# **Climsoft V4 – Quality Control Guide**

March 2020

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# 1. Introduction

Welcome to the Climsoft version 4 Quality Control guide. This guide will take you through two (2) levels of Quality Control checks required in Climsoft version 4. These are: Quality Control during Data Entry process and Post Key Entry Quality Control (QC) Checks performed on both data which has been entered via Climsoft data entry forms and external data imported or migrated into Climsoft through Climsoft data transfer facility.

# 2. Quality Control checks during Key Entry

When data are entered through the data entry forms, Climsoft performs validity checks as soon as the cursor move to the next value box or record. If there is a potential error or problem with data, Climsoft will display an error message and highlight the value box containing the error in question. If a value is entered and it is found to be outside the absolute limit set in the system (e.g. entering 3400 instead of 340 as a value for "daily temperature maximum"), a message box that includes the upper or lower limit allowed for this element will be displayed.

Figure 1 below shows a QC message that pops up after entering a value that has failed the QC check for upper limit when entering daily data. Click the "**OK**" button on the error message box to accept and place back the cursor into the data entry form value box to apply necessary correction.

🛃 Daily data for	the whole	month											×
Station		Bement											
AGASE				~	Temp Daily	Max			~ 2	Enable	Element	Sequencer	
Year: 2017	]	M 12	onth: 2 v		Hour 6 ~		Assign	Assign same value to all obs Value					
Units	s perature	Deg	c ~	Precip	mm ~	]	Cloud heigh	feet	~	Vis	blity	metres ~	]
Day	Value	Flag	Period	Day	Value	Flag	Period	Day	Value	Flag	Period		
01	290			11	270			21	321				
02	300			12	285			22	291				
03	265			13	274	$\square$		23	284		$\square$		
04	277			14	282	$\square$		24	286				
05	285			15	295			25	289		$\square$		
06	280			16	288			26	303		$\square$		
07	279			17	269			27	298		$\square$		
08	291			18	297			28	279		$\square$		
09	288			19	301			29	289		$\square$		
10	269	Clims	oftVer4					×	334		$\square$	Total	
Add New	Save		Valu	Je higher	than upp	erlimi	it of: 460.0	0	465  >>	Close		Help	
	L						UK						

Figure1 - QC checks during Data entry

# 3. Post Key-Entry Quality Control (QC) Checks

Climsoft provides a facility for Quality Control checks of data that has been uploaded from Data entry forms tables or transferred using climsoft external data transfer facility into the "observationinitial" table.

Two options for QC checks currently available in Climsoft version 4 are "Absolute limits checks" and "Inter-element comparison checks.

All data uploaded from Data entry forms into observationinitial table or transferred through the climsoft external data transfer facility into the observationinitial table have the QCstatus equal to 0 (**qcStatus=0**) and cannot be transferred to observationfinal because they have not yet undergone through the Quality Control checks process .

Data that have not yet undergone Quality Control checks process are not allowed to be transferred into the observation final table where data products is being generated.

After performing the Quality Control checks operation on data, the QCstatus change from **0** to **1 (qcStatus=1)**, in this case all data with QCstatus equal to **1** can be transferred to observationfinal table.

#### 3.1 Absolute Limits QC Checks

Follow the steps below to perform "Absolute limits QC checks":

Step 1: Sign into Climsoft with the right privilege;

**Step 2:** click on "**Quality Control Checks**" icon, in the main menu window to open the quality control dialog box, by default "**Absolute limits checks**" is selected as shown in Figure 2 below;

**Step 3: Specify the range** of the Quality Control Checks (Beginning Year, Ending Year, Beginning Month and Ending Month);

**Step 4:** Select the specific **station(s)** and **element(s)** for QC by selecting or ticking the box before the station(s) and element(s) boxes (Figure 2).

🔜 Quality Control Checks					– 🗆 X
Select Option for QC Type		Chec	ck to Select	Stations and E	ements for QC
	Station Id	Station Name	^	Element Code	Element Details
<ul> <li>Absolute limits checks</li> </ul>	00301AWS	BIGOGWE AWS		2	Temperature daily maximum
	00302AWS	NGARAMA AWS		<b>⊿</b> 3	Temperature daily minimum
<ul> <li>Inter-element comparison checks</li> </ul>	00303AWS	KAYONZA_AWS		4	Temperature daily mean
	2 00304AWS	NDEGO_AWS		5	Precipitation daily total
	2 00305AWS	KIREHE_AWS		6	Precip greatest amount in 5 min
	2 00306AWS	RUTONGO_AWS		7	Precip greatest amount in 10 m
	200308AWS	RULINDO_AWS		8	Precip greatest amount in 15 m
	200309AWS	MAYANGE_AWS		9	Precip greatest amount in 30 m
	🗹 00310AWS	KINAZI_AWS		10	Precip greatest amount in 60 m
	🗹 00311AWS	NYABIMATA_AWS		11	Precip greatest amount in 2 hou
	🗹 00312AWS	KADUHA_AWS		12	Temperature dew point daily m
	🗹 00313AWS	NGORORERO_AWS		13	Temperature dew point daily m
	🗹 00314AWS	RUTSIRO_AWS		14	Temperature dew point daily m
	00315AWS	KIGALI AERO_AWS		15	Relative humidity daily maximun
Calant Time Damas	🗹 00317AWS	GIKOMERO_AWS		16	Relative humidity daily minimum
Select Time Range	00319AWS	MUKUNGURI_AWS		17	Relative humidity daily mean
Begin Year 1900 Begin Month 01	🗹 00320AWS	BAKOKWE_AWS		18	Evaporation pan1 daily total
	🗹 00321AWS	MUHEMBE_AWS	v	19	Evaporation lake daily total
End Year 2017 End Month 12	<		>	<	T
	Unselect All Sta	ations		Select All Elem	ents
		1			
Perform QC Cancel	Help		Up	date With QC Repor	t

Figure 2 – Absolute limits Checks

**Step 5:** Click on "**Perform QC**" button to generate the QC report. QC checks will be performed on all the stations and elements selected within the period specified and the result will be sent in the QC folder. Two (2) Comma Separated Values (CSV) files will be generated and out in the QC folder, the file output for Upper Limit and the one for Lower limit (Figure 3):

Name	Date modified	Туре	Size	
ac_report_upperlimit_201601_201612.csv	25/11/2016 11:33	Microsoft Excel C		1 KB
c_report_lowerlimit_201601_201612.csv	25/11/2016 11:33	Microsoft Excel C		1 KB

Figure 3 – Dialog showing an Example of QC output file name structure

Step 5: Double click the files (Figure 3) to see the file conter
--

	A1		- : )	$f_x$	StationId											~
		Α	A B C			Е	F	G	н	I.	J	K	L	м	Ν	
1	1 9	stationId	tionId ElementIc DateTime			mm	dd	hh	ObsValue	upperlimi	qcStatus	acquisitio	obsLevel	captured	dataForm	
2	2	20310500	2 01/01/2016 06:00 20			1	1	6	470	460	1	1	surface	root	form_daily2	
3	3	20310500	5 01/04/2016 06:0		2016	4	1	6	3500	3000	1	. 1	surface	root	form_daily2	-
	4	F	qc_rep	ort_upperlimit_201	601_201	+				: •						
READY III+ 100%											%					

Figure 5 – Dialog showing an Example of the QC output file structure - Upper Limit

1	A1	• : ]	$\times \checkmark f_x$	StationId											*
	Α	В	С	D	E	F	G	н	I.	J	К	L	м	N	
1	StationId	Elementic DateTime yyyy		уууу	mm	dd	hh	ObsValue	lowerlimi	qcStatus	acquisitio	obsLevel	captured	dataForm	
2	20310500	2	01/07/2016 06:00	2016	7	1	6	125	130	1	1	surface	root	form_daily2	
3	20310500	2	27/07/2016 06:00	2016	7	7 27		100	130	1	1	surface	root	form_daily2	-
		qc_rep	ort_lowerlimit_201	601_201	+				: •						Þ
R	EADY											] 🛄 -		<b>+</b> 100	1%

Figure 6 - Dialog showing an Example of the QC output file structure - Lower limit

# 3.2 Inter Element Comparison QC Checks

**Inter Element Comparison Checks**", is done on related elements e.g. Maximum and Minimum temperatures, Maximum and Dry bulb temperatures, Dry bulb and Minimum temperatures, Dry bulb and Wet bulb temperatures, and Wet bulb and Dew point temperatures, Table 1 show the elements relationship table:

	Element	Relationship	Element
1.	Maximum temperature	>=	Minimum temperature
2.	Maximum temperature	>=	Dry bulb temperature
3.	Dry bulb temperature	>=	Minimum temperature
3.	Dry bulb temperature	>=	Wet bulb temperature
4.	Wet bulb temperature	>=	Dew point temperature

Table 1- Relations	nip between ele	ements
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Follow the steps below to perform the "Inter - element comparison QC checks":

Step 1: Sign into Climsoft with the right privilege;

Step 2: click on "Quality Control Checks" icon, located in the welcome window to open the quality control dialog box, select "Inter – element comparison checks", By default, elements with relationships will be selected automatically by the system and the elements codes and elements details will not be active (note: user will not be able to select these manually since they are already selected automatically);

**Step 3: Specify the range** of the Quality Control Checks (Beginning Year, Ending Year, Beginning Month and Ending Month);

**Step 4:** Select the specific **station(s)** or ticking the box "Select All Stations to select all the stations (Figure7).

🔜 Quality Control Checks					– 🗆 X
Select Option for QC Type		Check	to Selec	t Stations and Ele	ements for QC
	Station Id	Station Name	^	Element Code	Element Details
<ul> <li>Absolute limits checks</li> </ul>	10101100	GITEGA		2	Temperature daily maximum
	10105200	BUTAMWA		3	Temperature daily minimum
Inter-element comparison checks	10106500	MUHIMA		4	Temperature daily mean
	10107500	KABUSUNZU		5	Precipitation daily total
	10108500	COLLEGE ST ANDRE		6	Precip greatest amount in 5 min
	10109500	LYCEE ND CITEAUX		7	Precip greatest amount in 10 m
	10109600	RUGUNGA		8	Precip greatest amount in 15 m
	10109700	RWAMPARA		9	Precip greatest amount in 30 m
	10201500	RUBUNGO		10	Precip greatest amount in 60 m
	10202200	KABUYE SUGAR		11	Precip greatest amount in 2 hou
	10306100	KIGALI AERO		12	Temperature dew point daily m
	10308500	MASAKA		13	Temperature dew point daily m
	10308600	RUBIRIZI		14	Temperature dew point daily m
	20101500	NYANZA		15	Relative humidity daily maximun
Colort Time Deserve	20101600	GIHISI		16	Relative humidity daily minimum
Select Time Range	20101700	BUSASAMANA-NYANZA		17	Relative humidity daily mean
Begin Year 2000 Begin Month 01	20102PLP	BUSORO		18	Evaporation pan1 daily total
	20106500	MWEYA	~	19	Evaporation lake daily total
End Year 2019 End Month 12	<		>	<	T
	Select All Stati	ons		Select All Eleme	ents
Perform QC Cancel	Help		Up	date With QC Report	

Figure 7 – Inter - elements comparison Checks

**Step 5:** Click on "**Perform QC**" button to generate the QC report. QC checks will be performed on selected stations or on all the stations (if the box Selected All Stations was selected) and inter-related elements only predefined in the system (see the list of predefine inter-related elements in the table 1 above) selected within the period specified and the result will be sent in the QC folder (Figure 8):

Name	Date modified	Туре	Size
🗟 qc_interelement_2_3_201601_201612.csv	28/11/2016 14:31	Microsoft Excel C	1 KB
🚯 qc_interelement_2_101_201601_201612.csv	28/11/2016 14:39	Microsoft Excel C	1 KB
🗟 qc_interelement_101_3_201601_201612.csv	28/11/2016 14:37	Microsoft Excel C	1 KB
🗟 qc_interelement_101_102_201601_201612.csv	28/11/2016 14:32	Microsoft Excel C	1 KB
<b>qc_interelement_102_103_201601_201612.csv</b>	28/11/2016 14:34	Microsoft Excel C	1 KB

Figure 8 - List of inter- element QC report output files

**Step 6:** Double click the files one at a time (Figure 8 above) to open the file and view the file contents:

Г			_		_	-									L		
ł.		A	В	C	D	E	F	G	н		J	K	L	M	N	0	1
	1	stationId	elementio	elementi	obsDatetime1	obsdatetime_2	уууу	mm	dd	hh_1	hh_2	obsValue	obsValue	qcStatus_	qcStatus	acquisitio	
	2	20310500	2	3	02/01/2016 06:00	02/01/2016 06:00	2016	1	. 2	2 6	6	252	280	1	1	. 1	
	3	20310500	2	3	01/02/2016 06:00	01/02/2016 06:00	2016	2	1	ι ε	6	228	250	1	1	. 1	
	4	20310500	2	3	02/02/2016 06:00	02/02/2016 06:00	2016	2	1 2	2 6	6	219	230	1	1	. 1	
	5	20310500	2	3	03/02/2016 06:00	03/02/2016 06:00	2016	2		3 6	6	266	350	1	1	. 1	
ł.	6																-
	<pre>qc_interelement_2_3_201601_201</pre>			(+)										Þ			
1	READY												Ē	III		100%	

Figure 9 - Dialog showing an Example of the QC output file comparing Max and Min temperature.

#### Important:

The QC reports will be sent to the folder that would have been configured for the QC reports under "**General Settings**" (Figure 10). It is therefore important to make sure that the folder for QC reports has been configured correctly by the Climsoft administrator.

🔜 General Settings		×
When updating fo use backslash '\'	older location for QC output, you must use forward slash '/'. For all other folde '.	er locations
Setting Name	key08 Setting Value C:/data/QCReport	
Setting Description	Folder for QC Reports for MariaDB output (Unix style)	
	I<	
Add New	Save Update Delete Clear View Close	Help

Figure 10 - Configuration of the QC report folder

The name of the QC report file will be automatically generated based on the type of QC selected and the specified period for the QC.

For Absolute limits QC checks, the report file of data that fails the QC checks will specify whether it is upper or lower limit and the specific period range for QC (example: "qc\_report\_upperlimit\_201601\_201612.csv", qc\_report\_lowerlimit\_201601\_201612.csv").

For the case of inter-element comparison checks, the codes of the elements that would have failed the QC checks will also be included in the file name (example: "**qc\_interelement\_101\_3\_200101\_200312.csv**") for inter-element comparison checks between dry bulb temperature and minimum temperature for the mentioned period.

**Note:** Data which are undergone QC Checks (*Absolute limits or inter-element comparison QC checks*) will change the qcStatus in the database from **qcStatus=0** to **qcStatus=1**). It should be noted that data that satisfy preset conditions for global and inter element comparison check, will not appeared in the QC report output file (s). In case all the data satisfy preset conditions for global and inter-element comparison check during the QC process, a message box with "**No QC errors found**" message will be displayed (Figure11).

层 Quality Control Checks					— 🗆	$\times$	
Select Option for QC Type		Chec	k to Selec	Stations and E	ements for QC		
	Station Id	Station Name	^	Element Code	Element Details	^	
<ul> <li>Absolute limits checks</li> </ul>	10101100	GITEGA		90	Press. Min Matin		
	10105200	BUTAMWA		91	Mean Vapour Pressure Deficit	0	
<ul> <li>Inter-element comparison checks</li> </ul>	10106500	MUHIMA		92	Insolation Afternoon		
	10107500	KABUSUNZU		93	Insolation Morning		
	10108500	COLLEGE ST ANDRE		94	24 Hr Temperature range		
	10109500	LYCEE ND CITEAUX		95	Preciptation; duration; 06-18		
	10109600	RUGUNGA		96	Hauteur de Precip Nuit		
	10109700	RWAMPARA		97	Hauter de Precip Jour		
	10201500	RUBUNGO	ClimsoftVer4 X		Wind Totalizer at 18Z		
	10202200	KABUYE SUGAR			Wind Totalizer at 06Z		
	10306100	KIGALI AERO			Visi. Minimum		
	10308500	MASAKA	No QC errors found Temperature dry Temperature we Temperature de		Temperature dry bulb	0	
	10308600	RUBIRIZI			Temperature wet bulb	bulb	
	20101500	NYANZA			Temperature dew point	pint	
	20101600	GIHISI		OK	Precipitation total hourly		
Select Time Range	_ 20101700	BUSASAMANA-NYANZA			Relative humidity at 06Z		
Begin Year 2017 Begin Month 01	20102PLP	BUSORO		106	Pressure station		
	20106500	MWEYA		107	Pressure sea level		
End Year 2017 End Month 12	<	1577157787	>	< 100 <	Alia	*	
ProcessingPlease wait!	Select All Stati	ons		Select All Elem	ents		
Perform QC Cancel	Help		Up	date With QC Repo	t		

Figure 11 - QC Message Box

### 3.3 Renaming Updated QC Report File (s)

After performing the Quality Control Checks on data, all data are checked and change their qcStatus from 0 to 1 and data with errors are output in the QC folder for further investigation and correction.

After checking the output report file(s) and applying all the necessary correction, the file is saved with the same name as the previous file(s) **plus** the suffix "**updated**" (e.g. "**qc\_report\_upperlimit\_201601\_201612\_updated.csv**" for the absolute limits check and "**qc\_interelement\_101\_3\_200101\_200312\_updated.csv**" for the inter-element comparison check). A suffix "**Updated**" is added manually by the QC Officer to the file (s) name to show that the values in the QC report have been modified (updated) and is different with the original one (s) in the same QC folder.

#### 3.4 Updating observationinitial table with the updated QC report file.

#### 3.4.1 Case of Absolute limit Check

**Step1:** After analyzing a QC report file (s) and update both upper and lower limit report files, save changes to the report with updated values as instructed above by adding a suffix "**updated**" to the file name (Figure 12).

Name	Date modified	Туре	Size
🗟 qc_report_lowerlimit_201601_201612.csv	25/11/2016 11:33	Microsoft Excel C	1 KB
qc_report_lowerlimit_201601_201612_updated.csv	25/11/2016 11:36	Microsoft Excel C	1 KB
🕼 qc_report_upperlimit_201601_201612.csv	25/11/2016 11:33	Microsoft Excel C	1 KB
🕼 qc_report_upperlimit_201601_201612_updated.csv	25/11/2016 11:36	Microsoft Excel C	1 KB



**Step 2: Under Quality Control Dialog,** select "**Update With QC Report**" option (green button) and browse for the original QCd and then the updated QCd files (Figure 13);

🔛 Update ObservationIniti	al from QC Report	×
Original QC Report	C:\Data\QC\qc_report_upperlimit_201301_201512.csv Browse	]
Updated QC Report	C:\Data\QC\qc_report_upperlimit_201301_201512_updated.cs\ Browse	]
	Update Cancel Help	

Figure 13 – Process of updating the observationinitial table with the updated QC report file

**Step 3:** Click **Update** to validate and send changes from the updated QC report file into the observationInitial table.

#### 3.4.2 Case of the inter-element comparison check

**Step 1**: After analyzing a QC report and update the inter-element comparison QC report files, any changes to the report with updated values should be saved with a different name. What is recommended is to add a suffix "**updated**" see below (Figure 14).

Name	Date modified	Туре	Size
🕼 qc_interelement_2_3_201601_201612.csv	28/11/2016 14:31	Microsoft Excel C	1 KB
qc_interelement_2_3_201601_201612_updated.csv	28/11/2016 14:22	Microsoft Excel C	7 KB
🕼 qc_interelement_2_101_201601_201612.csv	28/11/2016 14:39	Microsoft Excel C	1 KB
🕼 qc_interelement_2_101_201601_201612_updated.csv	28/11/2016 14:39	Microsoft Excel C	1 KB
🕼 qc_interelement_101_3_201601_201612.csv	28/11/2016 14:37	Microsoft Excel C	1 KB
🕼 qc_interelement_101_3_201601_201612_updated.csv	28/11/2016 14:22	Microsoft Excel C	7 KB
🕼 qc_interelement_101_102_201601_201612.csv	28/11/2016 14:32	Microsoft Excel C	1 KB
🕼 qc_interelement_101_102_201601_201612_updated.csv	28/11/2016 14:22	Microsoft Excel C	4 KB
🕼 qc_interelement_102_103_201601_201612.csv	28/11/2016 14:34	Microsoft Excel C	1 KB
🚯 qc_interelement_102_103_201601_201612_updated.csv	28/11/2016 14:22	Microsoft Excel C	10 KB

#### Figure 14 - QCd and updated inter-element QC report files

**Step 2: Under "Quality Control"** select "**inter-element comparison checks**" and select "**Update With QC Report**" (green button) and browse for the original QCd and then the updated QCd files (Figure 15);

🔛 Update ObservationInitia	al from QC Report	×
Original QC Report	C:\Data\QC\qc_interelement_102_103_193001_193112.csv Browse	]
Updated QC Report	C:\Data\QC\qc_interelement_102_103_193001_193112_updatv Browse	]
	Update Cancel Help	

#### Fig 15 - Process of updating the observationinitial table with the updated QC report file

**Step 3:** Click **Update** to validate and send changes from the updated QC report file into the observationInitial database table.

#### Important

It should be noted that only data that would have gone through QC will be uploaded to the "**observationfinal**" table. Observation records that have not been QC'd will have a QC status "**0**" while records that have been QC'd will have a QC status "**1**".

**Note:** For any question or further clarifications, contact the Climsoft Helpdesk: <u>support@climsoft.org</u>