

5. Color Setup Utility

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5.1 Overview

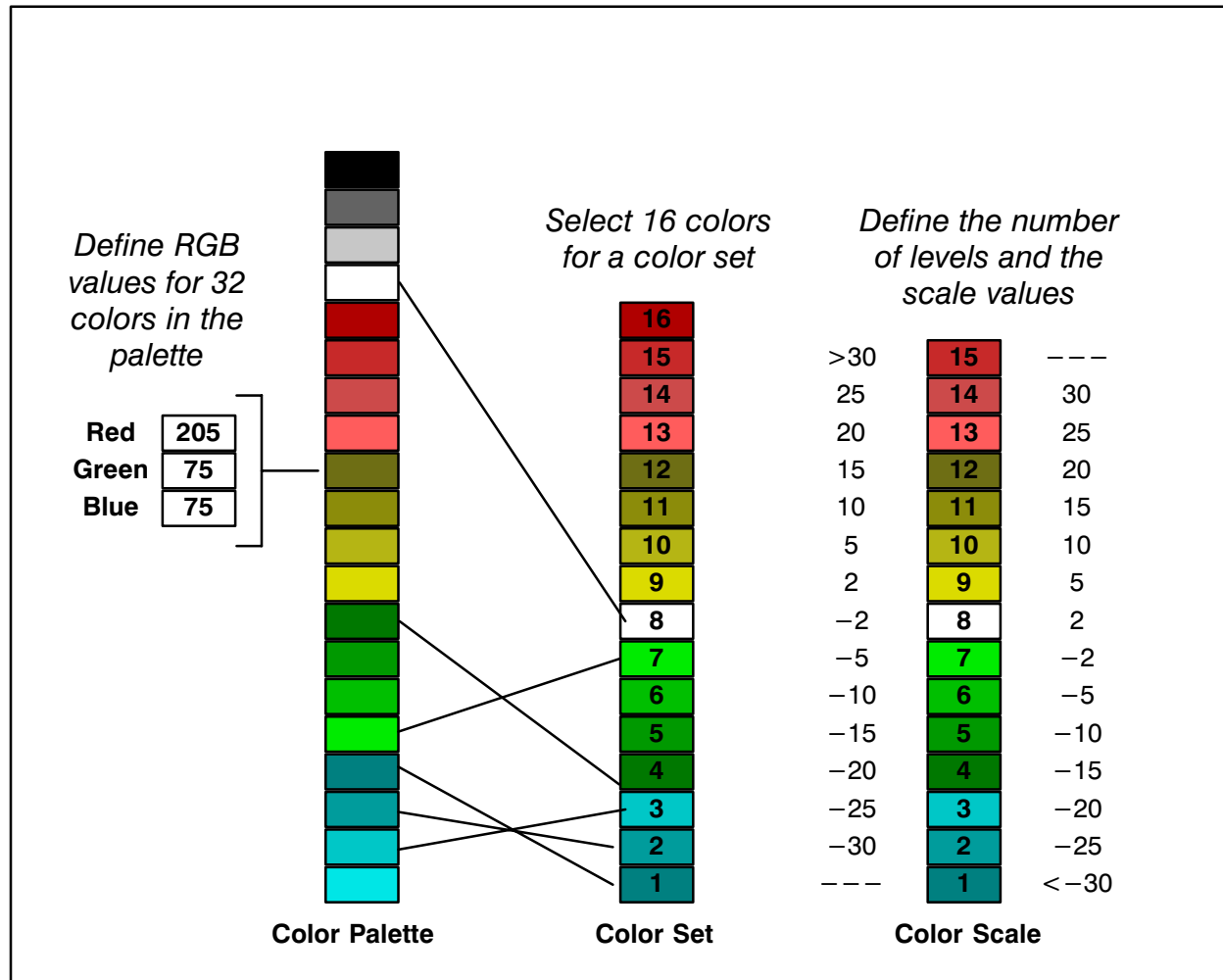
The colors in the IRIS graphical displays are configured using the **color_setup** utility. There are two classes of colors that are used in the displays:

- Data Colors** For displaying data values as color coded levels.
- Special Colors** Used for ocean, land, overlay lines, text, etc.

There are several concepts that are useful to understand when configuring the data colors. These are illustrated in Figure 5–1.

- Color Palette** This is the total palette of 32 colors that is available for representing data values on color displays. The user specifies the RGB values for each of the 32 colors. Defaults are provided.
- Color Set** This is the order of the colors for displaying up to 16 levels of data. The colors are selected from the color palette. IRIS supports up to four different color sets. For example, one may be used for positive data such as reflectivity or rainfall rate, while another may be used for signed data such as velocity of shear. Additional color sets may be created for persons who have difficulty seeing certain colors (this is quite common).

Figure 5–1: Steps in Defining a Color Scale



Color Scale or Legend The user can define the numeric values for the color scale. Each data parameter (dBZ, R, V, TOPS, etc.) can have up to 4 custom color scales. The example in Figure 5–1 is for velocity.

Typically, the color palette, color sets and color scales are not changed very frequently. Access to color_setup requires operator privilege. Observers can select different color scales and make their own uniformly-spaced color scales in the Quick Look Menu.



Caution: Changes to the color palette, color sets and color scales will effect all displays. Operators should coordinate changes with the system manager.

5.2 Starting color_setup

Command typed in terminal window as operator

```
$ color_setup
```

The Color Configuration Menu will appear on the screen as show in Figure 5–2.

5.3 Configuring a Color Scale

The Color Configuration Menu is used to configure the numerical data values that are associated with each color band. The menu fields are described below.

File

Open Example
Save
Print
Exit

Open Example This will load an example color scale for the selected data parameter (e.g., velocity, dBZ, etc.). The numerical values of the color seams for all of the examples correspond to the suggested default values that are given at the end of this chapter.

Save modifications to the current color scale will be saved to disk. For changes to take effect, be sure to restart those applications.

Print creates an X-window dump of the menu you are running, as follows:

- **Print→to Printer** sends the output to the Postscript or color printer specified in the Printer Setup menu.
- **Print→to File** sends the output to a file in your default home directory.
- **Print→Setup** lets you configure the printer on your system. See Section 1.4 for information on configuring a printer.

Exit exits from the Color Setup utility. If you have not saved your changes, you will get a prompt to save or cancel your changes before exiting.

Config

Change Color Set...
Set Special Colors ...

Change Color Set— Swap to the Color Set Configuration Menu

Set Special Colors — Swap to the Special Colors Configuration Menu

Figure 5–2: Color Configuration Menu Example for Velocity

File **Config** **Help**

Data Param **V**

Units **+ Vu m/s**

Levels **15**

Color Scale **Default**

Color Scale

????	16	????
>30	15	---
25	14	30
20	13	25
15	12	20
10	11	15
5	10	10
2	9	5
-2	8	2
-5	7	-2
-10	6	-5
-15	5	-10
-20	4	-15
-25	3	-20
-30	2	-25
---	1	<-30

Color Set **Velocity**

Save All **Restore All**

Data Params

Units

The first step is to select the data parameter for which you would like to make a color scale. The choices are:

Parameter	Signed (+_) or Positive	Description and Units
dBZ	Positive (Z)	dB of radar reflectivity factor in $\text{mm}^6 \text{m}^{-3}$
R	Positive	Rainfall rate in mm/hr
V	Signed	Velocity in m/s
W	Positive	Spectrum width in m/s
VIL	Positive	Vertically integrated liquid in mm
Height	Positive	Echo top height in km
Rain	Positive	Rain accumulation in mm
Shear	Signed	Wind shear in (m/s)/km
ZDR	Signed	Differential reflectivity (optional)

The units for these quantities and range of values is displayed in the **Units** field. The table above also indicates whether these quantities are treated as signed or positive only numbers. Note that dBZ can actually be negative if Z is less than 1 since it is a dB value.

Levels

The number of levels in your color scale can be 2 to 16. Typically:

- 16 levels are used for positive quantities.
- 15 levels or an odd number is used for signed quantities such as velocity or shear.

The use of an odd number of levels for velocity or shear allows a color set that is symmetric about zero similar to the example in Figure 5–2.

When you change the number of levels to be less than the maximum of 16, the unused levels will be desensitized. Also, the top end point indicator will shift.

Color Scale

This is to select existing color scales for editing or to create new ones. Up to eight are allowed for each data parameter. One of them must be named 'Default'. This leaves seven arbitrary names to be determined by the user. The button displays the following menu:

Default
Summer
Winter
Air Force
New
Delete

<file name> — Click on an existing Color Scale name to examine or edit it.

New — Select new to create a new name. If you already have 8 Color Scales names, then you will need to delete one before creating a new one. You can rename an existing one by calling it up and then editing the name.

Delete — Gives you a list of color scale names that can be deleted. Restrictions are:

- The current color scale name cannot be deleted.
- The Default color scale name cannot be deleted.



Note: You can rename a Color Scale by simply editing an existing name. The old name will be replaced by the new name.



Note: When you first enter the Color Configuration Menu, the Default Color Scale is always loaded. You can change the values of this Default but you cannot delete it. For convenience, set the Default scale to be something that you use frequently.

Color Set	Signed <input type="checkbox"/>
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Select the Color Set name. The Color Set determines the order of colors from top-to-bottom. There are 4 four available Color Sets, one of which must be named Default. Refer to section 5.4 for more information on color sets.

End Point Saturation			End Point Thresholding		
▶ <input type="text" value=">30"/>	<input type="text" value="15"/>	<input type="text" value="—"/>	▶ <input type="text" value="30"/>	<input type="text" value="15"/>	<input type="text" value="35"/>
<input type="text" value="—"/>	<input type="text" value="1"/>	◀ <input type="text" value="<-30"/>	<input type="text" value="-35"/>	<input type="text" value="1"/>	◀ <input type="text" value="-30"/>

At the end points of the scale (top and bottom) you can configure the behavior to do either of two things:

Saturate

This displays all values outside the last seam as the boundary color. The left example above shows both the bottom and the top using saturation. This is indicated by the > and < signs.

Threshold

This choice uses a fixed value as the outside limit. In this case, values beyond the fixed value (either too high or too low) are not displayed. The right example above shows the case for thresholding at the top and the bottom.

The thresholding/saturation choice is toggled by clicking the arrow sign. If you select thresholding, type in the appropriate boundary value. The top and the bottom behavior can be specified separately.



Hint: For positive-going scales (e.g., dBZ, tops, VIL, R, etc.) use thresholding at the bottom and saturation at the top. This will let you eliminate weak echoes from the display, while allowing you to see all of the very strong echoes.



Note: The uniform step color scales that can be configured interactively in the Product Configuration Menu and the Quick Look Menu will use whatever end-point behavior that you specify for the Default Color Scale.

Entering Color Scale Seam Values

The color scale values are most easily entered by

- Entering the lower left value first (if you are using thresholding).
- Entering the remaining seam values starting at the bottom right and working upwards in the right column. Note that the values in the left column will be filled-in automatically.

If a data value exactly matches a color scale seam, it will be displayed as if it was above the seam. So everything \geq the lower seam and $<$ the higher seam is included in a color interval. The values that are entered will be formatted in the same manner as they will be for the actual legends in the color display. The formatting is automatic to make numeric displays easily readable, i.e.,

- Trailing zeroes are suppressed whenever possible. However, if there is a value with 10ths such as 1.1, then the trailing zeroes are used (e.g., 5.0 rather than 5) for better text alignment.
- In most cases two significant figures are shown in the legend, provided that the data type supports it and that it does not cause incidental trailing zeroes.

Save All

Restore All

After you have made your changes, use Save All to save your results. Note that **File**→**Save** accomplishes the same thing. If you try to exit without saving, you will get a prompt to save or cancel your changes.

If you change your mind and want to start over, click Restore All. This will restore the values that were last saved.

5.4 Configuring a Color Set

To change a color set or create a new one (the order of the colors) click **Config->Change Color Set**. This will take you to the Color Set Configuration Menu. If you had made changes to the color scale, you will be prompted to first save or cancel your changes. The Color Set Configuration Menu will appear as shown in Figure 5-3.

On the left, the menu shows the current color set. The right side of the menu shows the total color palette from which you can select colors for the color set.

To change the colors in the color set, highlight the color level that you want to change and then click on the new color on the color palette. Your change will be reflected instantly in the color set (and in the color scale in the main menu as well).

There can be up to 4 color sets, one of which must be named 'Default'. This leaves three set names to be defined by the user.

The two example names used here are:

- **Positive** example will be the name given to the color set that is used for dBZ, rainfall rate, etc. In this case going from blues->greens->yellows->reds.
- **Signed** will be the name given to the color set that is used for velocity and shear. The negative values will be the blues and the positive values will be the reds. For velocity this corresponds to blue being motion toward the radar which is the usual Doppler convention.

The procedures for creating, renaming and deleting color sets are identical to those for color scales as described in the previous section.

When you are done, select **File->Close**. If you did not save your changes you will get a prompt to save or cancel your changes prior to closing.

Figure 5–3: Color Set Configuration Menu example for velocity.

File

Color Set

Velocity

Red

Green

Blue

Unify Colors ☐

		R	G	B			R	G	B			
16		16	16		255	0	255	32		225	225	225
15		15	15		182	0	106	31		195	195	195
14		14	14		229	0	0	30		165	165	165
13		13	13		255	73	0	29		135	135	135
12		12	12		255	138	0	28		105	105	105
11		11	11		255	178	0	27		75	75	75
10		10	10		255	220	0	26		45	45	45
9		9	9		255	255	0	25		15	15	15
8		8	32		72	255	70	24		172	172	0
7		7	7		0	245	7	23		128	115	0
6		6	6		0	202	17	22		145	100	32
5		5	5		0	162	53	21		220	110	85
4		4	4		0	128	69	20		0	172	0
3		3	3		0	151	154	19		186	255	0
2		2	2		0	209	213	18		0	0	196
1		1	1		0	255	255	17		96	96	255

Save All **Restore All** **Exit**

5.5 Configuring the Color Palette



Caution: Changes to the color palette, effect the display of all data in IRIS. Clear changes with the system manager. The color palette should rarely require changing.

There are two ways to change a color in the palette in the Color Set Configuration Menu (Figure 5–3):

- Click on the RGB value that you want to change and type in the value.
- Highlight the color that you want to change and use the RGB slide pots at the bottom.

5.6 Configuring the Special Colors

Special colors are used for non-data items in the display such as overlays and legends. The table below lists the special colors, their use and some typical values.

Name	Description	Default	R	G	B
Legend Background	Background behind the legend text	Black	0	0	0
Legend Text	Text on the legend background	White	255	255	255
Drop Shadows	Shadows cast underneath echoes for 3D look	Black	0	0	0
Overlay Level 1	Layer 1 lines typically used for geography	Black	0	0	0
Overlay Level 2	Layer 2 lines, e.g., rivers, roads, political	Gray	128	128	128
Overlay Level 3	Layer 3 lines, e.g., rivers, roads, political	Green	0	255	0
Overlay Text Background	Background color for text on the overlay	Tan	196	196	128
Underlay #1	To overlay areas, typically land color	LtBrn	212	155	95
Underlay #2	To overlay areas, typically sea color	Blue	117	117	199
Underlay #3	To overlay areas, typically special areas	Tan	170	155	95
Centroid Ellipses	Fill color for warning centroids, typically bold	DkPink	200	100	220
Blink	Blinking data will alternate with this color	Red	255	0	0
Track Line	Track lines drawn in this color	Black	0	0	0
Highlight	Forecast arrows and protected area hits	White	255	255	255
Shear Line	Shearlines drawn in this color	Black	0	0	0

To configure the special colors click **Config→Set Special Colors** in the Color Configuration menu (main menu). This will bring up the color configuration menu. Use **File→Open** example to get the sample values that are listed in the table above.



Hint: The colors related to overlays should be distinct from the colors in the color palette that are used for data. Otherwise overlay features will not be distinguishable from data.

5.7 Example Values to Get Started

To make it easier to start your operation, example values are supplied for all menus. These are intended as examples only. You can use these until you get a feeling for the climatology and your particular application. The examples are summarized below.

Color Scales

The default color scales are loaded in the Color Configuration Menu. First select the Data Parameter that you want (e.g., dBZ, R, etc.), then click **File→Open Example**. The table below gives the examples for each data type.

Reflectivity–dBZ (mm ⁶ /m ³)			Rainfall–Rate R (mm/hr)		
Level	Start	Stop	Level	Start	Stop
16	>66	—	16	>500	—
15	60	66	15	200	500
14	55	60	14	100	200
13	53	55	13	80	100
12	50	53	12	50	80
11	44	50	11	20	50
10	39	44	10	10	20
9	37	39	9	8	10
8	34	37	8	5	8
7	28	34	7	2	5
6	23	28	6	1	2
5	21	23	5	0.8	1
4	18	21	4	0.5	0.8
3	12	18	3	0.2	0.5
2	7	12	2	0.1	0.2
1	2	7	1	0.05	0.1

Rain Accumulation — Rain (mm)			Vertically Integrated Liq — VIL (mm)		
Level	Start	Stop	Level	Start	Stop
16	>800	—	16	>32	—
15	500	800	15	30	32
14	200	500	14	25	30
13	100	200	13	20	25
12	80	100	12	15	20
11	50	80	11	8	15
10	20	50	10	6	8
9	10	20	9	4	6
8	8	10	8	2	4
7	5	8	7	1	2
6	2	5	6	0.8	1
5	1	2	5	0.6	0.8
4	0.8	1	4	0.4	0.6
3	0.5	0.8	3	0.2	0.4
2	0.2	0.5	2	0.1	0.2
1	0.1	0.2	1	0.05	0.1

Velocity -V (+ is away in m/s)			Spectrum Width (W in m/s)		
Level	Start	Stop	Level	Start	Stop
16	Unused	Unused	16	>5.5	—
15	>30	—	15	5.0	5.5
14	25	30	14	4.5	5.0
13	20	25	13	4.0	4.5
12	15	20	12	3.5	4.0
11	10	15	11	3.0	3.5
10	5	10	10	2.5	3.0
9	2	5	9	2.0	2.5
8	-2	2	8	1.5	2.0
7	-5	-2	7	1.0	1.5
6	-10	-5	6	0.8	1.0
5	-15	-10	5	0.6	0.8
4	-20	-15	4	0.4	0.6
3	-25	-20	3	0.2	0.4
2	-30	-25	2	0.1	0.2
1	—	<-30	1	—	<0.1

Wind Shear– Shear (m/s/km)			Echo Tops– Height (km)		
Level	Start	Stop	Level	Start	Stop
16	unused	unused	16	???	???
15	>25	—	15	>16	—
14	20	25	14	15	16
13	15	20	13	14	15
12	10	15	12	13	14
11	6	10	11	12	13
10	3	6	10	11	12
9	1	3	9	10	11
8	–1	1	8	9	10
7	–3	–1	7	8	9
6	–6	–3	6	7	8
5	–10	–6	5	6	7
4	–15	–10	4	5	6
3	–20	–15	3	4	5
2	–25	–20	2	3	4
1	—	<–25	1	2	3

Specific Differential phase – KDP (deg/km)			Differential Phase – PHI (deg)		
Level	Start	Stop	Level	Start	Stop
16	>20	—	16	>169	—
15	>7.0	20	15	157	169
14	3.1	7.0	14	146	157
13	2.4	3.1	13	135	146
12	1.7	2.4	12	124	135
11	1.1	1.7	11	112	124
10	0.75	1.1	10	101	112
9	0.50	0.75	9	90	101
8	0.33	0.50	8	79	90
7	0.22	0.33	7	68	79
6	0.15	0.22	6	56	68
5	0.10	0.15	5	45	56
4	–0.10	0.10	4	34	45
3	–0.20	–0.10	3	23	34
2	–0.40	–0.20	2	11	23
1	—	<–0.40	1	—	<11

Signal Quality Index – SQI (no units)			Depolarization Ratio – LDR (dB)		
Level	Start	Stop	Level	Start	Stop
16	>0.94	—	16	>0	—
15	0.87	0.94	15	–2	0
14	0.81	0.87	14	–4	–2
13	0.75	0.81	13	–6	–4
12	0.69	0.75	12	–8	–6
11	0.62	0.69	11	–10	–8
10	0.55	0.62	10	–12	–10
9	0.50	0.55	9	–14	–12
8	0.44	0.50	8	–16	–14
7	0.38	0.44	7	–18	–16
6	0.31	0.38	6	–20	–18
5	0.25	0.31	5	–22	–20
4	0.19	0.25	4	–24	–22
3	0.13	0.19	3	–26	–24
2	0.06	0.13	2	–28	–26
1	—	<0.06	1	–30	–28

Differential Reflectivity ZDR		
Level	Start	Stop
16	Unused	Unused
15	>3.5	—
14	3.0	3.5
13	2.5	3.0
12	2.0	2.5
11	1.5	2.0
10	1.0	1.5
9	0.5	1.0
8	−0.5	0.5
7	−1.0	−0.5
6	−1.5	−1.0
5	−2.0	−1.5
4	−2.5	−2.0
3	−3.0	−2.5
2	−3.5	−3.0
1	—	<−3.5

Color Set and Palette Examples

In the Color Set Configuration Menu, click **File→Open Example** and choose either the velocity example or dBZ example. This will load both a color palette and a color set. Note that the color palette is the same for both examples.

The velocity example shows a convenient color set for signed data. The dBZ example shows a convenient color set for positive data. You may want to save these as “Signed” and “Positive” for your general use.

The RGB values for the default color palette are given in Figure 5–3.

Special Color Examples

In the Special Color Editor Menu, click **File→Open Example**. This will load examples for all special colors.