.086</b>	

List of the measurement results by CV (Camera Vector) data which is calibrated by GCP with 100m interval.

Sanroku Rd.

Point NO	Surveyed Coordinate[m]			Measured Coordinate (Video)[m]			Dis. From Camera	Difference[m]			Horizontal Dis. [m]	Remark
	X	Y	Z	X	Y	Z		Δ X	Δ Y	Δ Z		
001L-1	-106560.695	-75303.772	59.715	-106560.640	-75303.819	59.724	4.161	-0.055	0.047	-0.009	0.072	
002R	-106539.242	-75326.526	59.043	-106539.288	-75326.591	59.069	7.447	0.045	0.065	-0.026	0.079	
003L	-106537.057	-75353.003	58.178	-106536.908	-75353.112	58.094	4.266	-0.149	0.109	0.084	0.184	
004R	-106513.986	-75372.420	57.659	-106513.879	-75372.458	57.609	9.558	-0.107	0.038	0.050	0.114	
005L	-106522.787	-75399.624	57.376	-106522.710	-75399.587	57.365	11.032	-0.078	-0.036	0.011	0.086	
006R	-106496.700	-75413.942	56.197	-106496.751	-75413.948	56.199	7.279	0.051	0.006	-0.002	0.051	
007L-1	-106493.978	-75440.841	55.629	-106493.936	-75440.767	55.614	4.089	-0.042	-0.074	0.015	0.085	
008R	-106472.682	-75460.579	55.314	-106472.633	-75460.520	55.311	8.477	-0.049	-0.058	0.003	0.076	
009L-1	-106474.739	-75486.000	55.991	-106474.688	-75485.975	55.933	5.848	-0.051	-0.025	0.058	0.057	
010R-1	-106448.083	-75507.255	56.149	-106448.085	-75507.258	56.076	9.659	0.002	0.003	0.073	0.004	
011L	-106445.269	-75537.156	56.557	-106445.214	-75537.172	56.499	4.637	-0.056	0.016	0.058	0.058	
012R	-106425.392	-75548.606	56.556	-106425.357	-75548.644	56.576	7.318	-0.034	0.038	-0.020	0.052	
013L	-106418.706	-75575.353	57.187	-106418.683	-75575.354	57.184	4.816	-0.022	0.001	0.003	0.022	
014R	-106390.456	-75590.248	57.062	-106390.393	-75590.224	57.159	8.444	-0.064	-0.024	-0.097	0.068	
015L	-106388.375	-75611.162	57.168	-106388.327	-75611.242	57.227	6.486	-0.048	0.080	-0.059	0.094	
016R	-106362.719	-75617.111	56.186	-106362.611	-75617.239	56.265	6.970	-0.108	0.128	-0.079	0.167	
017L	-106356.184	-75633.969	55.933	-106356.103	-75633.987	56.008	4.335	-0.082	0.019	-0.075	0.084	
018R	-106325.622	-75643.748	54.546	-106325.622	-75643.754	54.545	7.125	0.000	0.007	0.001	0.007	
019L	-106318.191	-75663.630	53.867	-106318.179	-75663.623	53.834	6.782	-0.012	-0.007	0.033	0.014	
020R	-106296.286	-75664.004	53.373	-106296.233	-75664.083	53.339	6.763	-0.053	0.079	0.034	0.096	
021L	-106289.348	-75680.414	53.123	-106289.286	-75680.388	52.919	4.584	-0.062	-0.026	0.204	0.067	
022R-1	-106270.822	-75681.579	52.873	-106270.721	-75681.573	52.814	7.018	-0.101	-0.006	0.059	0.102	
023L	-106250.130	-75707.507	52.884	-106250.119	-75707.509	52.882	4.583	-0.011	0.002	0.002	0.011	
024R-1	-106232.992	-75707.913	52.642	-106232.982	-75707.953	52.672	6.887	-0.010	0.041	-0.030	0.042	
025L	-106219.655	-75728.572	52.903	-106219.617	-75728.579	52.864	4.706	-0.038	0.007	0.039	0.039	
026R	-106197.762	-75732.011	52.742	-106197.812	-75732.081	52.746	6.674	0.050	0.070	-0.004	0.087	
027L	-106184.629	-75752.700	52.807	-106184.655	-75752.647	52.781	4.717	0.026	-0.053	0.026	0.059	
028R	-106163.513	-75750.182	52.092	-106163.485	-75750.153	52.081	10.057	-0.028	-0.030	0.011	0.041	
029L	-106148.117	-75773.541	51.999	-106148.047	-75773.577	52.068	7.198	-0.070	0.036	-0.069	0.079	
030R	-106116.227	-75764.586	50.846	-106116.222	-75764.588	50.745	9.417	-0.005	0.002	0.101	0.005	
031L-1	-106094.665	-75778.731	49.309	-106094.656	-75778.729	49.308	4.534	-0.008	-0.001	0.001	0.008	
032R	-106070.913	-75771.768	48.375	-106070.948	-75771.752	48.284	6.932	0.035	-0.016	0.091	0.038	
033L	-106049.926	-75784.835	46.986	-106049.954	-75784.834	47.002	5.866	0.027	0.000	-0.016	0.027	
034R-1	-106027.606	-75775.922	46.148	-106027.611	-75775.938	46.152	7.973	0.005	0.016	-0.004	0.017	
035L	-106016.406	-75791.140	45.312	-106016.506	-75790.996	45.298	4.802	0.100	-0.145	0.014	0.176	
036R	-105982.313	-75798.701	44.873	-105982.345	-75798.702	44.864	9.202	0.032	0.001	0.009	0.032	
037L	-105980.669	-75822.011	44.661	-105980.815	-75822.074	44.544	6.867	0.146	0.063	0.117	0.159	
038R	-105962.439	-75822.254	44.464	-105962.502	-75822.279	44.521	9.325	0.063	0.025	-0.057	0.067	
039L	-105970.211	-75838.873	44.278	-105970.339	-75838.917	44.165	6.591	0.128	0.044	0.113	0.135	
040R	-105951.227	-75854.560	43.328	-105951.341	-75854.667	43.465	6.834	0.113	0.107	-0.137	0.156	
041L	-105956.799	-75872.457	43.293	-105956.789	-75872.462	43.294	5.835	-0.010	0.005	-0.001	0.012	
042R-1	-105934.137	-75881.725	42.373	-105934.045	-75881.713	42.506	14.447	-0.092	-0.013	-0.133	0.093	
043L	-105941.604	-75910.958	43.322	-105941.523	-75911.040	43.306	4.386	-0.081	0.082	0.016	0.116	
044R-1	-105923.796	-75930.260	44.813	-105923.751	-75930.302	44.919	7.740	-0.046	0.042	-0.106	0.062	
045L	-105926.575	-75953.557	46.367	-105926.462	-75953.571	46.301	4.599	-0.113	0.014	0.066	0.114	
046R	-105909.863	-75969.897	47.770	-105909.873	-75969.895	47.773	7.522	0.010	-0.003	-0.003	0.010	
047L	-105908.013	-76012.690	50.642	-105908.034	-76012.651	50.598	6.281	0.021	-0.039	0.044	0.044	
048R	-105892.413	-76034.454	52.722	-105892.503	-76034.453	52.830	6.809	0.089	-0.001	-0.108	0.089	
049L	-105903.005	-76045.860	53.370	-105903.063	-76045.790	53.389	5.809	0.059	-0.070	-0.019	0.091	
050R-1	-105891.999	-76063.313	54.726	-105891.999	-76063.337	54.822	8.826	-0.001	0.024	-0.096	0.024	
<b>Average[m]</b>								<b>-0.014</b>	<b>0.012</b>	<b>0.004</b>	<b>0.069</b>	
<b>Standard Deviation[m]</b>								<b>0.065</b>	<b>0.050</b>	<b>0.067</b>	<b>0.047</b>	
<b>RMS Error[m]</b>								<b>0.066</b>	<b>0.051</b>	<b>0.067</b>	<b>0.084</b>	



1.5. Result : Distance accuracy

(1)Method 1

Kanjyo Rd.(unit: m)

The distance between two points on the same side of the road.

Point NO		Surveyed		Measured		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
K001-2	K002	30.705	30.707	30.711	30.714	-0.006	-0.007	
K002	K003-1	37.108	37.111	37.127	37.129	-0.019	-0.019	
K003-1	K004	34.043	34.046	33.988	33.991	0.055	0.055	
K004	K005-1	44.071	44.071	44.077	44.078	-0.006	-0.006	
K005-1	K006	24.065	24.068	24.090	24.091	-0.025	-0.023	
K006	K007	30.011	30.014	30.018	30.022	-0.007	-0.009	
K007	K008	28.833	28.834	28.875	28.876	-0.043	-0.042	
K008	K009	36.873	36.877	36.866	36.870	0.007	0.006	
K009	K010	44.963	44.963	44.979	44.979	-0.017	-0.017	
K010	K011	38.665	38.666	38.676	38.676	-0.011	-0.011	
K011	K012-1	38.599	38.604	38.554	38.557	0.045	0.047	
K012-1	K013	52.111	52.112	52.089	52.090	0.022	0.022	
K013	K014-1	53.895	53.895	53.980	53.980	-0.084	-0.084	
K014-1	K015	44.559	44.560	44.562	44.563	-0.003	-0.003	
K015	K016-1	48.454	48.456	48.429	48.431	0.025	0.025	
K016-1	K017-1	31.792	31.792	31.796	31.796	-0.005	-0.005	
K017-1	K018	69.035	69.036	69.038	69.041	-0.004	-0.004	
K018	K019-1	27.068	27.068	27.029	27.029	0.039	0.039	
K019-1	K020	49.359	49.359	49.455	49.455	-0.096	-0.096	
K020	K021	25.659	25.662	25.656	25.658	0.003	0.005	
K021	k022-2	43.437	43.437	43.333	43.333	0.104	0.104	
k022-2	K023-1	62.872	62.875	62.910	62.914	-0.039	-0.038	
K023-1	K024	36.563	36.564	36.542	36.543	0.021	0.021	
K024	K025	52.227	52.227	52.221	52.221	0.006	0.006	
K025	K026	29.637	29.637	29.768	29.768	-0.131	-0.131	
K026	K027-1	46.620	46.621	46.727	46.727	-0.107	-0.107	
K027-1	K028	56.416	56.417	56.386	56.387	0.030	0.031	
K028	K029	51.422	51.423	51.418	51.420	0.004	0.003	
K029	K030	45.745	45.747	45.788	45.789	-0.043	-0.043	
K030	K031-2	43.418	43.419	43.467	43.468	-0.050	-0.050	
K031-2	K032-2	36.230	36.230	36.119	36.119	0.111	0.111	
K032-2	K033	29.371	29.372	29.386	29.387	-0.015	-0.015	
K033	K034	37.201	37.203	37.195	37.197	0.006	0.006	
K034	K035-2	63.668	63.668	63.684	63.684	-0.017	-0.017	
K035-2	K036	38.360	38.360	38.320	38.321	0.040	0.039	
K036	K037-2	55.450	55.452	55.512	55.514	-0.062	-0.062	
K037-2	K038	43.411	43.412	43.432	43.432	-0.020	-0.020	
K038	K039	47.408	47.409	47.364	47.366	0.044	0.044	
K039	K040	40.158	40.159	40.288	40.289	-0.130	-0.130	
K040	K041	43.757	43.757	43.662	43.662	0.095	0.095	
K041	K042-1	42.840	42.842	42.814	42.816	0.027	0.027	
K042-1	K043-1	31.819	31.819	31.843	31.843	-0.025	-0.025	
K043-1	K044	73.949	73.954	73.930	73.936	0.019	0.018	
K044	K045-2	17.529	17.531	17.563	17.564	-0.034	-0.034	
K045-2	K046-2	43.790	43.794	43.802	43.806	-0.012	-0.012	
K046-2	K047	29.353	29.355	29.286	29.287	0.067	0.068	
K047	K048-2	45.721	45.723	45.821	45.823	-0.100	-0.100	
K048-2	K049	33.036	33.038	33.003	33.004	0.034	0.034	
K049	K050	28.539	28.543	28.576	28.580	-0.037	-0.037	
<b>Average[m]</b>						<b>-0.007</b>	<b>-0.007</b>	
<b>Standard Deviation[m]</b>						<b>0.053</b>	<b>0.053</b>	
<b>RMS Error[m]</b>						<b>0.054</b>	<b>0.054</b>	

## Kanjiyo Rd.(unit: m)

The distance between two points facing each other across the road.

Point NO		Surveyed		Measured		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
K001-2	K050	28.793	28.795	28.870	28.871	-0.077	-0.076	
K002	K049	25.404	25.405	25.352	25.353	0.052	0.052	
K003-1	K048-2	27.723	27.725	27.678	27.679	0.046	0.046	
K004	K047	20.574	20.576	20.582	20.585	-0.008	-0.009	
K005-1	K046-2	32.135	32.136	32.109	32.111	0.026	0.025	
K006	K045-2	15.605	15.605	15.507	15.507	0.098	0.098	
K007	K044	23.998	23.999	23.938	23.940	0.060	0.059	
K008	K043-1	33.911	33.915	33.974	33.978	-0.063	-0.064	
K009	K042-1	24.379	24.379	24.414	24.414	-0.035	-0.035	
K010	K041	26.451	26.454	26.530	26.533	-0.079	-0.079	
K011	K040	28.679	28.682	28.619	28.621	0.060	0.060	
K012-1	K039	29.375	29.375	29.406	29.406	-0.031	-0.031	
K013	K038	26.073	26.073	26.143	26.143	-0.071	-0.071	
K014-1	K037-2	19.642	19.644	19.609	19.610	0.033	0.034	
K015	K036	24.821	24.824	24.824	24.827	-0.003	-0.003	
K016-1	K035-2	19.367	19.368	19.371	19.371	-0.004	-0.004	
K017-1	K034	45.872	45.872	45.953	45.953	-0.081	-0.081	
K018	K033	16.775	16.775	16.924	16.925	-0.149	-0.149	
K019-1	K032-2	18.337	18.337	18.386	18.386	-0.049	-0.049	
K020	K031-2	22.885	22.885	22.909	22.909	-0.024	-0.024	
K021	K030	28.599	28.599	28.567	28.567	0.032	0.032	
K022-2	K029	27.306	27.307	27.322	27.323	-0.016	-0.016	
K023-1	K028	16.558	16.559	16.554	16.554	0.004	0.004	
K024	K027-1	34.151	34.151	34.209	34.209	-0.057	-0.057	
K025	K026	29.637	29.637	29.768	29.768	-0.131	-0.131	
<b>Average[m]</b>						<b>-0.019</b>	<b>-0.019</b>	
<b>Standard Deviation[m]</b>						<b>0.061</b>	<b>0.061</b>	
<b>RMS Error[m]</b>						<b>0.063</b>	<b>0.063</b>	

# Sanroku Rd.(unit: m)

The distance between two points on the same side of the road.

Point NO		Surveyed		Measured		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
001L-1	003L	54.611	54.633	54.575	54.600	0.036	0.033	
002R	004R	52.385	52.403	52.484	52.503	-0.099	-0.100	
003L	005L	48.756	48.762	48.744	48.752	0.012	0.011	
004R	006R	44.976	45.000	44.999	45.024	-0.023	-0.024	
005L	007L-1	50.288	50.318	50.301	50.329	-0.014	-0.011	
006R	008R	52.458	52.465	52.438	52.446	0.020	0.020	
007L-1	009L-1	49.086	49.088	49.076	49.077	0.010	0.010	
008R	010R-1	52.762	52.769	52.718	52.724	0.044	0.044	
009L-1	011L	59.038	59.040	58.976	58.979	0.062	0.061	
010R-1	012R	47.167	47.169	47.173	47.174	-0.005	-0.005	
011L	013L	46.526	46.530	46.529	46.533	-0.003	-0.003	
012R	014R	54.356	54.358	54.379	54.381	-0.023	-0.023	
013L	015L	46.927	46.928	46.952	46.952	-0.025	-0.025	
014R	016R	38.613	38.623	38.664	38.674	-0.051	-0.050	
015L	017L	39.451	39.471	39.450	39.469	0.001	0.002	
016R	018R	45.669	45.699	45.617	45.646	0.052	0.053	
017L	019L	48.201	48.245	48.196	48.240	0.005	0.005	
018R	020R	35.650	35.669	35.647	35.665	0.003	0.004	
019L	021L	33.371	33.379	33.348	33.361	0.022	0.018	
020R	022R-1	30.940	30.944	30.966	30.971	-0.025	-0.026	
021L	023L	47.667	47.667	47.722	47.722	-0.055	-0.055	
022R-1	024R-1	46.094	46.094	46.096	46.096	-0.002	-0.002	
023L	025L	37.046	37.046	37.031	37.031	0.015	0.015	
024R-1	026R	42.683	42.683	42.680	42.680	0.003	0.003	
025L	027L	42.533	42.533	42.496	42.496	0.037	0.037	
026R	028R	38.771	38.776	38.747	38.752	0.024	0.024	
027L	029L	42.041	42.049	42.071	42.077	-0.030	-0.028	
028R	030R	49.431	49.447	49.434	49.450	-0.002	-0.003	
029L	031L-1	53.704	53.771	53.698	53.765	0.006	0.006	
030R	032R	45.880	45.946	45.855	45.923	0.025	0.023	
031L-1	033L	45.153	45.212	45.136	45.197	0.016	0.015	
032R	034R-1	43.506	43.563	43.538	43.587	-0.032	-0.024	
033L	035L	34.108	34.149	34.122	34.164	-0.014	-0.015	
034R-1	036R	50.698	50.714	50.936	50.954	-0.238	-0.239	
035L	037L	47.225	47.229	47.269	47.275	-0.044	-0.046	
036R	038R	30.817	30.820	30.601	30.603	0.217	0.217	
037L	039L	19.841	19.845	19.814	19.818	0.027	0.027	
038R	040R	34.196	34.215	34.261	34.279	-0.065	-0.063	
039L	041L	36.163	36.177	36.149	36.160	0.014	0.017	
040R	042R-1	32.094	32.108	32.038	32.057	0.056	0.051	
041L	043L	41.391	41.391	41.367	41.367	0.024	0.024	
042R-1	044R-1	49.624	49.684	49.584	49.640	0.040	0.044	
043L	045L	45.172	45.275	45.167	45.268	0.006	0.007	
044R-1	046R	42.015	42.119	42.027	42.134	-0.013	-0.016	
045L	047L	61.978	62.125	62.024	62.171	-0.046	-0.046	
046R	048R	66.874	67.057	66.890	67.080	-0.016	-0.023	
047L	049L	33.546	33.657	33.481	33.592	0.065	0.064	
048R	050R-1	28.862	28.931	28.859	28.925	0.003	0.006	
<b>Average[m]</b>						<b>0.000</b>	<b>0.000</b>	
<b>Standard Deviation[m]</b>						<b>0.057</b>	<b>0.057</b>	
<b>RMS Error[m]</b>						<b>0.057</b>	<b>0.057</b>	

## Sanroku Rd.(unit: m)

The distance between two points facing each other across the road.

Point NO		Surveyed		Measured		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
001L-1	002R	31.272	31.279	31.123	31.131	0.149	0.148	
002R	003L	26.567	26.581	26.586	26.603	-0.019	-0.022	
003L	004R	30.155	30.159	30.187	30.191	-0.033	-0.032	
004R	005L	28.592	28.593	28.569	28.572	0.023	0.022	
005L	006R	29.758	29.782	29.697	29.716	0.061	0.065	
006R	007L-1	27.036	27.042	27.008	27.015	0.028	0.028	
007L-1	008R	29.036	29.038	29.028	29.030	0.008	0.008	
008R	009L-1	25.504	25.513	25.507	25.515	-0.003	-0.001	
009L-1	010R-1	34.093	34.094	34.013	34.013	0.080	0.080	
010R-1	011L	30.034	30.036	30.002	30.005	0.032	0.032	
011L	012R	22.939	22.939	22.946	22.946	-0.007	-0.007	
012R	013L	27.571	27.578	27.563	27.570	0.007	0.008	
013L	014R	31.935	31.936	31.971	31.971	-0.035	-0.035	
014R	015L	21.017	21.017	21.038	21.039	-0.021	-0.021	
015L	016R	26.337	26.355	26.379	26.399	-0.042	-0.044	
016R	017L	18.080	18.082	18.008	18.010	0.072	0.072	
017L	018R	32.089	32.118	32.081	32.112	0.007	0.006	
018R	019L	21.226	21.237	21.194	21.204	0.032	0.033	
019L	020R	21.908	21.913	21.884	21.891	0.023	0.023	
020R	021L	17.817	17.819	17.731	17.736	0.086	0.083	
021L	022R-1	18.562	18.564	18.638	18.638	-0.075	-0.074	
022R-1	023L	33.173	33.173	33.175	33.175	-0.002	-0.002	
023L	024R-1	17.143	17.145	17.132	17.133	0.011	0.012	
024R-1	025L	24.590	24.591	24.547	24.548	0.043	0.044	
025L	026R	22.162	22.162	22.136	22.136	0.026	0.026	
026R	027L	24.506	24.506	24.412	24.412	0.094	0.094	
027L	028R	21.265	21.277	21.255	21.264	0.010	0.012	
028R	029L	27.976	27.976	27.998	27.998	-0.022	-0.022	
029L	030R	33.124	33.144	33.120	33.142	0.004	0.001	
030R	031L-1	25.788	25.834	25.786	25.828	0.002	0.006	
031L-1	032R	24.751	24.769	24.742	24.763	0.009	0.006	
032R	033L	24.722	24.761	24.729	24.764	-0.007	-0.003	
033L	034R-1	24.034	24.049	24.046	24.058	-0.012	-0.009	
034R-1	035L	18.895	18.914	18.819	18.842	0.076	0.071	
035L	036R	34.922	34.924	35.182	35.184	-0.260	-0.260	
036R	037L	23.369	23.369	23.218	23.220	0.151	0.149	
037L	038R	18.231	18.232	18.295	18.295	-0.063	-0.062	
038R	039L	18.346	18.347	18.378	18.381	-0.031	-0.034	
039L	040R	24.627	24.645	24.679	24.690	-0.052	-0.045	
040R	041L	18.744	18.744	18.597	18.597	0.148	0.147	
041L	042R-1	24.484	24.501	24.489	24.508	-0.005	-0.007	
042R-1	043L	30.171	30.186	30.165	30.181	0.006	0.005	
043L	044R-1	26.262	26.304	26.239	26.276	0.023	0.028	
044R-1	045L	23.462	23.513	23.441	23.498	0.021	0.015	
045L	046R	23.373	23.415	23.352	23.391	0.021	0.024	
046R	047L	42.833	42.929	42.856	42.955	-0.024	-0.026	
047L	048R	26.778	26.858	26.747	26.832	0.031	0.026	
048R	049L	15.565	15.578	15.478	15.489	0.087	0.089	
049L	050R-1	20.633	20.678	20.719	20.764	-0.086	-0.087	
<b>Average[m]</b>						<b>0.014</b>	<b>0.014</b>	
<b>Standard Deviation[m]</b>						<b>0.049</b>	<b>0.049</b>	
<b>RMS Error[m]</b>						<b>0.051</b>	<b>0.051</b>	

## (2)Method 2

Kanryo Rd.(unit:m)

The distance between two points on the same side of the road.

Point NO		Surveyed distance[m]		Measured distance[m]		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
K001-2	K002	30.705	30.707	30.685	30.687	0.021	0.020	
K002	K003-1	37.108	37.111	37.146	37.148	-0.038	-0.037	
K003-1	K004	34.043	34.046	33.991	33.994	0.052	0.053	
K004	K005-1	44.071	44.071	44.063	44.064	0.008	0.008	
K005-1	K006	24.065	24.068	24.032	24.034	0.033	0.033	
K006	K007	30.011	30.014	30.044	30.049	-0.032	-0.035	
K007	K008	28.833	28.834	28.863	28.863	-0.030	-0.029	
K008	K009	36.873	36.877	36.828	36.832	0.046	0.045	
K009	K010	44.963	44.963	45.000	45.000	-0.037	-0.037	
K010	K011	38.665	38.666	38.633	38.634	0.031	0.031	
K011	K012-1	38.599	38.604	38.616	38.619	-0.017	-0.016	
K012-1	K013	52.111	52.112	52.114	52.116	-0.003	-0.004	
K013	K014-1	53.895	53.895	53.960	53.960	-0.065	-0.065	
K014-1	K015	44.559	44.560	44.513	44.514	0.046	0.046	
K015	K016-1	48.454	48.456	48.404	48.406	0.050	0.050	
K016-1	K017-1	31.792	31.792	31.886	31.887	-0.095	-0.095	
K017-1	K018	69.035	69.036	69.038	69.040	-0.004	-0.004	
K018	K019-1	27.068	27.068	27.057	27.058	0.011	0.011	
K019-1	K020	49.359	49.359	49.436	49.436	-0.078	-0.078	
K020	K021	25.659	25.662	25.640	25.641	0.019	0.021	
K021	k022-2	43.437	43.437	43.372	43.372	0.065	0.065	
k022-2	K023-1	62.872	62.875	62.860	62.863	0.012	0.012	
K023-1	K024	36.563	36.564	36.503	36.504	0.060	0.060	
K024	K025	52.227	52.227	52.208	52.208	0.019	0.019	
K025	K026	29.637	29.637	29.849	29.849	-0.213	-0.213	
K026	K027-1	46.620	46.621	46.821	46.821	-0.201	-0.201	
K027-1	K028	56.416	56.417	56.363	56.364	0.053	0.053	
K028	K029	51.422	51.423	51.452	51.453	-0.030	-0.031	
K029	K030	45.745	45.747	45.766	45.768	-0.021	-0.021	
K030	K031-2	43.418	43.419	43.401	43.402	0.017	0.017	
K031-2	K032-2	36.230	36.230	36.081	36.081	0.148	0.148	
K032-2	K033	29.371	29.372	29.429	29.430	-0.058	-0.057	
K033	K034	37.201	37.203	37.223	37.225	-0.022	-0.022	
K034	K035-2	63.668	63.668	63.825	63.825	-0.157	-0.157	
K035-2	K036	38.360	38.360	38.262	38.263	0.097	0.097	
K036	K037-2	55.450	55.452	55.413	55.415	0.037	0.037	
K037-2	K038	43.411	43.412	43.464	43.464	-0.053	-0.052	
K038	K039	47.408	47.409	47.370	47.371	0.039	0.038	
K039	K040	40.158	40.159	40.267	40.268	-0.109	-0.109	
K040	K041	43.757	43.757	43.760	43.760	-0.003	-0.002	
K041	K042-1	42.840	42.842	42.777	42.779	0.063	0.063	
K042-1	K043-1	31.819	31.819	31.855	31.855	-0.036	-0.036	
K043-1	K044	73.949	73.954	73.962	73.968	-0.013	-0.014	
K044	K045-2	17.529	17.531	17.562	17.564	-0.033	-0.034	
K045-2	K046-2	43.790	43.794	43.706	43.711	0.084	0.084	
K046-2	K047	29.353	29.355	29.301	29.301	0.053	0.053	
K047	K048-2	45.721	45.723	45.828	45.829	-0.107	-0.106	
K048-2	K049	33.036	33.038	32.993	32.994	0.043	0.043	
K049	K050	28.539	28.543	28.565	28.570	-0.026	-0.027	
<b>Average[m]</b>						<b>-0.007</b>	<b>-0.007</b>	
<b>Standard Deviation[m]</b>						<b>0.053</b>	<b>0.053</b>	
<b>RMS Error[m]</b>						<b>0.054</b>	<b>0.054</b>	

Kanjo Rd.(unit : m)

The distance between two points facing each other across the road.

Point NO		Surveyed distance[m]		Measured distance[m]		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
K001-2	K050	28.793	28.795	28.870	28.871	-0.077	-0.076	
K002	K049	25.404	25.405	25.352	25.353	0.052	0.052	
K003-1	K048-2	27.723	27.725	27.678	27.679	0.046	0.046	
K004	K047	20.574	20.576	20.582	20.585	-0.008	-0.009	
K005-1	K046-2	32.135	32.136	32.109	32.111	0.026	0.025	
K006	K045-2	15.605	15.605	15.507	15.507	0.098	0.098	
K007	K044	23.998	23.999	23.938	23.940	0.060	0.059	
K008	K043-1	33.911	33.915	33.974	33.978	-0.063	-0.064	
K009	K042-1	24.379	24.379	24.414	24.414	-0.035	-0.035	
K010	K041	26.451	26.454	26.530	26.533	-0.079	-0.079	
K011	K040	28.679	28.682	28.619	28.621	0.060	0.060	
K012-1	K039	29.375	29.375	29.406	29.406	-0.031	-0.031	
K013	K038	26.073	26.073	26.143	26.143	-0.071	-0.071	
K014-1	K037-2	19.642	19.644	19.609	19.610	0.033	0.034	
K015	K036	24.821	24.824	24.824	24.827	-0.003	-0.003	
K016-1	K035-2	19.367	19.368	19.371	19.371	-0.004	-0.004	
K017-1	K034	45.872	45.872	45.953	45.953	-0.081	-0.081	
K018	K033	16.775	16.775	16.924	16.925	-0.149	-0.149	
K019-1	K032-2	18.337	18.337	18.386	18.386	-0.049	-0.049	
K020	K031-2	22.885	22.885	22.909	22.909	-0.024	-0.024	
K021	K030	28.599	28.599	28.567	28.567	0.032	0.032	
k022-2	K029	27.306	27.307	27.322	27.323	-0.016	-0.016	
K023-1	K028	16.558	16.559	16.554	16.554	0.004	0.004	
K024	K027-1	34.151	34.151	34.209	34.209	-0.057	-0.057	
K025	K026	29.637	29.637	29.768	29.768	-0.131	-0.131	
<b>Average [m]</b>						<b>-0.019</b>	<b>-0.019</b>	
<b>Standard Deviation [m]</b>						<b>0.061</b>	<b>0.061</b>	
<b>RMS Error [m]</b>						<b>0.063</b>	<b>0.063</b>	

Sanroku Rd.(unit: m)

The distance between two points on the same side of the road.

Point NO		Surveyed distance[m]		Measured distance[m]		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
001L-1	003L	54.611	54.633	54.575	54.600	0.036	0.033	
002R	004R	52.385	52.403	52.484	52.503	-0.099	-0.100	
003L	005L	48.756	48.762	48.744	48.752	0.012	0.011	
004R	006R	44.976	45.000	44.999	45.024	-0.023	-0.024	
005L	007L-1	50.288	50.318	50.301	50.329	-0.014	-0.011	
006R	008R	52.458	52.465	52.438	52.446	0.020	0.020	
007L-1	009L-1	49.086	49.088	49.076	49.077	0.010	0.010	
008R	010R-1	52.762	52.769	52.718	52.724	0.044	0.044	
009L-1	011L	59.038	59.040	58.976	58.979	0.062	0.061	
010R-1	012R	47.167	47.169	47.173	47.174	-0.005	-0.005	
011L	013L	46.526	46.530	46.529	46.533	-0.003	-0.003	
012R	014R	54.356	54.358	54.379	54.381	-0.023	-0.023	
013L	015L	46.927	46.928	46.952	46.952	-0.025	-0.025	
014R	016R	38.613	38.623	38.664	38.674	-0.051	-0.050	
015L	017L	39.451	39.471	39.450	39.469	0.001	0.002	
016R	018R	45.669	45.699	45.617	45.646	0.052	0.053	
017L	019L	48.201	48.245	48.196	48.240	0.005	0.005	
018R	020R	35.650	35.669	35.647	35.665	0.003	0.004	
019L	021L	33.371	33.379	33.348	33.361	0.022	0.018	
020R	022R-1	30.940	30.944	30.966	30.971	-0.025	-0.026	
021L	023L	47.667	47.667	47.722	47.722	-0.055	-0.055	
022R-1	024R-1	46.094	46.094	46.096	46.096	-0.002	-0.002	
023L	025L	37.046	37.046	37.031	37.031	0.015	0.015	
024R-1	026R	42.683	42.683	42.680	42.680	0.003	0.003	
025L	027L	42.533	42.533	42.496	42.496	0.037	0.037	
026R	028R	38.771	38.776	38.747	38.752	0.024	0.024	
027L	029L	42.041	42.049	42.071	42.077	-0.030	-0.028	
028R	030R	49.431	49.447	49.434	49.450	-0.002	-0.003	
029L	031L-1	53.704	53.771	53.698	53.765	0.006	0.006	
030R	032R	45.880	45.946	45.855	45.923	0.025	0.023	
031L-1	033L	45.153	45.212	45.136	45.197	0.016	0.015	
032R	034R-1	43.506	43.563	43.538	43.587	-0.032	-0.024	
033L	035L	34.108	34.149	34.122	34.164	-0.014	-0.015	
035L	037L	47.225	47.229	47.269	47.275	-0.044	-0.046	
037L	039L	19.841	19.845	19.814	19.818	0.027	0.027	
038R	040R	34.196	34.215	34.261	34.279	-0.065	-0.063	
039L	041L	36.163	36.177	36.149	36.160	0.014	0.017	
040R	042R-1	32.094	32.108	32.038	32.057	0.056	0.051	
041L	043L	41.391	41.391	41.367	41.367	0.024	0.024	
042R-1	044R-1	49.624	49.684	49.584	49.640	0.040	0.044	
043L	045L	45.172	45.275	45.167	45.268	0.006	0.007	
044R-1	046R	42.015	42.119	42.027	42.134	-0.013	-0.016	
045L	047L	61.978	62.125	62.024	62.171	-0.046	-0.046	
046R	048R	66.874	67.057	66.890	67.080	-0.016	-0.023	
047L	049L	33.546	33.657	33.481	33.592	0.065	0.064	
048R	050R-1	28.862	28.931	28.859	28.925	0.003	0.006	
<b>Average[m]</b>						<b>0.001</b>	<b>0.001</b>	
<b>Standard Deviation[m]</b>						<b>0.034</b>	<b>0.034</b>	
<b>RMS Error[m]</b>						<b>0.034</b>	<b>0.034</b>	

Sanroku Rd.(unit: m)

The distance between two points facing each other across the road.

Point NO		Surveyed distance[m]		Measured distance[m]		Difference[m]		Remark
Point1	Point2	Horizontal	Solid	Horizontal	Solid	Horizontal	Solid	
001L-1	002R	31.272	31.279	31.123	31.131	0.149	0.148	
002R	003L	26.567	26.581	26.586	26.603	-0.019	-0.022	
003L	004R	30.155	30.159	30.187	30.191	-0.033	-0.032	
004R	005L	28.592	28.593	28.569	28.572	0.023	0.022	
005L	006R	29.758	29.782	29.697	29.716	0.061	0.065	
006R	007L-1	27.036	27.042	27.008	27.015	0.028	0.028	
007L-1	008R	29.036	29.038	29.028	29.030	0.008	0.008	
008R	009L-1	25.504	25.513	25.507	25.515	-0.003	-0.001	
009L-1	010R-1	34.093	34.094	34.013	34.013	0.080	0.080	
010R-1	011L	30.034	30.036	30.002	30.005	0.032	0.032	
011L	012R	22.939	22.939	22.946	22.946	-0.007	-0.007	
012R	013L	27.571	27.578	27.563	27.570	0.007	0.008	
013L	014R	31.935	31.936	31.971	31.971	-0.035	-0.035	
014R	015L	21.017	21.017	21.038	21.039	-0.021	-0.021	
015L	016R	26.337	26.355	26.379	26.399	-0.042	-0.044	
016R	017L	18.080	18.082	18.008	18.010	0.072	0.072	
017L	018R	32.089	32.118	32.081	32.112	0.007	0.006	
018R	019L	21.226	21.237	21.194	21.204	0.032	0.033	
019L	020R	21.908	21.913	21.884	21.891	0.023	0.023	
020R	021L	17.817	17.819	17.731	17.736	0.086	0.083	
021L	022R-1	18.562	18.564	18.638	18.638	-0.075	-0.074	
022R-1	023L	33.173	33.173	33.175	33.175	-0.002	-0.002	
023L	024R-1	17.143	17.145	17.132	17.133	0.011	0.012	
024R-1	025L	24.590	24.591	24.547	24.548	0.043	0.044	
025L	026R	22.162	22.162	22.136	22.136	0.026	0.026	
026R	027L	24.506	24.506	24.412	24.412	0.094	0.094	
027L	028R	21.265	21.277	21.255	21.264	0.010	0.012	
028R	029L	27.976	27.976	27.998	27.998	-0.022	-0.022	
029L	030R	33.124	33.144	33.120	33.142	0.004	0.001	
030R	031L-1	25.788	25.834	25.786	25.828	0.002	0.006	
031L-1	032R	24.751	24.769	24.742	24.763	0.009	0.006	
032R	033L	24.722	24.761	24.729	24.764	-0.007	-0.003	
033L	034R-1	24.034	24.049	24.046	24.058	-0.012	-0.009	
034R-1	035L	18.895	18.914	18.819	18.842	0.076	0.071	
037L	038R	18.231	18.232	18.295	18.295	-0.063	-0.062	
038R	039L	18.346	18.347	18.378	18.381	-0.031	-0.034	
039L	040R	24.627	24.645	24.679	24.690	-0.052	-0.045	
040R	041L	18.744	18.744	18.597	18.597	0.148	0.147	
041L	042R-1	24.484	24.501	24.489	24.508	-0.005	-0.007	
042R-1	043L	30.171	30.186	30.165	30.181	0.006	0.005	
043L	044R-1	26.262	26.304	26.239	26.276	0.023	0.028	
044R-1	045L	23.462	23.513	23.441	23.498	0.021	0.015	
045L	046R	23.373	23.415	23.352	23.391	0.021	0.024	
046R	047L	42.833	42.929	42.856	42.955	-0.024	-0.026	
047L	048R	26.778	26.858	26.747	26.832	0.031	0.026	
048R	049L	15.565	15.578	15.478	15.489	0.087	0.089	
049L	050R-1	20.633	20.678	20.719	20.764	-0.086	-0.087	
<b>Average[m]</b>						<b>0.014</b>	<b>0.014</b>	
<b>Standard Deviation[m]</b>						<b>0.049</b>	<b>0.049</b>	
<b>RMS Error[m]</b>						<b>0.051</b>	<b>0.051</b>	